History of Operations Research in the United States Army

Volume II: 1961–1973

Charles R. Shrader

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OFFICE OF THE DEPUTY UNDER SECRETARY OF THE ARMY FOR OPERATIONS RESEARCH
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For those who served, 1961–1973

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Foreword

The 1960s and early 1970s were a tumultuous period in world history. Insurgent political movements as well as profound economic and social changes affected many regions of the world, including the United States. The rapid changes in technology and the shifting international political scene, most particularly the Communist insurgency in Vietnam, forced substantial changes in U.S. Army weaponry, organization, and doctrine. Coping with such fundamental and rapid change would not have been possible without the use of operations research and systems analysis (ORSA) techniques to aid Army decision makers in dealing with a complex present and a cloudy future.

In this, the second of three proposed volumes on the history of operations research in the United States Army, Dr. Charles R. Shrader identifies, describes, and evaluates the ideas, people, organizations, and events that influenced the development of ORSA in the Army from the inauguration of President John F. Kennedy in 1961 to the withdrawal of U.S. forces from Vietnam in 1973. Basing his work on extensive research of the surviving archival materials, official publications, books, articles, and interviews with key personnel, he clearly and concisely outlines the impact on the Army ORSA program of the McNamara revolution in defense management, the development of new organizations and methods for managing ORSA activities, the establishment of the ORSA Officer Specialist Program, the expansion of in-house ORSA elements, the contributions of ORSA contractors, and the important role played by ORSA in the studies of counterinsurgency and airmobility that preceded the commitment of U.S. combat forces in Vietnam. He also describes in some detail the organization and functions of Army ORSA elements in Vietnam, the work of the Army Concept Team in Vietnam, and the two major evaluations of Army combat operations conducted in country, the Army Combat Operations in Vietnam study and the Mechanized and Armor Combat Operations in Vietnam study as well as the use of ORSA techniques at field force, division, and lower levels.

In this volume, Dr. Shrader carries the story up to 1973 and the beginning of the period of recovery from America's long involvement in Southeast Asia. The final volume will cover the development of Army ORSA from 1973 to 1995, the post-Vietnam period of recovery and reorganization that led to a 100-hour victory in the first Gulf War in 1991 and the emergence of the U.S. Army as second to none in modern weaponry, tactical prowess, and strategic vision. All three volumes in the series are recommended for study not only by those of us in the Army analysis community but by civilian leaders, military commanders, and staff officers at all levels. The story of ORSA in the U.S. Army provides many important insights into Army decision making, the adaptation of science to military affairs, the process by which we design and evaluate weapons and other equipment, tactical organization and doctrine, strategy, and management of the Army.

WALTER W. HOLLIS
Deputy Under Secretary of the
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Preface

The story of operations research and systems analysis (ORSA) in the United States Army during the 1960s and early 1970s is one of challenges, achievements, and failures. The number of Army personnel engaged in Army ORSA activities and the number of in-house Army ORSA organizations increased, and the scope of problems taken up by Army ORSA analysts expanded. Setbacks were not uncommon, but on the whole the era was one of progress, maturation, and increasing acceptance of ORSA as an important tool in the decision-making process.

The longtime interest of Army leaders in applying the latest "scientific" methods to improve the efficiency and effectiveness of Army operations and management accelerated after the Spanish-American War of 1898, and sixty years of slow but steady progress provided an excellent foundation for the changes in defense management precipitated by Secretary of Defense Robert S. McNamara in the early 1960s. The advent of the Planning, Programming, and Budgeting System, newly developed techniques of systems and cost-effectiveness analysis, the consequent demand by the Office of the Secretary of Defense (OSD) for accurate, timely, and detailed quantitative data and analysis, and the resulting centralization of defense decision making forced the Army to adapt, to reorganize its own decision-making and data management processes, and to improve its analytical capabilities. Although Secretary McNamara resigned in February 1968, the changes he introduced continued to affect the Army's analytical community for the remainder of the decade and beyond.

In seeking to reorganize itself to provide the data demanded by OSD, the Army Staff discovered the value of ORSA as a management tool, and its use expanded substantially. The Army Staff underwent an internal reorganization designed to ensure that the Army could respond quickly and accurately to the demands for quantitative data imposed by Secretary McNamara and the "Whiz Kids" in OSD. The position of deputy under secretary of the Army for operations research (DUSA [OR]) evolved to provide centralized technical oversight for the Army ORSA community, and the Office of the Assistant Vice Chief of Staff of the Army was created to maximize the effective use of ORSA techniques by the Army Staff. At the same time, the analytical capabilities of other Army Staff elements were expanded, and Army Staff supervision of Army-wide ORSA programs was strengthened.

The increased emphasis Army-wide on developing an effective ORSA capability carried with it the need to significantly increase and improve the Army's in-house capability to conduct ORSA analyses and to review analyses conducted by other agencies. Initially, Army ORSA assets, although substantial, were inadequate to meet the increased demand, and neither the expansion of contractual arrangements for ORSA support nor increases in the Army's civilian ORSA workforce were desirable or practical alternatives. Consequently, the Army Study System and the Army analytical community itself were the subjects of extensive investigation during the 1960s. The May 1964 Bonesteel study of the Army Study System, the February 1966 Haines Board study of Army officer education, the August 1966 Army Study Advisory Committee study of Army ORSA requirements, and the September 1969 DePuy review of the Army Study System defined the Army's need for analytical studies and prescribed the means needed to meet those needs. Army officers were becoming more directly involved in ORSA work at every level, and one of the principal recommendations of all four studies was to increase the number of Army officers in ORSA as well as to create a centralized system for the identification, development, and management of both uniformed and civilian ORSA specialists and executives. Thus, in the mid-1960s the Army began a sustained effort to increase both the number of officers sent for graduate training in ORSA and the number of qualified Department of the Army (DA) civilians, and in March 1967, the Army finally

established a formal program for the career management of officer ORSA specialists. By 1974, there were nearly 600 Army officers qualified as ORSA specialists, and the number of qualified civilian ORSA managers and analysts had increased as well.

While the Army's ORSA requirements were under study, analytical organizations throughout the Army applied both the traditional methods of operations research and the new techniques of systems and cost-effectiveness analysis to the perennial problems of weapons systems development, the formation of tactical and strategic doctrine, and force structuring. Indeed, the number and scope of Army organizations, contract and in-house, employing ORSA methods to solve current Army problems and plan for the future increased substantially during the McNamara years. Coordinated through the Army Study System, the ORSA study became an essential tool at every level. Although Army leaders focused on improving in-house capabilities, they also increased ORSA contracting activities; and Army ORSA contractors, such as the Research Analysis Corporation (RAC), the Human Resources Research Office (HumRRO), and the Special Operations Research Office/Center for Research in the Social Systems (SORO/CRESS), received additional tasks and funding.

Although the majority of Army funds for ORSA studies during the period 1961–1973 went to the Army-sponsored Federal Contract Research Centers (FCRCs) and other ORSA contractors, the emphasis placed by the Army on improving its in-house ORSA capabilities ensured the substantial growth of Army Class II activities and organizations in the Army major commands involved in the production of studies and analyses and other ORSA work. Class II activities under the direction of the Army Staff, such as the Army Research Office-Durham (ARO-D) and the Strategy and Tactics Analysis Group (STAG), prospered. The February 1962 reorganization of the Army created two commands that were to be major users of ORSA: the United States Army Materiel Command (AMC) and the United States Army Combat Developments Command (CDC). AMC and CDC absorbed the remnants of the small operations research groups in the Technical Services when the Technical Services were abolished in 1962 and went on to create active ORSA elements in both their headquarters and in their subordinate commands. Although the Combat Operations Research Group (CORG) was transferred to the new CDC in July 1962, the United States Continental Army Command (CONARC) continued the use of ORSA, both on contract and in-house, and the ORSA elements in the other major Army commands, both at home and abroad, increased in size, scope, and level of production.

At the same time, other forces, notably congressional criticism of Army FCRCs and the dissatisfaction of Army leaders with the malleability of Army ORSA contractors such as RAC, led to increased efforts to replace contract ORSA work with in-house resources as both cheaper and more controllable. By the late 1960s, RAC and the other Army ORSA contractors were under increasing pressure from Congress and from the Army itself. Congressional criticism and restrictions forced the Army's ORSA contractors to diversify their client lists and seek other means of compensating for the general reduction in funding available for contract studies. Nevertheless, RAC, HumRRO, SORO/CRESS, and the other contracting agencies continued to make major contributions to the solution of ongoing problems and the design of the Army of the future as well as to the art and science of ORSA. Even so, by the early 1970s the tide was running against them as the Army focused on ending the Vietnam War, coped with budget cutbacks, improved its in-house ORSA capabilities, and severed its traditional relationships with nonprofit research organizations.

The period of enthusiasm and accelerated growth prompted by Secretary McNamara's emphasis on scientific management and analysis came to an end in January 1969 when the administration of President Richard M. Nixon took office and shifted the emphasis from centralization and quantitative analysis to a more effective "participatory" management style and reductions in defense manpower and budgets. One consequence of the changes introduced by President Nixon and Secretary of Defense Melvin Laird was a reduction in the resources allocated to Army ORSA activities. Although Army ORSA activities did not decline precipitately, the growth of in-house organizations slowed and opportunities for contract work declined.

Throughout the 1960s and early 1970s, Army ORSA elements, coordinated by the Army Study System, made major contributions to both ongoing operations at home and in Southeast Asia and to the development of the Army of the future. Few of the complex tactical

and materiel innovations introduced by the Army in the 1960s would have been possible without the assistance to decision makers provided by Army ORSA contractors and in-house ORSA analysts. Among their most notable contributions were studies of insurgency, counterinsurgency, and unconventional warfare, such as the 1962 Howze Board on special warfare, and the series of studies, tests, and evaluations of Army airmobility issues, including the use of fixed-wing aircraft and armed helicopters for fire support and the use of helicopters for tactical troop transport and resupply, embodied in the 1962 Howze Board on Army aviation requirements and the subsequent evaluations of the 11th Air Assault Division (Test).

The Army analytical community produced both successes and failures, and the analytical process itself was sometimes abused by ignorant or unscrupulous practitioners, but on the whole, ORSA managers and analysts, both contract and in-house, served the Army well during a period of turmoil and difficult decisions. The many studies, analyses, simulations, war games, tests, and evaluations conducted by Army ORSA contractors and in-house organizations between 1961 and 1973 greatly enhanced the Army's ability to deal with ongoing problems and the more complex difficulties of planning for the future. ORSA methods were used extensively to support the management of the Army, force structuring, the development of tactical and strategic doctrine, and the development of new organizations and weapons systems. The day-to-day problems of fighting the war in Southeast Asia also prompted a renewed interest in the application of ORSA techniques to concrete problems of battlefield performance of weapons and other equipment, organization, and tactics—topics that had first generated an interest in operations research in World War II. Thus, in a sense Army ORSA returned to its roots. At the same time, the classic applications of ORSA were augmented by the use of ORSA techniques to deal with the many complex political, economic, and social aspects of the war in Vietnam.

In Vietnam, Army ORSA analysts and Army ORSA contractors played a significant role in the evaluation of ongoing Army operations and of Army equipment, tactics, and strategy for the pursuit of counterinsurgency and airmobile operations. The Army Concept Team in Vietnam (ACTIV) employed ORSA techniques to evaluate new equipment and methods, and Army analysts played a major role in the Army Combat Operations in Vietnam (ARCOV) and Mechanized and Armor Combat Operations in Vietnam (MACOV) evaluations conducted in the mid-1960s. Army organizations at every echelon from Headquarters, United States Military Assistance Command, Vietnam, to division and lower echelons employed ORSA personnel and techniques to evaluate and improve ongoing operations. Even at the lowest levels, Army personnel employed ORSA techniques, often without even recognizing them as such, to solve the myriad problems encountered in a complex and often confusing operational environment. Such techniques affected the organization and planning of combat service support as well as combat and combat support units at every level. In general, the results achieved were good, but some applications of quantitative methods to the problems of the Vietnam environment proved to be unsuccessful—indeed, counterproductive. Chief among these were the so-called body count method of assessing operational effectiveness and the techniques employed to assess the progress of the rural pacification programs. The fault lay not with Army ORSA managers and analysts but with unwise civilian and military leaders and untutored staff officers. Even so, the misuse of quantitative analysis cast a shadow over ORSA in general that required some time to overcome.

As was the case with Volume I, the complexity of the story and the gaps in the available documentation ensure that some omissions and imperfections will appear in this study. The responsibility for those is mine alone. As ever, I am grateful for the assistance I have received from many sources, most particularly the contributions of Eugene P. Visco and Brian R. McEnany, whose comments and suggestions have been of high value indeed. The suggestions of E. B. Vandiver III have also been most helpful. I am also much indebted to Jim Hooper and Roy McCullough of SAIC for their support. My wife Carole continues to patiently endure my absorption with this work and thus deserves yet another special thank you.

CHARLES R. SHRADER
Carlisle, Pennsylvania
September 2006

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History of Operations Research in the United States Army

Introduction

President John F. Kennedy took office in January 1961 and appointed Robert S. McNamara, then an executive with the Ford Motor Company, as secretary of defense. Acting on his perceptions of the changed international defense environment, the limits on U.S. economic power, and the deficiencies in the organization and operation of the Department of Defense (DOD), Secretary McNamara immediately began to transform the DOD decision-making process, thereby precipitating what came to be called the McNamara revolution. In response to the rapid growth of new military technology; the need to select from among a daunting array of alternative weapons systems, organizations, doctrines, and policy; the increasing interest in low-intensity warfare; and the ongoing Cold War competition with the Soviet Union in both the military and economic spheres, McNamara instituted a number of changes in defense organization and procedures.

The essence of McNamara's managerial revolution was the need for continuous and effective planning for the future in an era of limited resources and an insistence on facts rather than experience, intuition, and bureaucratic inertia as the basis for defense decision making, particularly as it applied to the formulation of the annual defense budget and the development of new weapons systems and force structure. The core of the new system was the Planning, Programming, and Budgeting System (PPBS); the decision-making tools that supported PPBS were systems analysis and cost-effectiveness analysis, both of which had emerged in the 1950s and were close cousins of the existing operations research (OR) methodology.[1] The new DOD organizational elements created by McNamara's key subordinates—the so-called Whiz Kids—to manage the process soon came to dominate defense decision making, and the role and independence of the services were correspondingly reduced.

The McNamara revolution of the 1960s made the application of operations research and its cousins—systems analysis and cost-effectiveness analysis—essential elements not only in the development of weapons, tactics, and strategy, but also in the management of the Army itself. The Army had a long history of attempts to organize its management and administration along "rational" (that is, "scientific") lines. After the Civil War and again after the Spanish-American War of 1898, there were several attempts to reform Army organization and administration, notably the reforms instituted by Secretary of War Elihu Root at the beginning of the twentieth century. At the end of the nineteenth century and in the early years of the twentieth century, the "scientific management" ideas of Frederick W. Taylor and others influenced the operation of the Army arsenals and other logistical facilities. In World War I, and again in World War II, modern methods of statistical analysis were used to manage Army programs and ongoing operations. In the post–World War II period, the Army instituted several major management improvements, including the creation of the Office of the Army Comptroller and improved budgeting processes. These activities enjoyed varying degrees of success and were but a prelude to the changes introduced by Secretary McNamara in the 1960s. They did, however, prepare the Army for the McNamara revolution, which forced the services to strengthen their own programs and organizations dedicated to Operations Research and Sysems Analysis (ORSA) activities and thus prompted a significant increase in the acceptance of, and resources for, such activities.

The transformation of the Army's ORSA program during the 1960s and early 1970s produced a flexible and effective tool for Army decision makers. From its infancy in World War II, Army OR had evolved through the late 1940s and 1950s into a youth of promise. OR had achieved acceptance as an integral part of Army weapons systems analysis, development of tactical doctrine, analysis of soldier behavior, and even grand strategic analysis. The only major area that remained relatively untapped in 1961

was the application of OR to the management of the Army itself. Army OR organizations—contractors such as the Operations Research Office/Research Analysis Corporation as well as in-house OR organizations in the Army Staff, the Technical Services, and the major Army commands—had grown and strengthened throughout the period. By fiscal year 1962 (the first full fiscal year under McNamara), the Army Research Office could report that the Army ORSA program included twenty different study contractors (with more than 400 analysts) and fifty research studies sponsored by eleven Army agencies, as well as some twenty in-house Army ORSA organizations in nine Army commands and agencies that employed some 200 civilian and military personnel.[2] And as the papers presented at the second Army Operations Research Symposium held in Durham, North Carolina, in March 1963 demonstrated, there had also been quantum leaps in the evolution of OR methodology and in such related activities as simulations and war gaming, field testing of Army organization and doctrine, and the harnessing of the digital computer for OR work.[3]

McNamara's abrupt management style, the arrogance of the "Whiz Kids" charged with implementing the "revolution," and the technical limitations of systems analysis prompted numerous complaints among the services, particularly by military leaders who felt that their experience and expertise were being seriously degraded. Nevertheless, the Army, Navy, and Air Force were forced to react in a positive manner to the new environment in order to continue to maintain their bureaucratic position vis-à-vis the DOD comptroller and Office of Systems Analysis and the other services. The introduction of PPBS and the emphasis on systems and cost-effectiveness analysis triggered a profound reaction in the Army ORSA community that took the form of greater centralization of ORSA programs, a significant expansion in the money and manpower devoted to ORSA by major Army commands, the creation of an ORSA officer specialist program, and, ultimately, a shift from heavy reliance on contracted ORSA studies to a preference for building and maintaining a substantial in-house ORSA capability. The long-felt need for greater centralized management of Army analysis programs was met by creation of the position of Deputy Under Secretary of the Army for Operations Research. To further enhance the Army's ability to work successfully in the environment created by the changes in DOD management, two new Army Staff agencies were created: the Office of the Assistant Vice Chief of Staff of the Army and the Office of the Assistant Chief of Staff for Force Development, both of which placed a heavy reliance on ORSA analysts in performing their functions. Moreover, the management of studies conducted by and for the Army was further centralized and substantially improved by the establishment of a formal Army Study Program, and the Army sought to create its own uniformed core of in-house ORSA specialists with the creation of the Army ORSA Officer Specialist Program. Although the Army ORSA program expanded steadily throughout the 1960s, after 1969 the reduced defense budgets of the Nixon administration and growing dissatisfaction with ORSA contracting arrangements led the Army to rein in the expansion of ORSA activities, to further increase reliance on its own in-house capabilities, and to reduce the proportion of contracted work.

The ultimate test for the rapidly evolving Army ORSA program came with the long war in Vietnam. The war in Southeast Asia posed challenges similar to those faced by the Army in World War II: how to maximize the use of available weapons and tactics and how to develop more effective new ones. Several major studies employing ORSA techniques were conducted, including major studies of counterinsurgency, Army airmobility and aerial weaponry, Army ground operations in Vietnam, and the use of armored and mechanized vehicles in Vietnam. Organizations as varied as the Army Special Forces and the 9th Infantry Division relied heavily on ORSA techniques to improve their battlefield performance, and there were attempts to measure the overall progress of the war (or the lack thereof) using ORSA techniques. By and large such applications were relatively successful, although commanders and soldiers in the field often expressed very negative thoughts about trying to manage the war by means of body counts and other methods seen (often incorrectly) as part of the ORSA approach.

By the time U.S. combat forces were withdrawn from Vietnam in 1973, the Army ORSA program had undergone substantial change. Not only were Army ORSA capabilities greater due to the increased application of resources in the 1960s, but there was also greater centralization and professionalization of the Army ORSA program overall and a greater emphasis on in-house ORSA efforts tied more closely to the Army's need for enhanced decision-making tools. The

focus of Army ORSA had changed as well. By 1973, there was much more emphasis on planning for future weapons, organization, and doctrine than there was on the older tasks of analyzing and improving existing weapons and doctrine. Moreover, ORSA had become embedded at every stage of the Army's planning, management, administration, logistics, and operations. Although still subject to the vagaries of defense budget levels and the personalities and management styles of DOD and Army leaders, the Army ORSA program was widely recognized as an essential part of the Army's decision-making process, and its continuation into the future was unchallenged.

INTRODUCTION NOTES

[1] From about 1961 onward, one should perhaps speak of operations research and systems analysis (ORSA) rather than of operations research (OR) alone. The relationship between OR and SA (systems analysis) is discussed in ch. 1.

[2] Lynn H. Rumbaugh, *A Look at US Army Operations Research–Past and Present*, RAC-TP-102 (McLean, Va.: Research Analysis Corporation, Apr 1964), p. 6; U.S. Congress, Office of Technology Assessment, *A History of the Department of Defense Federally Funded Research and Development Centers*, background paper OTA-BP-ISS-157 (Washington, D.C.: Government Printing Office, Jul 1995), p. 22.

[3] See U.S. Army Research Office-Durham, Operations Research Technical Assistance Group, *Proceedings of the United States Army Operations Research Symposium, 26, 27, 28 March 1963, Durham, North Carolina, Part I*, ORTAG–25 (Durham, N.C.: Operations Research Technical Assistance Group, U.S. Army Research Office-Durham, 30 Sep 1963).

CHAPTER ONE

The Army and "Scientific" Management

By the late 1950s, the U.S. Army had a vigorous operations research (OR) program that was recognized as having played an important role in the remarkably successful transformation of the post–World War II Army into a truly modern force well suited to any future battlefield. A number of Army contracts with universities and independent business organizations plus in-house groups composed of both military and civilian personnel provided OR services dealing with a broad range of topics. In all, the Army employed nearly one thousand OR supervisors, analysts, and support personnel in some twenty contracting agencies and an equal number of in-house Army OR organizations.[1] Army operations researchers were applying OR techniques successfully to the problems of weapons systems analysis, the development of tactical and operational doctrine, the analysis of soldier behavior, and even national security strategy and defense economic policy. The digital computer, just beginning to transition from vacuum tubes to transistors and still rather limited in its capabilities, was beginning to be harnessed to OR work, and OR was being used for simulations, war-gaming, and the field testing of Army organization and doctrine. Most important, military operations research had become an accepted methodology, and "a successful and continuing partnership" between scientists and military leaders had been formed.[2] As Director of Army Research Maj. Gen. William J. Ely noted in 1962, there were four principal reasons for this tremendous expansion of Army OR:

> First, more scientific personnel have become aware of the effectiveness of inter-disciplinary teams studying operational problems.
>
> Second, the complex nature and increased cost of weapons systems require decisions by military managers which have a greater impact on the service budget.
>
> Third, we have better computing equipment for use in the support of operations research.
>
> Fourth, the military decision maker has learned more about the values and the limitations of operations research.[3]

Despite the general acceptance of OR and the growth of both contract and in-house OR capabilities in the Army in the 1940s and 1950s, one major area remained relatively untouched by the scientific rigors of OR: the organization, administration, and management of the Army itself. Since 1775, Army civilian and military leaders have demonstrated an intense interest in using the latest "scientific" methods to improve the efficiency and effectiveness of all Army activities. Beginning in the mid-nineteenth century, there were numerous attempts to apply "scientific" methods, often drawn from business and industry, to improve the management of the Army, and such efforts gathered momentum as the Army became larger and more complex after the Spanish-American War of 1898. "Scientific" management improvements, such as the Root reforms and the introduction of the General Staff in the early twentieth century, were followed by the innovative use of statistics in World War I and the "control division" concept in World War II. Changes in the post–World War II defense environment that further increased the need for effective tools to manage the increasingly complex decisions regarding future weapons, tactics, and strategy prompted additional interest in advanced management techniques and led to the introduction of the Office of the Army Comptroller and the program budget. The growing interest in the

improvement of Army management was also reflected in increased scrutiny of Army OR programs by the Congress and the executive branch; and the number of government and private studies, pieces of legislation aimed at the reorganization of the Department of Defense (DOD), and new techniques aimed at making Army management more efficient and effective accelerated in the 1950s.[4]

"Scientific" Management Defined

The efficient and effective use of resources is a military necessity, and sound principles of management must be applied at all echelons of the Army. In 1951, the Management Division of the Office of the Comptroller of the Army defined management as "the scientific utilization of men, money, materials, methods, and machines in the attainment of a desired objective or mission" and its three basic functions as "Planning, Execution, and Review and Analysis."[5] From the perspective of the military commander, management is simply "making the most effective allocation and utilization of resources to meet a number of competing requirements, both short and long term."[6] All Army leaders, military and civilian, from the squad leader to the secretary of the Army, are of necessity involved in the tasks of management: organizing, planning, supervising, leading, coordinating, controlling, training, and improving.[7]

"Scientific" management emphasizes the use of systematic analysis for the purpose of improving the design, operation, efficiency, and effectiveness of a piece of equipment, an organization, or a process, be it in business, industry, or the Army. Operations research, systems analysis, and cost-effectiveness analysis are all aspects of "scientific" management and as such are closely related to older techniques of business management and industrial engineering, such as time and motion studies.[8] For many years, military operations researchers failed to appreciate the degree to which OR, industrial engineering, and business management had shared interests and techniques, and it was only after World War II that the close relationship of these three aspects of management science was recognized.[9] As David Novick and G. H. Fisher have noted:

> Although military management problems are not identical to those of large business corporations, they have many similarities. In the cold-war type of military operation, which has characterized the last ten years, and which seems to represent what we can expect for many years in the future, some of the major types of decision-making problems of management for the military seem likely to be very similar to those with which business is now struggling. While the general types of problems of decision may be similar in both types of activity, they are likely to be considerably more complex in the case of the armed forces.[10]

The Army's concern with efficiency and the advantages to be gained through the use of the latest "scientific" management methods extends back to the earliest days of the U.S. Army. Such methods were often first developed in business and industry, and as a result there has been a constant interchange of management personnel and ideas between the American business and military communities almost from the foundation of the Army in 1775. Specific management methods first developed in industry and business have been applied directly to Army affairs, and vice versa.[11] Businesspeople have been borrowed temporarily from their factories and offices to direct various aspects of the Army's operations, most often administrative and logistical activities, and many retired Army leaders have found places in business and industry. Finally, since World War II civilian consultants and ad hoc study groups dominated by businesspeople have been employed to instruct the Army on how best to do its work.

Among the many business methods adopted by the Army from civilian practice were Frederick W. Taylor's time and motion studies, the use of statistics to control operations, the concept of the comptroller, and the program budget. In the nineteenth century, American railroads and other businesses adopted the military line and staff concept, and after World War II operations research itself was transferred from the military to business enterprises, only to come back to the military in the 1960s in the form of systems analysis and cost-effectiveness analysis. The objective in all cases was to provide the decision makers with means for making better decisions regarding the efficiency and effectiveness of the organization, whether it happens to be a manufacturing concern or an Army infantry division.

"Scientific" Management in the Army before World War I

The Root Reforms

From its founding in 1775, the U.S. Army has undergone a constant evolutionary process of change aimed at more efficient and effective control by leaders at all echelons. The principal means of impacting the efficiency and effectiveness of the Army as a whole has been the organizational structure. The development of the bureau system and later the adoption of the General Staff system have been important stages in this process. There has been a constant search for the optimum size, configuration, and command structure for the Army, the one best suited to the available resources and the perceived threat of the time. As American society has evolved, this process has become more complex and leaders have required ever more sophisticated tools to help them make the right decisions. In time this process has come to be called the rationalization of the Army, the search for the one best way to organize and command our military forces, and various models have been adopted—in the early nineteenth century, that of Napoleon; in the late nineteenth century, that of Prussia (including the *pickelhaube* helmet!).

The Spanish-American War of 1898 catapulted the United States and its army into a new era of global interests and responsibilities. The war also greatly expanded the problems of Army administration and logistics, not least by the subsequent requirement to maintain military forces on a worldwide basis. The size of the forces to be supported, the distance over which they had to be maintained, and the use of new technology all increased dramatically during the war and in the first decade of the twentieth century. Enormous demands were placed on a support system initially unequal to the task, and the need for major improvements was clearly revealed.

In 1898, the collection of ten departments charged with the administration and supply of the Army was little more than what one author has called "a hydra-headed holding company, an arrangement industrialists were finding increasingly wasteful and inefficient."[12] Despite heroic efforts to cope with the problems presented by the Spanish-American War and its aftermath, the bureaus, lacking adequate mechanisms for planning and coordination and hampered in their efforts to prepare for war in advance by detailed congressional oversight and red tape, became the subject of public scandal and provoked demands for improvement of the administration of the Army. These demands were frequently couched in the imagery of business and the "efficiency" then in vogue in the industrial and business community, whose leaders dominated much of American life.

The first comprehensive criticism of the bureaus came from the Dodge Commission, set up by President McKinley to investigate the conduct of the War Department in the war with Spain. In its report, rendered in 1899, the commission noted that the methods employed by the bureaus required an attention to details that made impossible the consideration of "matters of larger moment" and that made it "almost impossible to transact business promptly."[13] The commission report then went on to state that "no well-regulated concern or corporation could conduct business satisfactorily under such regulations as govern the staff departments."[14]

The first tangible step toward making the Army as efficient as business was the appointment as secretary of war on 1 August 1899 of Elihu Root, a reform-minded corporation lawyer steeped in the progressive business ideas of the day. Root viewed the elaborate bureau system as "admirably adapted to secure pecuniary accountability and economy of expenditure in time of peace" but manifestly unsuited to modern war or modern efficiency standards.[15] As he testified before Congress: "In the successful business world work is not done in that way. What would happen if a railroad company, or a steel corporation, or any great business concern should divide its business up in that way? What would become of that business?"[16]

As an advocate of the new business methods, Root sought to use modern techniques to improve the organization and efficiency of the old, outmoded, and often scandalous bureau system. In this, he foreshadowed the revolution in defense management led by Secretary of Defense Robert S. McNamara sixty years later. In both cases, the impetus for reform was provided by both a demonstrated need and the existence of emerging techniques of management based on rational, "scientific" principles

that conflicted with the traditional ways of managing the nation's military affairs. Root's attempts at reform were only partly successful; those of McNamara would thoroughly overhaul the process of managing America's military forces.

To correct the problems of Army organization and administration Secretary Root proposed a series of reform measures that were directed primarily at the Army's administrative and logistical agencies.[17] According to Root, a "modern" army required intelligent planning for possible future operations and effective executive control over current operations. The first requirement he proposed was the creation of a General Staff that would act as a "bureau of plans" for the Army. Current operations, he believed, should be controlled by a chief of staff, a professional military adviser to the president and secretary of war who would act as a general manager of the Army and who would be assisted by the General Staff. In short, he proposed that the Army should adopt an organization similar to that of a modern industrial corporation.

The central portion of Root's reform program, the General Staff Bill, passed Congress on 14 February 1903 but met immediate opposition because Root's ideas represented a major break in the traditional alliance of the secretary of war and the bureau chiefs against the commanding general of the Army and the line. The key point at issue was Secretary Root's perception of the need for firm executive control over the bureaus at the level of the secretary of war rather than the loose supervision exercised through the bureau chiefs that was common before that time. The conflict that subsequently developed over implementation of the Root reforms was thus really a conflict over the level at which central control of the Army's operations should be exercised—at the traditional bureau level or at the level of the civilian secretary of war.

Secretary Root's attempt to impose centralized executive control over the Army was only one facet of a more general movement toward the imposition of centralized authority over all aspects of American life. American business and industry in particular were adopting new ideas and techniques of management designed to facilitate the centralized direction of large enterprises and to increase efficiency, which was often defined in terms of "machine-like-ness." The development of such management techniques and the organization of business undertakings along "rational" lines have been described by James E. Hewes as "a natural consequence of industrialization and urbanization of a once predominately rural society."[18]

Hewes has also pointed out that the Army's management structure as it existed at the beginning of the twentieth century had developed in the context of a rural America that stressed individual initiative and self-reliance against "corporateness," that distrusted centralized control, and that held that government is best when it governs least. In the late nineteenth century, the adherents of the old ways, exemplified in the Army by the traditionalist bureau chiefs, came to be opposed by those who were convinced that the traditions, values, and institutions of America's rural past were no longer valid or useful in an era of industrialism and urbanization. These modernists believed society would descend into class warfare and chaos unless greater centralized authority was developed to guide political, economic, and social development. For the most part they advocated the imposition of rational order and organization from above, a process that came to be known as "rationalization" and which regarded centralized direction and control of all activities as key elements.

The rationalist movement first made itself felt in the organization of American business, but the new industrial technology and increasing urbanization with improved opportunities for effective social control also changed the character of warfare. Armies in the field became consumers of enormous resources of men and materiel and thus were required to operate with greater efficiency and under greater central control in order to avoid unnecessary squandering of scarce resources. As logistical and administrative support of armies became more complex and more expensive, it also became much more difficult to control armies properly with the older methods then in use.

In an effort to streamline the Army's support structure, Secretary Root recommended the consolidation of all Army supply operations into one bureau along the lines already suggested by the Dodge Commission. This was, he said

> exactly the same line that had been followed in the industrial world by the men who have combined various corporations . . . they have reduced the cost of production and increased their efficiency by bringing together various lines of work in different manufacturing establishments.

> They have reduced the cost of production and have increased their efficiency by doing the very thing we propose you shall do now, and it does seem a pity that the Government of the United States should be the only great industrial establishment that can not profit by the lessons which the world of industry and commerce has learned to such good effect.[19]

Yet despite the consolidation proposal's obvious merits and the wide support for such a reorganization going back at least to 1848, Congress proved unwilling to support such a drastic change. Secretary Root left office in 1904 without having fully achieved his goals of rationalizing the operations of the War Department.

Root's successor as secretary of war, William Howard Taft, was not interested in promoting the newly created General Staff and other innovative ideas in the face of strong, entrenched opposition from the bureaus; and under the influence of Adjutant General Fred C. Ainsworth, Taft returned to the traditional alliance of the secretary of war with the bureaus. However, on 22 May 1911, Henry L. Stimson, a law partner and protégé of Root's, replaced Taft as secretary of war and again reversed course. Stimson wished to complete Root's plan to achieve central executive control over Army operations and resumed a vigorous program designed to reform Army organization and procedures to conform to efficient business practice. Unlike Root, who had had to contend with the opposition of Commanding General of the Army Maj. Gen. Nelson A. Miles, Stimson found positive support for his program in Chief of Staff Maj. Gen. Leonard Wood, who was also an advocate of progressive ideas.

The Stimson-Wood program of reform ran into heavy opposition. A serious conflict between Adjutant General Ainsworth and Chief of Staff Wood resulted in the forced retirement of Ainsworth, who nevertheless continued to agitate against reform from retirement. The disgruntled Ainsworth found an ally in the chairman of the House Military Affairs Committee, Democrat James Hay of Virginia, "a rural Jeffersonian opposed on principle to both a large standing army and the idea of a ["Prussian"] General Staff."[20] Together Hay and Ainsworth worked to limit the size and activity of the fledgling General Staff and to oppose centralization of control over the bureaus by the secretary of war and the chief of staff.

Despite the best efforts of Hay, Ainsworth, and their supporters, some progress was made. When he became president in 1910, Taft appointed a Committee on Economy and Efficiency under Dr. Frederick A. Cleveland, a leader in the then-new field of public administration and a man determined to make public administration conform to efficient business practice. Employing minute observations in line with the principles of "scientific management" espoused by Frederick W. Taylor then in vogue in the business world, Cleveland's commission criticized War Department administration, particularly the clumsy muster roll system, protection of which had been the key element in Ainsworth's opposition to the Stimson-Wood reforms.[21] In passing the Army Appropriation Act of 1912, Congress vetoed the Stimson-Wood plan to reorganize the field army by consolidating forty-nine separate posts into eight larger and more efficient ones but did approve the long-standing proposal of Army reformers to consolidate the Quartermaster, Subsistence, and Pay departments. While experiencing some significant advances in the first decade of the twentieth century, the "rationalist" attempts to centralize Army administration and make the Army more businesslike faced consistently strong opposition and were not destined to take full effect until the pressures of a world war made them a matter of national interest and importance.

Taylorism and the Army

Although the work of the American industrial engineer Frederick W. Taylor predates the pre–World War II British development of operational research by some four decades, Taylor's application of scientific method to industrial decision making is often cited as an early form of operations research.[22] Other American pioneers in the application of scientific methods of analysis and measurement to industrial processes and business decision making included Henry L. Gantt and Harrington Emerson.[23] Although the work of Taylor, Gantt, and Emerson falls into the category of industrial engineering, in many respects it approaches operations research as we understand it today.

Taylor began publication of his ideas on so-called scientific management with a paper entitled "A Piece-Rate System: A Step toward Partial Solution of the

Labor Problem," presented to the American Society of Mechanical Engineers in 1895.[24] Based on the detailed division of tasks, the recording of minute time and motion data, and analysis of the data collected, Taylor's system sought to increase industrial efficiency for the benefit of both workers and owners and thereby avoid class warfare and the disruption of society. Taylorism also provided a key role for middle-class experts and thus created a whole new class of industrial planners and managers with a vested interest in promoting the new methods. In 1908, Carl G. Barth successfully promoted the acceptance by the newly established Harvard Business School of "scientific management" as the standard of modern management, and Taylor's ideas sparked a period of intense interest in the cult of efficiency and the dominance of business in American life.[25]

In the early part of the twentieth century, Taylor's doctrine of solutions to industrial problems based on the analysis of facts rather than on intuition and experience expanded into general business management, and many firms were reorganized in accordance with Taylor's ideas.[26] Among the converts to scientific management were several Army and Navy officers. In fact, Taylor's ideas were in many ways very compatible with the "military mind," particularly the desire for organizational order and social tranquility. His idea of educational discipline, for example, was that of the soldier as exemplified by West Point, and he was a great admirer of German military efficiency.[27] Taylor retired at age forty-five to promote his system and offered key executives, including a number of military and naval officers, a year's salary to attend the management seminars that he ran in his home near Philadelphia.[28]

Not all of the Army bureau chiefs with whom Root, Stimson, and Wood had to contend were immune to new ideas. Brig. Gen. William Crozier, the chief of ordnance (1901–1918), was among the military men attracted to Taylorism, and he introduced the scientific management system in the Army arsenals at Frankford, Pennsylvania; Springfield, Massachusetts; and Watertown, Massachusetts, where the resident expert was Barth.[29] The results were initially encouraging, with significant production increases and savings amounting to $363,251.54 in one year (the "scientific managers" were very precise!), but Crozier soon ran afoul of the interests of organized labor.[30]

Despite its popularity with managers, scientific management aroused fierce opposition on the part of workers, primarily because Taylor insisted on the minute division of industrial tasks and prohibited one skilled worker from carrying a project from start to finish. He thus subordinated human values to the demands of mechanical production and eliminated the element of personal judgment from factory tasks, thereby undermining the craftsman approach.[31] As one author has noted:

> The skill of the craftsman was replaced by a sequence of exercises fit for idiots. It was not merely that this led to boredom and fractiousness in the factories but also that the loss of skill was largely irreversible, and American industry (especially in the area of military technicians) suffers from it today.[32]

In 1911, the molders and machinists at Watertown Arsenal went out on strike over certain Tayloristic procedures.[33] Although the strike itself was settled quickly, the workers petitioned the secretary of war and the Congress for relief, and in 1912 Congress conducted extensive investigations of the whole efficiency movement. The leaders of organized labor then took up the political cudgels against Taylorism because they saw that the Taylor system weakened the cohesion of labor against management. At their 1913 convention in Seattle, the American Federation of Labor decided to fight the Taylor system officially. The 63d Congress (1914–1915) hastened to secure the goodwill of the laboring classes and subsequently passed as a rider to the Fortifications Bill legislation proposed by the labor unions to prohibit the use of a stopwatch or the payment of bonuses (both key elements in Taylor's system) in the government works. These restrictions against the use of industrial management techniques remained on the books until 1949, but once established, Taylorism proved difficult to suppress.[34]

The first period of enthusiasm for scientific management theory in America, which began with the "efficiency fever" following the Eastern rates case in 1911, ended with the stock market crash of 1929. Even so, Taylor's ideals and methods live on in operations research and systems analysis and in the continued search for efficiency and effectiveness.[35] Indeed, they established in the American consciousness the very image of the "efficiency engineer."[36]

"Scientific" Management in World War I

Soon after the United States entered the world war in April 1917, it became apparent that the magnitude and complexity of Army operations both at home and overseas would require the effective use of proven management principles and personnel. Above all, coordinated central direction of the vast logistical activities of the Army would be necessary if great quantities of men and materiel were to be produced and moved to France to assist our allies in the defeat of the Central Powers. However, President Woodrow Wilson and Secretary of War Newton D. Baker were opposed in principle to the imposition of strict controls over the national economy even in time of war. It was not until the almost total collapse of the nation's transportation system in the winter of 1917–1918 that they began to act decisively to coordinate the war effort and to provide for the efficient direction of Army logistical activities.

Unrestrained competition among the Army supply bureaus for men, materiel, and transportation services finally induced Secretary Baker to act. In November 1917, he appointed Benedict Crowell, a Cleveland industrialist and a Reserve quartermaster officer, as assistant secretary of war.[37] Crowell, an advocate of centralized control, also received the title of director of munitions. The following month Baker recalled retired Maj. Gen. George W. Goethals to active duty as acting quartermaster general and director of the new Storage and Traffic Division of the General Staff, responsible for supervising all quartermaster functions except camp construction. Goethals was an engineer with a distinguished career behind him. An 1880 graduate of the United States Military Academy, he had been a member of the first permanent General Staff in 1903 and the chief engineer for the building of the Panama Canal. He had also served as governor of the Panama Canal Zone from January 1914 to September 1916 and had been advanced in grade directly from colonel to major general.

Goethals was imbued with the same principles of efficiency that had inspired Root and Stimson. He saw the Quartermaster's Department as essentially a huge purchasing organization rather than a purely military operation, and he believed it should be staffed with experienced civilian businesspeople rather than with soldiers.[38] Among the businesspeople appointed to assist the acting quartermaster general were Harry M. Adams, a vice president of the Missouri Pacific Railroad; Edward R. Stettinius, a partner in the investment firm of J. P. Morgan and Company; and Robert J. Thorne, an 1897 graduate of Cornell University who was then president of Montgomery Ward.[39] Civilian clerks had long been a part of the Army administrative and logistical structure, but now for the first time high-level civilians were introduced to perform jobs previously done by uniformed officers. These representatives of American industry promoted in the Army the then still-new principles of business management and centralized control with decentralized operations. Their contribution to the success of the Army's logistical efforts in World War I was substantial, and they established a precedent that is still followed today in the appointment of successful businesspeople to positions of importance in the Army management structure.

Another major step in the rationalization of the Army support structure came on 4 March 1918, when General Peyton C. March, the chief of artillery of the American Expeditionary Forces, was recalled from France to become the Army chief of staff. March immediately demonstrated that he had one goal: to make the structure designed by Secretary Root work by establishing effective centralized control over all War Department operations and solidifying that control in the hands of the chief of staff. He hoped to accomplish his goals by making the General Staff a true directing staff rather than just a planning body. In that way the chief of staff working through the General Staff would be able to control all War Department activities except for the American Expeditionary Forces (AEF) under General John J. Pershing and those industrial operations specifically placed under Assistant Secretary of War Benedict Crowell, the director of munitions.[40]

Drawing on proven business practices and with the aid of men drawn from American industry and commerce, General March established several agencies to promote his objectives. He first created a Coordination Section under the direction of Col. E. S. Hartshorn within the Office of the Executive Assistant to the Chief of Staff and charged it with

"preventing the duplication of work, maintaining proper channels, and eliminating unnecessary administrative machinery and paperwork."[41] He also transferred War Department appropriations activities from the quartermaster general to a newly created Finance Department. A revival of the Pay Department that had been eliminated in the 1912 consolidation, the new Finance Department was headed by Brig. Gen. Herbert M. Lord, who introduced into the Army, and for the first time anywhere in the federal government, the use of the budget system as we understand it.[42] General Lord later became the first chief of the budget for the federal government.

General March also created a central statistics unit to promote increased central control of all Army operations.[43] The mission of the Central Statistical Office was to collect, coordinate, and maintain all statistical information pertaining to the war program.[44] This unit was staffed by statisticians from the War Council and was placed under the direction of Dr. Leonard P. Ayres, chief statistician of the Russell Sage Foundation. Ayres was commissioned directly from civil life as a major and rose to the rank of colonel, eventually creating a similar organization for Pershing's AEF.[45]

Congress also contributed to the drive toward centralization and efficiency. In reaction to the report of the Chamberlain Committee, which was highly critical of the lack of coordination in the government's conduct of the war, on 20 May 1918, Congress passed the Overman Act, which granted the president authority to reorganize the government as he saw fit in the interest of greater efficiency for the duration of the war. Armed with the authority of the Overman Act and with the backing of Assistant Secretary of War Crowell and General March, General Goethals proceeded to reorganize the Army's fragmented supply system. Under his direction the Purchasing, Storage, and Traffic (PST) Division of the General Staff was established on 16 April 1918 as the single agency for the coordination of the Army's logistical activities. For the duration of the war the PST Division was the focal point of efforts to streamline and rationalize Army logistical operations. Staffed mainly with civilian businesspeople temporarily in uniform and accustomed to using the most advanced business techniques, the PST Division introduced more centralized control and advanced industrial methods. The primary technique used was centered on control and uniformity of reports and statistics.[46]

The war ended on 11 November 1918, before Goethals' program was fully implemented, and the Army supply system was left in a state of transition. In the postwar rush to demobilize, the great logistical and administrative apparatus that had been formed to create and support the AEF and the Army at home was dismantled, and most of the progress made toward efficient central management of the Army was abandoned. The National Defense Act, passed by Congress on 4 June 1920, required a return to the traditional pre–World War I pattern of independent bureaus and diffused authority, and Congress resumed its usual detailed supervision. The General Staff was forced to surrender its 1918 role as a central management agent directing bureau activities and once again became little more than the Army' planning bureau, not even the first among equals.

However, several wartime innovations survived. The spectacular ability of the United States to mobilize and control the machinery of war had been assured in World War I by the greatly increased use of business methods and appointment of businesspeople to key positions in the Army supply system. The success achieved during the war, particularly in the logistics field, through the use of advanced business management techniques and civilian businesspeople in uniform suggested to Assistant Secretary of War and Director of Munitions Benedict Crowell and to others that matters of production, purchasing, and contracts, once the province of uniformed officers of the Army, might best be handled even after the manpower emergency had passed by civilian officials rather than military members of the bureaus or the General Staff. The wisdom and efficacy of such a system, one of the more striking aspects of American participation in World War I, would be tested again even more severely in just twenty-three years, when the necessities of a second world war would again demand intense and widespread application of efficient business methods in the Army and an even heavier reliance on personnel drawn from American industry and commerce.

"Scientific" Management in World War II

Between 1939 and 1945, the demands of a high-technology, global, coalition war made centralized control and businesslike efficiency of the Army imperative, and the means and methods of managing Army administration and operations improved dramatically. The pressures of raising and maintaining a military force of ten million, conducting worldwide operations, managing multiple-billion-dollar budgets, and utilizing a flood of new technology demanded better systems for overseeing not only operations in the field but also the design and production of military equipment and supplies, worldwide storage and distribution of materiel, recruitment and training of men and women, and scheduling of personnel, equipment, and transportation for overseas theaters. Statistics provided a means for overseeing such complex activities, and accurate statistical reporting allowed decision makers to identify problem areas quickly, to make the necessary corrections and changes in the apportionment of available resources more effectively, and to measure the results of their decisions. The increased centralization of military organization and operations, the necessarily close relationship of industry and the military, the extensive use of techniques and organizational forms borrowed from the business world, and the enormous influx of civilians into government service and into uniform characterized the Army's development and operations in World War II and signaled a further stage in the evolution of the Army toward "scientific" management.

The Marshall Reorganization of 1942

The post–World War I reorganization of the Army embodied in the National Defense Act of 1920 foresaw only a small, peacetime constabulary with expenditures tightly controlled by the Congress.[47] The War Department General Staff was seen as the agency by which the chief of staff could exercise centralized control over the traditionalist bureaus, but by World War II the General Staff itself had become a vast traditionalist bureau. Army Chief of Staff General George C. Marshall accused it of the same vices as the bureaus; it was just "another collection of bureaus," he said, that "had lost track of the purpose of its existence" . . . [and had become] . . . "a huge, bureaucratic, red tape-ridden, operating agency. It slowed down everything."[48]

The General Staff was functionally oriented, a pattern first adopted by the great continental railroads in the United States, but since its inception in 1903 the General Staff had tended to become bogged down in operations as opposed to planning and policy formulation. Thus, since 1903 there had been constant debate over whether the General Staff should be a planning body (i.e., another bureau) or a true coordinating staff responsible for formulating policy and insuring it was carried out. Moreover, the experience of World War I had interjected some elements of the General Staff, notably the Purchasing, Storage, and Traffic Division, directly into operations. In the period immediately before World War II the War Department General Staff had become mesmerized by the minutiae of Army operations and administration and was thus unable to adequately perform its more general planning missions.[49]

There was a natural tendency toward compartmentalization, delay, and compromise in the General Staff brought on by the traditional "concurrence" system then in use. But perhaps the most significant defect of the General Staff by 1941 was its inability to distinguish between minor administrative details and major policy issues—one took as long to decide as the other. This had been one of the major defects of the old bureau system and the consequence was that reformers insisted that the Army staff divorce itself from the details of administration and concentrate on questions of policy and on planning.

During the 1920s and 1930s the managers of Dupont, General Motors, and Sears, Roebuck had solved similar problems by combining centralized control over policy with decentralized responsibility for operations. Control was centralized in a group of top executives without operating or administrative responsibilities who concentrated on major policy decisions, planned future operations, allocated resources accordingly, and reviewed the results, a technique later referred to as "planning-programming-budgeting." Responsibility for operations was decentralized to field agencies. In one case, Sears, Roebuck and Co., the experiences of the War Department General Staff under General March in World War I seem to have been a factor in the development of a modern corporate organization, an example of the constant

interchange of ideas between the Army and business. The reorganization of Sears was carried out by Robert E. Wood, a retired Army officer who had served as one of General Goethals' assistants in World War I.

In 1941, more than sixty agencies reported directly to the chief of staff, even on many minor details, and General Marshall's duties as "general manager of the Army" seriously interfered with his role as presidential adviser, chief strategist, and resource allocator.[50] He thus concluded that the solution of centralized control and decentralized operations used by modern business corporations should be adopted by the Army. Marshall realized that in order to safely decentralize operations he would first have to effectively centralize executive control, and that this could be accomplished by substituting the vertical pattern of military command for the traditional horizontal pattern of bureaucratic coordination. Acting under the authority of the First War Powers Act of 18 December 1941, which gave the president the power to reorganize the federal government for the duration of the war plus six months, General Marshall assigned the task of designing a new, streamlined Army structure to three officers: Brig. Gen. Joseph T. McNarney, Col. Laurence S. Kuter, and Col. William K. Harrison, Jr. The result was the famous Marshall Reorganization Plan of 9 March 1942, which established Army Ground Forces, Army Service Forces, and Army Air Forces as the operating agencies; reduced the General Staff to a planning and coordinating body without operating responsibilities; and created the Operations Division of the General Staff as the "command post," or top management office.[51] Supplemented by minor management techniques, such as Marshall's famous "green hornets" (requests for information or staff action from the chief of staff that required an immediate response within twenty-four hours—so called because of the color of the paper's cover and the consequences of failing to comply with the time limits), the new structure proved most effective in helping Army leaders to manage the conduct of the second world war.

Apart from the adoption of the principle of centralized control and decentralized operations embodied in the Marshall Reorganization Plan, the Army also became deeply involved with business management personnel and techniques in many other ways. As had been the case in World War I, a vast number of civilians, many with significant expertise in modern business management methods, were injected into the Army at all levels and thus transmitted their methods to the running of the Army. For example, a former Harvard Business School professor, Lt. Col. Robert S. McNamara, was assigned to develop statistical procedures for managing the Army Air Force's worldwide inventories. The use of civilian study groups and consultants also expanded. For example, Under Secretary of War Robert Patterson hired the management consultant firm of Booz, Frey, Allen, and Hamilton to suggest improvements in the organization and operations of his office, which was responsible for logistical matters.

The connection of civilian industry and the military was closer than ever before and required mutual agreement on methods, many of which originated in the business and industrial community. The complex technical weapons systems coming into being required a whole new range of techniques and methods to design, build, purchase, store, and account for the expensive new materiel. Primitive automatic data-processing equipment was developed for code work and statistical compilation, and the newly developed methods of analysis were adopted to improve the design and use of weapons and other equipment as well as tactics.

The Army Air Forces Statistical Control Division

Two students of business statistics, John E. Freund and Frank J. Williams, have noted that "the many critical problems of strategy, tactics, organization, logistics, and weapons systems during World War II demanded the application of new techniques, new methods, and new ideas."[52] Chief among these new techniques, new methods, and new ideas was the use of statistical reporting as the means of gaining control over diverse and complex operations, a concept first used in World War I. In one of the most significant management developments of World War II, the headquarters of both the Army Air Forces (AAF) and the Army Service Forces (ASF) established management offices designed to assist the commander in controlling the many and varied operations of command through the use of accurate statistical reporting, the analysis of those reports, and decisions and action based on the results.

Unhampered by old traditions that inhibited the development of modern industrial control techniques, the Army Air Forces took the lead in the establishment of statistical controls. The Management Control Directorate was one of seven directorates reporting directly to the commander of the Army Air Forces, General Henry "Hap" Arnold. This directorate was established following the 1942 Marshall reorganization and was responsible for administrative services, organizational planning, and statistical controls.[53] It borrowed heavily from the experiences of the aircraft industry, which had grown up with the Air Corps itself, and its staff was composed largely of civilian management experts. Within the Management Control Directorate, an Administrative Services Division was combined with the Air Adjutant General's office and was staffed mostly by military personnel. An Organizational Planning Division was responsible for analyzing and recommending the proper allocation of functions within the AAF, supervised the preparation of organization charts, and promoted decentralized operations, elimination of duplication, clarification of functional responsibilities, and other measures to provide more effective coordination and administration. A Manpower Division, established in March 1943, promoted the effective use of personnel in the face of a growing nationwide manpower shortage and prepared job analyses and job descriptions to determine the exact number of individuals by type, both military and civilian, required to perform efficiently the functions of any AAF unit or installation.

The heart of the AAF Management Control Directorate was the Statistical Control Division directed by Col. Charles "Tex" Thornton.[54] Ultimately the most sophisticated and effective of all similar activities in the armed services, the AAF Statistical Control Division has been called "the most elaborate management information system of the pre-computer era."[55] The Statistical Control Division began in March 1942 with a staff of some 100 "citizen-soldiers" with experience in business, banking, and data processing recruited personally by Tex Thornton; it grew to more than 15,000 personnel stationed worldwide in AAF headquarters and some seventy continental United States (CONUS) and overseas Statistical Control Units.[56] More than 3,000 of the statistical officers serving AAF commanders in the field were trained at the Harvard Business School; these citizen-soldiers from the business and academic world brought to the AAF quantitative methods and an analytical mindset, and after the war they returned to civilian life to preach the new gospel of statistical control.[57]

Statistics, centrally controlled, were indispensable in establishing effective program controls and in evaluating air operations. The Statistical Control Division attempted to consolidate, standardize, and rationalize the many disparate statistical reporting systems of the AAF, especially in the personnel, materiel development, and training fields, to produce "the most complete and timely reporting system in the War Department and in the Army."[58] Data were collected on the production, storage, and distribution of aircraft and other equipment as well as on personnel matters, training, and combat operations. The accuracy, timeliness, and completeness of this data permitted AAF leaders to make timely and effective decisions in every area of air power development and use.[59]

Yet another analytical technique adopted from the business world by the AAF in World War II was program planning, a method for coordinating the current and projected supply of resources with the expected demand for them. In late 1943, the AAF commander, General Arnold, appointed Edmund Learned of the Harvard Business School as his special consultant for program control. Learned had set up a course on management control for defense industry managers in 1941 and had been the director of statistical training for AAF officers at the Harvard Business School in mid-1942.[60] As special consultant for program control, he advised the AAF on the amounts and types of aircraft and other equipment, personnel, and munitions that were needed and spread the use of program planning.

The analysts of the Statistical Control Division not only used the newest business methods, they also had access to the latest data-processing and communications technology, including punched card tabulators and a dedicated, privately leased teletype network that was the largest installation of International Business Machines (IBM) equipment in the world.[61] Such equipment was essential for the handling of the massive amounts of data being collected and analyzed.

The Army Service Forces Control Division

Army Service Forces (ASF) headquarters also quickly ascertained the usefulness of statistical control techniques and proceeded to utilize them to manage the enormously complex problem of supplying an army spread around the world. General Brehon B. Somervell, commanding general of ASF, was one of the chief proponents of rationalization along functional lines in World War II.

Although his aggressive, empire-building style did not endear him to other Army leaders, he was very successful in bringing order out of the chaos of Army supply operations. Somervell established divisions within ASF headquarters similar to those in AAF headquarters and promoted the use of both civilian experts and management techniques drawn from industry and business in order to "rationalize their structure and operations along sound businesslike principles."[62] As he told a conference of Service Command generals in July 1942:

> Organization has peculiarly been considered a part of the American genius. Our great private industrial organizations, accomplishing enterprises covering the entire US and the world, have been developed through organization specialists . . . the civilians who have spent their lives on this one subject have it so far over us that they make us look silly . . . we can and we must take the skill and efficiency which has been developed in industry and apply it to our great big wartime Army.[63]

The Control Division was one of ten functional staff agencies established by the directive that created the Service of Supply (SOS) (later renamed the Army Service Forces) on 9 March 1942, and it reflected General Somervell's desire to "provide in his office for a unit that would devote attention exclusively to measuring the progress of the SOS, to improving its organizational structure, and to improving the procedures and system used in its operations."[64] Although the functions of the division were somewhat unclear at the time of its creation, by July 1942, the director, Col. (later Maj. Gen.) Clinton F. Robinson, was able to state them succinctly:

> To evaluate the effectiveness with which plans of the commander are executed; to measure the progress of operations under his control; to make recommendations for adjustments in policies, organization and methods to increase effectiveness and progress; to follow up the execution of approved recommendations.[65]

Ultimately, the assigned mission of the Control Division was defined as follows:

> (1) To gather, analyze, and evaluate data regarding the efficiency of the operations of all elements of the Army Service Forces;
> (2) To recommend changes of existing policies, organization, procedures, and methods in situations requiring corrective action;
> (3) To supervise statistical and reporting procedures within the Army Service Forces and to prepare or supervise the preparation of statistical reports on the operations of the Army Service Forces.[66]

The structure of the ASF Control Division was very similar to that of the AAF Management Control Directorate. The members of the division included both civilian management experts and military officers, most of whom had little experience with industrial management. There were three methods of recruiting expert civilian personnel for the Control Division, two of which proved of limited value. There were no real industrial management experts at the top levels of the regular civil service, and the hiring of consultants at a pitiful $25 per day was not a satisfactory method for long-term projects; the best method was thus to commission proven experts in the Army of the United States from civilian life.[67]

The Control Division was organized with an Administrative Management Branch, a Statistics and Progress Branch, an Office Service Section, and such special advisers as were appointed from time to time. As in the AAF, the Statistics and Progress Branch was the focal point of control.[68] It developed, standardized, and monitored the submission of recurring statistical reports, including a monthly progress report that was the key ASF management tool; analyzed the progress of ASF operations using the data from recurring and special reports; coordinated the providing of statistical information to agencies outside ASF; and acted as the staff supervisor and adviser with respect to statistical and reporting methods and procedures.[69]

The Administrative Management Branch studied, developed, and recommended policies, plans, and

procedures for more effective organization and administration; monitored and recommended necessary changes in the organization of ASF and its subordinate commands; developed control techniques and prepared literature on control work; and promoted the use of industrial management techniques generally throughout the ASF.[70] Its most important function was administrative troubleshooting, for which purpose civilian consultants conducted hundreds of special management surveys.

The Office Service Section provided routine clerical support, and the special advisers constantly reviewed organization, policies, and procedures in their assigned field of expertise; conducted special surveys as required; recommended corrective actions; and handled requests for information not within the province of the Statistics and Progress Branch.[71] In 1943, a Work Simplification Branch, employing standard industrial work measurement techniques, was added to organize routine clerical and industrial operations more efficiently and to simplify supply and personnel procedures in order to save manpower. In addition, the Control Division developed a network of control units throughout the ASF. The number of such units in field installations exceeded 370 by February 1944.[72]

The Control Division goal of centralized management control depended on four general types of control operations: management surveys, organizational analyses, procedural standardization, and progress reporting. The desired uniformity was achieved by

> standardizing presentation practices, specifically outlining and defining all required data, personal consultation between the branch and the preparing organizational elements, analyzing and interpreting of data prepared for publication, and reviewing contents of report sections for post-publication criticism.[73]

The centerpiece of this system was the monthly progress report used to measure performance against established goals. A lengthy document, the report's successful use was based on a carefully worded narrative section and the use of selected graphics. The Control Division's products also included organizational surveys and management improvement programs aimed at work measurement, work simplification, standardization of procedures and forms, and centralization and control of publications. The Control Division also pioneered the use of work simplification methods in the federal government on a scale never seen before or since.[74]

Although the contact with subordinate control units served to promote good relationships with other ASF elements, the Control Division made many enemies by knocking heads and assuming operational duties.[75] Overall, however, the Control Division was successful in developing and employing industrial management techniques in the supervision, direction, coordination, and control of the disparate functions and operations for which ASF was responsible.

The Improvement of Army Management, 1945–1950

In the immediate postwar period the traditionalists again attempted to undo the wartime advances of the advocates of scientific management and reassert their independence from centralized control. However, their attempts were doomed to ultimate failure as a result of the new international responsibilities of the United States, the continuous crisis atmosphere of the Cold War, the revolution in technology, and the mounting costs of weapons systems, all of which demanded tighter centralized control over military research, development, and procurement. Greater efficiency across the board was absolutely essential and, it was thought, could be achieved only with the use of advanced business management techniques. As Army Chief of Staff General George H. Decker later told students at the Army Management School, "The post–World War II period introduced an entirely new era. . . . Under these conditions, the problem of good military management which would provide the best possible balance between military effectiveness and business economy assumed new importance."[76]

On 18 October 1945, a board of senior officers headed by General Alexander M. Patch forwarded its recommendations on the postwar reorganization of the Army to the chief of staff. In general, the Patch Board recommended the elimination of many wartime innovations in organization. Consequently, in May 1946, the ASF and its Control Division were abolished, as was most of the AAF Management Control Directorate. A few parts were saved, notably

the AAF Program Control Office and those elements of the ASF Control Division that were reorganized as the Central Statistical Office and the Management Office directly under the Army chief of staff.[77]

There were several reasons for this elimination of activities that had proven successful in wartime management of the military forces. The law permitting the Marshall reorganization was for "the duration of the war plus six months" only, but perhaps the most obvious reason was the personal opposition of some Army leaders to General Somervell's antagonistic, "empire-building" style. There was also widespread disenchantment and dissatisfaction among tradition-minded Army officers regarding the concepts of industrial management and control introduced during the war, concepts that they believed violated the principle of unity of command and were ill-suited to military organizations. There was also a suspicion of the "civilian experts in uniform" who advocated such methods so forcefully. The Technical Services, especially the Ordnance Department, resented the imposition of management controls alien to their tradition of bureau autonomy. They regarded the efficiency experts as a horde of uninformed, meddlesome busybodies, and they particularly resented the ASF Control Division's persistent efforts to reorganize the Army's supply system along functional lines, a trend that they rightly foresaw would only end in the demise of the supply departments as separate entities. Merely mentioning "functionalization" was enough to send Chief of Ordnance Maj. Gen. Levin H. Campbell, Jr., into a towering rage.[78]

Despite their strong feelings and still powerful connections in the Congress and elsewhere, the traditionalists were fighting a losing battle. In addition to the necessity for firm control of costly enterprises, a number of other developments conspired to make more effective management of Army activities not only necessary but easier to apply. Advances in the design and manufacture of automatic data-processing equipment, for example, gave managers more effective devices for asserting centralized control than had been physically possible before. The advocates of scientific management were also aided by outside management consulting firms and special commissions on government organization and operations chartered by Congress and the president. In December 1945, the position of deputy chief of air staff for research and development was created, and in 1946 his office sponsored the creation of the Research and Development (RAND) Corporation as an independent private business employing civilian scientists on operations research and later broader systems analysis projects under contract to the Army Air Forces.[79] Additional support for scientific management was provided by the first Hoover Commission, appointed by President Truman in 1947 to review various aspects of government operations. The prestige of members of such commissions influenced Congress to break their traditional ties with the bureaus in both the Army and the Navy.

The Emergence of the Comptroller of the Army, 1948–1950

The most significant Army management improvement in the postwar period was the creation of the Office of the Army Comptroller in January 1948. The use of a comptroller to oversee the management of resources was introduced in American business in the 1880s but was little used in the armed forces until World War II.[80] After the war, all of the armed services established comptroller offices to oversee their increasingly large and complex budgeting, auditing, and disbursing activities.[81] The creation of the Office of the Army Comptroller in January 1948 was antedated by the creation in May 1947 of an air comptroller in the newly established United States Air Force. Assistant Secretary of War for Air Robert Lovett had recommended the establishment of such a position to AAF commander General "Hap" Arnold in October 1945, and it was later established by the first secretary of the Air Force, Stuart Symington.[82]

At the end of the World War II, the Truman Committee of the United States Senate, the watchdog over wartime spending, criticized "the unpardonable waste of money [because] the services failed to use modern business practices and the Secretary of War did not have sufficient information (proper reporting and analysis) to take corrective action."[83] In 1947, Secretary of War Kenneth C. Royall, who had served during World War II in the Office of the Fiscal Director, ASF, and who concurred with the findings of the Truman Committee, appointed the successful businessman Edwin C. Pauley to the

position of special assistant to the secretary of war to study the Army's logistical programs and business practices and to recommend ways in which they might be improved. Pauley found that Army leaders lacked good information regarding the actual cost of Army operations, primarily because no two cost accounting systems in the Army were alike or complete and their information could not be totaled for the Army as a whole.[84] He thus recommended that cost accounting procedures be improved by establishing a comptroller for the Army and hiring the best available civilian cost accounting experts to modernize and standardize the Army system. He also recommended the establishment of a management engineering function in the War Department "to keep the organization and methods of the Department under continuing survey to insure constant attention to efficiency and economy."[85]

Meanwhile, in February 1947, Army Chief of Staff General of the Army Dwight D. Eisenhower appointed a War Department Policies and Program Review Board, headed by Maj. Gen. Wade H. Haislip, to study and make recommendations on Army policies and programs. After seven months, the Haislip Board found the Army's organization and methods inadequate for proper efficiency and economy and recommended the creation within the Office of the Deputy Chief of Staff of a management engineering office to conduct continuing surveys of Army organization and methods, with particular attention to matters of efficiency and economy.[86]

Pauley's report and that of the Haislip Board reached the secretary of war and the Army chief of staff at about the same time. After discussion of the matter with General Eisenhower, Secretary Royall combined the recommendations of the two studies and decided to create at General Staff level an agency headed by a military officer charged with overseeing the Army's budget and fiscal operations and the Army's organization and management practices. Accordingly, the Office of the Army Comptroller (OAC) was created on 2 January 1948, by *Department of the Army Circular No. 2*, "in order to improve the use of modern management techniques in the business administration of the Army, and to use accounting more effectively as a tool throughout the Army in the control of operations and costs."[87] A nucleus for the new office was provided by the transfer of functions and personnel from the Budget Division, Manpower Board, Central Statistical Office, and Management Office of the Office of the Deputy Chief of Staff of the Army.[88] Maj. Gen. George J. Richards was appointed as the first Army comptroller.

It was intended that the Army comptroller would serve Army leaders in four ways:

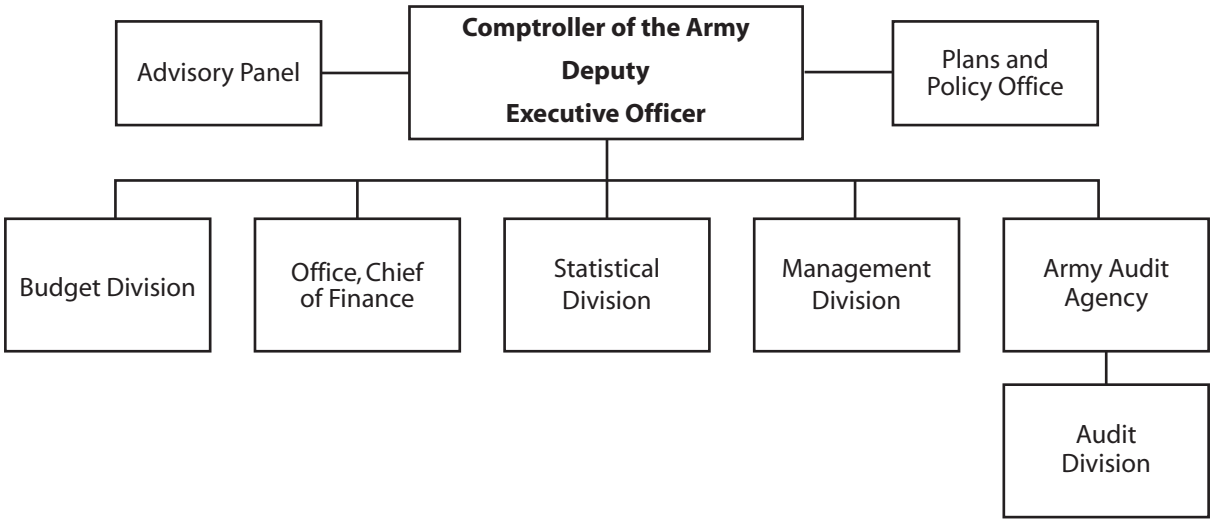
1. By collecting accurate and timely information and synthesizing that information so as to provide the basis for command decisions.
2. By providing the Commander with a means of exerting immediate influence over administrative operations.
3. By conducting a continuing review of the organization and procedures of the command to insure that proper provision is made for carrying out the Commander's responsibilities and to insure the effective use of resources made available to him.
4. By safeguarding the command's resources through the provision and maintenance of adequate accounting systems and through the conduct of audits.[89]

To that end, four basic missions were assigned to the Army comptroller:

1. Furnishing accurate and timely fiscal and statistical information upon which the commander can make decisions.
2. Assisting the commander in the budget and fiscal field.
3. Critically searching organization and procedures to assure that proper provisions have been made for carrying out the commander's responsibility.
4. Determination of the manner in which funds and other resources are applied.[90]

The Army comptroller thus had responsibility for the independent review and analysis of Army programs and commands; the accounting, fiscal, audit, budgetary, progress and statistical reporting, reports control, cost analysis, and management analysis activities of the Army; legislative policies and programs pertaining to appropriations acts and liaison with Congress on budget matters; the management systems of the Army; data-processing systems supporting his assigned functional areas; overall management improvement policies and concepts; and the continuing and independent analysis of Army organization, functions, and procedures.[91]

FIGURE 1–1—ORGANIZATION OF THE OFFICE OF THE ARMY COMPTROLLER, NOVEMBER 1948



Source: Selim Seymour Podnos, *The Development of Army Comptrollership Functions during the Span 1942–1949, with Particular Reference to Management Control during World War II*, Ph.D. diss. (Washington, D.C.: George Washington University, 7 Jun 1966) p. 149, Chart 9.

Note: The Army Audit Agency came under Army comptroller control on 21 December 1948.

Initially, the OAC was placed under the deputy chief of staff and organized with three divisions (Budget, Statistical, and Management). In November 1948, a reorganization of the Army created two deputy chief of staff positions (planning and administration). For all practical purposes, the Army comptroller constituted a third deputy chief of staff but without the title. The Office of the Chief of Finance was placed under the Army comptroller and an Audit Division was created, thereby consolidating the Army's finance, fiscal, and management functions under the Army comptroller. The resulting organization of the OAC was as shown in Figure 1–1.

The Statistical Division was organized with three branches (Troop Program and Strength, Statistical Analysis, and Reports Control) and was responsible for

> securing factual data on which to base sound recommendations and make timely and well founded decisions; presenting the data in a manner that can be clearly and readily understood; minimizing the man-hours and money expended in collecting data through a well established and monitored reports control system and by training personnel to anticipate needs for data as far in advance as possible.[92]

Key documents produced by the Statistical Division included the Troop List; the Troop Program; the Mobilization Plan; Strength Reports of the Army; and the Civilian Statistics Bulletin.

The Army comptroller was unique among service comptrollers in that his mandate included "management engineering," the application of scientific principles and techniques to management problems, including the system of management, organizational structure and working relationships, and the methods used to carry out programs and operations.[93] To oversee matters of management practice, the OAC was organized with a Management Division headed by Col. Kilbourne Johnston, the son of Brig. Gen. Hugh "Iron Pants" Johnston of National Recovery Act fame.[94] Colonel Johnston would become the intellectual and philosophical driving force for the OAC.[95]

Once installed as the Army's chief management expert, Colonel Johnston recalled the opposition that had been aroused by the ASF's Control Division's knocking heads, making enemies, and assuming operating duties. He thus decided that his functions could best be carried out through education and guidance rather than by direct operation or staff

coordination. He therefore declared the new Management Division a service unit, stating, "We look upon the Management Division as a close parallel to a management engineering firm in that its purpose is to serve, not to control or manage."[96] Elsewhere, he explained the Management Division credo by writing: "We are specialists who use scientific techniques in helping *you* solve *your* management problems. *We*, as management engineers, *have no management problems* because *we manage nothing*."[97]

The official functions of the Management Division were:

1. To develop and encourage an Army-wide management improvement program, and thereby assure maximum application of modern management principles and techniques in Army activities.
2. To encourage throughout the Army a new management attitude of constructive criticism with a view to developing improvements in organization, methods, and procedures through studying the answers to these questions: How does the Army schedule its job? How is the Army organized to do its job? How does it go about its job? How well is top management informed on the way the job is being done?[98]

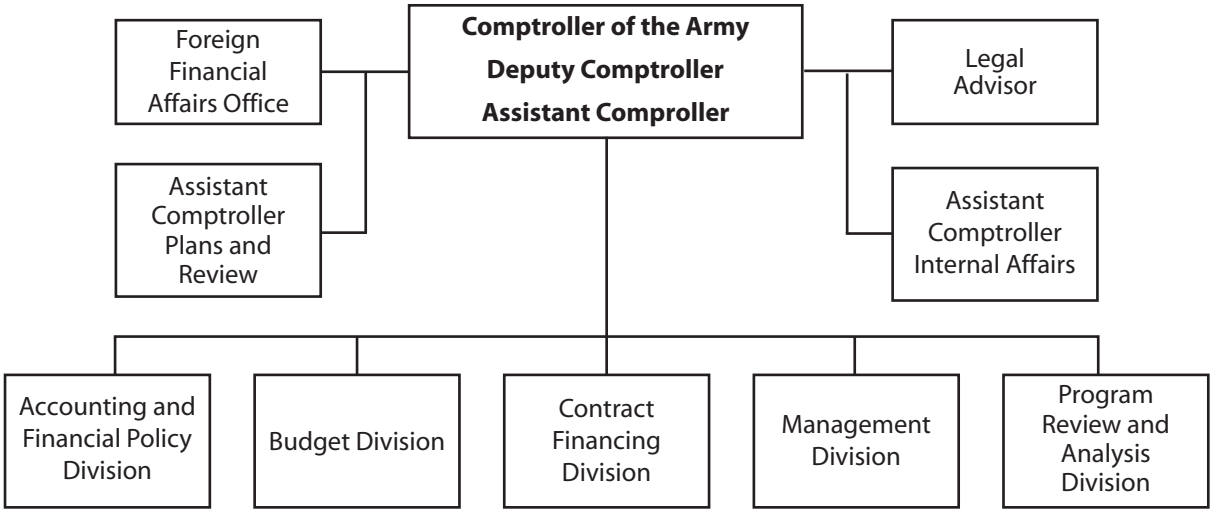
In order to carry out its assigned functions, the Management Division was staffed by twenty-nine officers, twenty key civilians, and twenty-one clerical personnel (seventy total) organized in two main branches (Organization and Methods) plus a Statutory Revision Branch and a provisional Program Branch.[99] The Organization Branch conducted "continuous analysis of the non-tactical organization structure of the Department, seeking weaknesses which it brings to the attention of the Secretary of the Army, the Chief of Staff, and the Deputy Chief of Staff."[100] The seventy assigned personnel carried out programs in eight main areas: management assistance; management surveys; methods and procedures surveys; personnel requirements surveys; performance standards and staffing criteria; codification of Army laws; Department of the Army organization improvement; and design for performance evaluation.

By the end of 1948, the Management Division had the Army moving forward on a number of management improvements, among which were the following:

- A plan for the analysis and control of the programs of the Army in the light of the best available techniques of management.
- A survey of all cost accounting activities within the Department of the Army and the development of plans to weld these activities into useful devices for management purposes.
- A management assistance program for the Department of the Army.
- Comprehensive study of the organization of the Department of the Army in the light of all pertinent factors.
- Legislation to conform to Army organization and to eliminate all obsolete legislation pertaining thereto.
- A Code of Army Laws embracing all laws pertaining to the Army.
- An organizational manual for Headquarters, Department of the Army.
- A management manual covering all aspects of management pertinent to the activities within the Department of the Army.
- A detailed survey of the manpower and materiel control procedures with a view to recommend types more effective and economical organization and procedures.[101]

On 1 November 1948, the Office of the Chief of Finance, formerly a Technical Staff organization, was subordinated to the Army comptroller pursuant to *Department of the Army Circular No. 394*, and the Army Audit Agency (AAA), created by Secretary of the Army Kenneth C. Royall in 1946, was transferred from the Office of the Assistant Secretary of the Army to the OAC on 21 December 1948, pursuant to the same *DA Circular*.[102] The AAA consisted of the Audit Division (an element under the Office of the Army Comptroller) and seven regional offices (one in each Army area plus the Military District of Washington), with twelve branch offices, eighty CONUS residencies, and two overseas residencies (Atlantic, responsible to the New York Audit Region, and Pacific, responsible to the San Francisco Audit Region).[103] The Audit Division was organized with three branches (Military, Industrial, and Management). In FY 1948, the Audit Division conducted 8,284 military audits and 9,439 industrial audits with 124 military and 782 civilian personnel, plus another 5,405 military audits and 422 industrial audits with 153 military and 218 civilian personnel overseas.[104]

FIGURE 1–2—ORGANIZATION OF THE OFFICE OF THE COMPTROLLER OF THE ARMY, 15 OCTOBER 1950



Source: Selim Seymour Podnos, *The Development of Army Comptrollership Functions during the Span 1942–1949, with Particular Reference to Management Control during World War II*, Ph.D. diss. (Washington, D.C.: George Washington University, 7 Jun 1966) p. 155, Chart 10.

In August 1949, the status of the Army Comptroller was formalized with passage of Title IV ("Promotion of Economy and Fiscal Procedures and Organizations") of Public Law 216 (An Act to Reorganize Fiscal Management in the National Military Establishment to Promote Economy and Efficiency, and for Other Purposes, 81st Congress, 10 August 1949).[105] On the basis of the recommendations of the first Hoover Commission, Title IV of Public Law 216 created the Office of the Comptroller in the Department of Defense and offices of Comptroller and Deputy Comptroller in each of the services.[106] It also directed that the Department of Defense adopt a performance-type budget, authorized the establishment of working capital funds and management funds, directed the maintenance of property records on both a quantitative and monetary basis, and prescribed a number of matters having to do with fiscal and accounting procedures.[107] Public Law 216 provided that the comptroller at each level would be responsible for budgeting, accounting, auditing, progress and statistical reporting, and organization and procedures related to such matters.[108]

To implement the provisions of Title IV, Public Law 216, Secretary of the Army Gordon Gray issued *Department of the Army Circular No. 109* on 15 October 1949. *DA Circular No. 109* redesignated the Office of the Army Comptroller (OAC) as the Office of the Comptroller of the Army (OCA), made the comptroller of the Army responsible directly to the secretary of the Army, and gave the comptroller of the Army the formal status of a deputy chief of staff with responsibility for

> All budgeting, accounting, progress and statistical reporting, and internal audit in the Army Establishment.
> The administrative organization structure and managerial procedures of the Army Establishment relating to all budgeting, accounting, progress and statistical reporting, and internal audit.
> Such other duties as a now or may hereafter be prescribed by regulations, orders, circulars, or other directives.[109]

DA Circular No. 109 also designated the Office of the Chief of Finance and the U.S. Army Audit Agency as operating elements responsible to the comptroller of the Army (COA), created an Accounting and Financial Policy Division and a Contract Financing Division within the Office of the COA, and redesignated the Statistical Division as the Program Review and Analysis Division.[110] The resulting organization of the Office of the COA, effective on 15 October 1950, was as shown in Figure 1–2.

The Improvement of Army Management, 1950–1961

The efforts of Army leaders to improve Army management continued unabated during the 1950s, despite some delays as a result of the Korean War. As Army Chief of Staff General George H. Decker later noted, "Within the Department of the Army, the period 1950–1962 probably witnessed more changes in management procedures than perhaps were instituted throughout the previous history of the Army."[111] The principal changes were focused on three main areas: streamlining organizational structures, implementing more effective management techniques, and finding an effective method for translating strategic plans into a mission-oriented "performance" budget.[112] Although the improvements in organization and management technique were significant, the development of the Army Program System and the resulting changes in the Army's financial management processes were perhaps the most important aspects of Army management improvement efforts in the 1950s.

Army Reorganization, 1950–1961

Following World War II there was widespread interest in reorganizing the defense establishment to achieve greater executive control and efficiency. Accordingly, the Department of Defense and the Army, spurred on by the recommendations of various commissions, committees, and study groups appointed by the president, the Congress, and the secretary of the Army, underwent several significant reorganizations during the decade and a half after 1945.[113] The principal objective of such efforts was to improve executive control and efficiency by streamlining administration. In the Army the focus was on dealing with the long-standing problems of the proper organization and functions of the Army Staff and the effective control of the Technical Services (the old bureaus).[114]

Improvements in Management Techniques, 1950–1961

In his semiannual report for the period January–June 1951, Secretary of Defense George C. Marshall stated, "The primary mission of the Department of Defense, to organize, train, equip, and operate military forces in support of national policy, must be accomplished with the highest kind of business efficiency in order to obtain maximum military effectiveness."[115] Accordingly, efforts to improve Department of Defense and Army management techniques continued throughout the 1950s at an accelerated pace.

In 1949, Secretary of Defense Louis A. Johnson had established a Defense Management Committee composed of members from the highest levels of the Defense Department and the military services in order to assure the "full and direct participation of all the agencies concerned in the development of management improvement programs."[116] In February 1951, a management engineering group was created to act as a staff for the Defense Management Committee, taking over on permanent basis the work previously performed since 1949 by a private management consulting firm. At about the same time, the Army created a formal Army Management Improvement Program (AMIP) to provide "an organized, systematic way of constantly re-examining Army management and perfect the way the Army does its job."[117] The most up-to-date business techniques were employed, work simplification methods were spread throughout the Army, and coordination with the Department of Defense on management efforts was improved. Each year the AMIP focused on certain special fields for improvement. For example, the fields chosen for emphasis in 1954 included programming, financial management, personnel management, reserve affairs, contracting, stock control, and salvage and disposal.[118]

In 1954, Secretary of the Army Robert T. Stevens was able to report that "The Army management improvement program has brought about concrete and measurable results in many areas through systematic and sustained utilization of tried and proved techniques of modern management."[119] In FY 1954 alone, the AMIP resulted in savings of more than $15 million from work simplification; a manpower savings of some 32,000 military and civilian positions as a result of a reduction in processing time in receiving and discharging soldiers; and substantial reductions in red tape, depot stocks and costs, and the costs of maintaining the Army Reserve.[120]

In early 1955, the Army accelerated its efforts to improve organization and administration by "decentralizing authority, improving procedures, and reducing or eliminating unnecessary paperwork."[121] Commanders in the continental United States were given greater control over the resources required to accomplish their missions; better methods of selecting the best qualified people for the Army's managerial positions were adopted; substantial progress was made in measuring and evaluating the proper utilization and performance of manpower; and many reports were simplified or eliminated altogether at a substantial savings in cost. Among the more important improvements in Army resource management in 1955 were the implementation of reorganization plans at the highest levels in the department; the application in many areas of more efficient management techniques; the creation of the Army Financial Management Plan; the completion of an Army Budget Manual; the extension of the Army Program System to the Technical Services; and the completion of a number of studies of techniques by which installations, as well as the department, could apply review and analysis procedures in improving program execution.

In FY 1955, additional improvements in work simplification produced an estimated $13 million in savings, new policies for the use of electric accounting machines were introduced, and the Army began serious planning for the use of high-speed electronic computers.[122] The focus on computers continued in FY 1956, and computers and other advanced automatic data processing equipment were introduced at various Army installations.[123] Similar efforts to introduce improved management techniques at all levels of the Army continued until the end of the decade and beyond. They resulted in greater efficiency and effectiveness of administration and operations and produced significant cost savings.

Army Budgeting and Programming, 1950–1961

Aside from the emphasis on obtaining greater efficiency and effectiveness through better organization and improved management techniques, the principal focus of Army management in the 1950s was on the improvement of financial management through adoption of a more efficient programming and budgeting system. Accordingly, efforts to develop a "performance budget" and a workable Army Program System dominated the Army drive to improve financial management in the 1950s.

The "Performance Budget"

Attempts to reform the Army budget process have a long history. In the early twentieth century, two presidential commissions prepared the ground for such reforms, and in 1947, President Harry Truman appointed the first Hoover Commission on Organization of the Executive Branch of the Government, which rendered its report in 1949 and recommended adoption of a "performance budget."[124] Based on the recommendations of the Hoover Commission Task Force on National Security Organization headed by Ferdinand Eberstadt, the 1949 amendments to the National Security Act of 1947 gave the secretary of defense additional authority over the defense budget, created the Office of the Defense Comptroller and comptroller offices in the services, and required that the secretary of defense submit future budgets in a performance budget format.[125]

The performance budget differed from earlier forms of budgets by requiring that costs related to a particular activity be keyed directly to that activity, that the chain of command and the chain of financial responsibility be parallel, and that capital and operating costs be separated.[126] As DOD Comptroller Alain C. Enthoven later pointed out:

> Ideally, a budget should convert goals, programs, and priorities into monetary terms following rational economic analysis and decision on the optimum means of accomplishing an agency's objectives . . . modern budgeting is inextricably linked to the formulation of policy and the orderly execution of programs.[127]

Little action was taken toward developing performance budgets in the Department of Defense until Wilfred J. McNeil was appointed as the first DOD comptroller on 12 September 1949, and on 17 May 1950 he introduced the new DOD performance budget.[128] In one fell swoop, McNeil overturned the domination of the Army budget process by the bureaus (Technical Services)

that had existed since 1775. The Army General Staff was given greater control over the Technical Services budgets by its representation on the new Budget Advisory Committee (BAC) established by *Army Regulation No. 15–35* on 2 October 1951, and the responsibility for defending budget requests before Congress was transferred from the bureau chiefs to the General Staff, which would henceforth control the Technical Services' budgets.[129]

More than two years passed before the first Army performance budget could be developed and presented to Congress.[130] The Army budget for FY 1953 reduced the number of appropriations categories from the traditional twenty-five Technical Service–oriented appropriations categories to nine, as prescribed by the DOD guidance.[131] Even so, the new Army budget format did not clearly indicate the cost of operations or the relationship between military commitments and the resources available to meet them. Thus, there remained a gap between strategic planning and budget preparation until the end of the 1950s.

The adoption of a performance budget was an important step in the improvement of Army financial management and accounting because it established a closer link between Army programs and their associated costs. As it existed in 1949, the Army's budget was based on twenty-five major "projects" (appropriations categories) aligned to the Technical Services, which accounted for some 80 percent of Army expenditures.[132] Such a system did not reflect clearly the costs of carrying out various Army programs or even the total amount spent and provided no means of distinguishing between capital and operating expenses or of determining inventories of supplies on hand. Most important, such a budget system inhibited control by the secretary of the Army or by the General Staff over Army expenditures and made it impossible to relate budget requests and the funds appropriated with military plans, missions, and functions. Moreover, Congress prohibited the transfer of funds among the major appropriations categories, thereby limiting the secretary of the Army's ability to shift funds among the various Technical Services and Army Staff agencies without congressional approval.

A number of presidential and congressional committees investigated Army financial management practices during the 1950s and made recommendations supporting the adoption and perfection of performance budgeting. In the early 1950s, Secretary of Defense Charles E. Wilson appointed a special Advisory Committee on Fiscal Organization and Procedures within the Department of Defense. Known as the Cooper Committee, after its chairman, the committee recommended that the traditional "obligation-allotment" form of accounting be replaced by the performance budget "as a more rational means of controlling defense costs," but DOD Comptroller Wilfred McNeil, a member of the committee, disagreed and was able to forestall adoption of the recommendation.[133]

On 24 August 1953, Secretary of the Army Robert T. Stevens appointed an Advisory Committee on Army Organization headed by Paul L. Davies, the president of the Food Machinery and Chemical Corporation.[134] Other members of the committee included Harold Boeschenstein (president, Owens-Corning Fiberglas Corporation), Irving A. Duffy (vice president, Ford Motor Company), C. Jared Ingersoll (chairman of the board, Kansas, Oklahoma and Gulf Railway Company), and Lt. Gen. Lyman L. Lemnitzer (deputy chief of staff of the Army). The staff of the committee consisted of four persons from the consulting firm of McKinsey and Company plus several Army officers. The committee met between 18 September 1953 and 5 January 1954, and interviewed some 129 witnesses. Its final report addressed five basic questions:

1. What is the role of the secretary of a military department in the DOD as it is developing?
2. How shall the secretary of a military department delegate his authority among military and civilian subordinates?
3. What is required to ensure effective civilian control?
4. How can the secretary best organize his department to develop, train, and maintain an army ready for war, and simultaneously see to the procuring, storing, supplying, and warehousing of the vast quantities of materiel needed?
5. Does the department's organization fix responsibility and establish lines of accountability so clear as to ensure efficient performance and responsible management?[135]

The Davies Committee also criticized the existence within the Army of some thirty separate accounting systems and called for a single, integrated system that would measure the cost of operations

adequately. The committee also recommended that the Army's budgeting system reflect the actual cost of operations on the basis of the assigned missions rather than on the basis of the functional means of accomplishing them.

In 1954, the Army instituted a different approach to budgeting that came to be known as the Army Command Management System (ACMS). Under the ACMS, installation commanders received budget guidance in the form of "control programs," five-year projected estimates based on Army mid-range planning in five major areas (troop, materiel, installations, Reserve components, and research and development) and then prepared detailed budget requests based on twenty-one major functions.[136] The problems of using the new system effectively were many.

In the mid-1950s, the second Hoover Commission, formally entitled the Commission on Organization of the Executive Branch of the Government, incorporated many of the findings of previous study groups, such as the Advisory Committee on Fiscal Organization and Procedures.[137] Established in 1953 to make recommendations that would "promote economy, efficiency, and improved service of the public business," the Hoover Commission published some nineteen commission and twenty task force reports and made some 350 recommendations, of which 320 (over 90 percent) pertained directly to the Department of Defense.[138] Among the topics addressed by the commission were the business organization of the Department of Defense, military procurement, depot utilization, management of real property, commercial and industrial activities, and disposal of surplus property, budgeting and accounting practices, civilian personnel, medical services, intelligence activities, and paperwork management. The commission's final report emphasized four main management goals:

1. More effective management coordination within the Office of the Secretary of Defense, and between this Office and the military departments;
2. Improving management of supply and service activities common to the military departments;
3. Improving management personnel;
4. Improving financial management.[139]

The second Hoover Commission also criticized defense budgeting and accounting systems and recommended that Congress require systems based on a cost of performance or accrual basis.[140] Congress subsequently passed Public Law 863 (89th Congress) on 1 August 1956, to implement the commission's recommendations, but due to the opposition of DOD Comptroller McNeil, the provisions of the law were largely ignored.[141] However, some 40 percent of the Hoover Commission's recommendations regarding the DOD could be carried out immediately, and the DOD undertook an active program, headed by a special assistant to the secretary of defense, to review and implement them and to seek legislation or action by other government agencies to effect the remaining 60 percent.[142] As Secretary of Defense Wilson reported in 1957, "This intensive search for more effective procedures is resulting in substantial improvements in operations throughout the Department."[143]

The Army Program System

The key to preparing a performance budget was to clearly link strategic plans with the resources necessary to carry them out and then to convert those resources into dollar amounts in budget requests. Such a system would permit a more accurate estimate of the cost of various alternative strategies and was thus an important consideration during a period of constrained resources. Consequently, the relationship between strategic planning and budgeting received increased attention during the 1950s.

In the late 1940s, the first Hoover Commission and the consulting firm of Cresap, McCormick and Paget both recommended that the Army develop a "program system" to translate strategic plans into functional operating programs that could in turn be used to prepare Army budget requests in the new performance budget format.[144] With passage of the Army Reorganization Act in March 1950, the Army comptroller became legally responsible for budgeting, accounting, progress and status reporting, and internal auditing, and on 12 April 1950, the Army established a comprehensive Army Program System (APS) to oversee major Army activities and to "assist in the alignment of resources and military requirements."[145] The new APS cycle had three distinct elements: (1) program devel-

opment (when plans were translated into operating programs); (2) program execution (when operating programs were converted into budgets and later into appropriations and then carried out); and (3) program review and analysis.[146] Responsibility for program development was assigned to the deputy chief of staff for plans; for program execution, to the deputy chief of staff for administration; and for program review and analysis, to the comptroller of the Army.[147] At the same time, Army Comptroller Maj. Gen. Edmond H. Leavey urged further changes in the Army's programming methods and the development of a new system for program review and analysis.[148]

Under the new APS the Army established fourteen "primary programs" to categorize all that the Army did or planned to do.[149] The primary programs, which were introduced in the FY 1951 budget, were intended to weigh "what should be done against what there is to do with" and thus determine both "what must be done and what can be done."[150] However, it took time to implement the new system, and the Korean War postponed implementation of the APS until July 1953 (simultaneous with the new Army performance budget), but even then implementation proved difficult inasmuch as the Army had significant problems in translating "mission-oriented strategic plans into functionally oriented operating programs and then into functional budgets."[151] Nevertheless, Army leaders continued to press forward.

In the mid-1950s, Army leaders introduced the Army Financial Management Plan (AFMP), which they hoped would "provide the responsible officials with the modern types of financial control and information that has been found by business to be a vital element of successful management."[152] The AFMP was aimed at

> [i]mproving the financial processes and controls, such as budgeting, funding, accounting and auditing;
> Using working-capital funds to finance certain types of activities, and;
> The use of resulting improved financial information in the day-to-day management and control of the Army Establishment.[153]

In 1955 and 1956 there was also further development of the ACMS, which was intended to integrate the basic elements of the AFMP, the APS, and other Army management systems.[154] The ACMS related "financial operations to programs when first undertaken and then periodically evaluate[d] progress in terms of cost and performance."[155] In FY 1955, the Army began testing a system of integrated programming, budgeting, and accounting at Fort Jackson, South Carolina. The aim of the proposed system was to

> devise a practical method for achieving the ultimate goal of the Army Financial Management Plan, to improve operational performance by assignment of specific responsibility for the evaluation and control of the cost of labor, supplies, and services by those who cause the expenditures to be made.[156]

The ACMS was extended to three CONUS Army areas in FY 1956, to the remaining three CONUS Army areas and the Military District of Washington on 1 July 1956, and to overseas commands and the rest of the Army in FY 1957.[157]

Substantial progress was also made in FY 1955 toward extending the APS to the Technical Services, and efforts to extend the techniques of program review and analysis beyond departmental and major command level to installation level began the same year.[158] The following fiscal year, the Technical Services were brought under the APS, and an Office of Review and Analysis was established in the Office of the Under Secretary of the Army to review and analyze Army requirements in terms of Army plans and Army needs for manpower, materiel, and facilities.[159] The Office of Review and Analysis was also charged with examining "the systems for translating the Army's plans into quantitative requirements to insure proper balance and correlation in the Army's operations and to insure that the Army's activities agree with its objectives."[160] At the same time, a Programs and Analysis Group was established within the Office of the Chief of Staff of the Army to assist in the development of Army programs, review their progress through analysis of Army reports, and advise the Joint Chiefs of Staff on Army program and budget matters.[161]

By 1956, the Army Program System had three principal programs—Troops, Materiel, and Installations—each of which was assigned to a director whose responsibilities for a particular program might cross command lines. Such a system allowed the detailed

components of many broad activities to be administered separately while maintaining a comprehensive picture of the broad program and its integrated parts and measuring progress against objectives quickly.

Further progress in the improvement of Army financial management was also made during FY 1956. In addition to organizational changes at the top echelons of the department structure and planning for extension of the APS to nontactical matters, the Army Command Management System was expanded to speed and sharpen control of financial matters and move toward a cost of performance budget; a new maintenance and operations appropriations was introduced, effective 1 July 1956; a new Army Budget Manual was completed; cost savings were achieved through improved management techniques; the industrial fund was extended to additional installations; and feasibility studies on automatic data processing and computers were begun at various points throughout the Army.[162]

Despite the progress made during the 1950s, criticism of the DOD programming process increased in the late 1950s, and in 1958 the Rockefeller Committee recommended a shift to a system more aligned with U.S. strategic missions.[163] In April 1958 President Eisenhower made a number of proposals aimed at reducing the rivalry and duplication among the services.[164] Congress responded with passage of the Defense Reorganization Act of 1958, which was to "facilitate the establishment of a system of unified commands and to promote more unified strategic planning, and to eliminate 'harmful' inter-service rivalry, especially in research and development, by strengthening the authority of the Secretary of Defense."[165] In December 1958, the secretary of defense decided to give the Joint Chiefs of Staff (JCS) a role in the development of the DOD budget, and in early 1959 a Joint Programs Office was created to assist the JCS in that role.[166] In planning for the FY 1961 budget, the JCS took four steps:

1. They gave the unified and specified commanders an opportunity to present their views regarding the budget submissions of their various component commanders.
2. They provided military advice to the Secretary of Defense to assist him in the preparation of budget guidelines for the military departments.
3. They considered the major program content of the Service budgets after they were submitted to the Secretary of Defense.
4. They informed the unified commanders of the effects which the President's budget would have on the forces of those commanders.[167]

To align the Army with these DOD initiatives, Army Chief of Staff General George H. Decker tried once again in 1960 to develop a budget that would present the cost of Army operations in terms of the missions assigned to the Army, but this again met with little success.[168]

Conclusion

The century following the Civil War saw the rapid development of new techniques for management of American business and industrial organizations, and many of those techniques were adopted by the Army in a search for greater efficiency in organization, operations, and financial management. The Root reforms at the beginning of the twentieth century were followed by experiments with Taylor's "scientific management," the use of statistics to control operations in both World War I and World War II, and postwar efforts to create an effective Army comptroller organization and to rationalize the Army programming and budgeting process through greater linkage of missions and plans with the costs of carrying them out.

While the Army sought more effective management methods wherever they were to be found, many of the methods adopted had been tested first in the American business community. The search was for rational systems based on tested "scientific" methods employing verifiable facts derived from close observation of processes; sound, systematic analysis; and the application of the results in the form of principles that could stand the test of practicality and universality. In this, the methods adopted by the Army to improve management in the first six decades of the twentieth century were related to the methods of operations research developed during the World War II era; and in the postwar period, various techniques taken from the OR methodology were adapted to Army management methods.

Substantial progress was made in the 1950s toward accomplishing the goals of streamlining Army organization, greater executive control, and developing effective means of controlling costs. Nevertheless, by 1960 the process was not complete, and there remained much to do, particularly in the area of linking strategic plans to Army budgets. Fortunately, six decades of steady progress in the improvement of Army management using "scientific" methods would provide an excellent foundation for the great changes in defense management that would be initiated by Secretary McNamara in the 1960s.

CHAPTER ONE NOTES

[1] Lynn H. Rumbaugh, *A Look at US Army Operations Research–Past and Present*, RAC–TP–102 (McLean, Va.: Research Analysis Corporation, Apr 1964), p. 6; U.S. Congress, Office of Technology Assessment, *A History of the Department of Defense Federally Funded Research and Development Centers*, Background Paper OTA-BP-ISS-157 (Washington, D.C.: Government Printing Office, Jul 1995), p. 22.

[2] Donald W. Meals, "Trends in Military Operations Research," *Operations Research* 9, no. 2 (March–April 1961), p. 252.

[3] Maj Gen William J. Ely, "OR in the Army: Past, Current and Future," in *Proceedings of the [First] United States Army Operations Research Symposium, 27, 28, 29 March 1962, Durham, North Carolina, Part I—Proceedings* (Durham, N.C.: U.S. Army Research Office-Durham, 1962), I, p. 4.

[4] Ibid., I, pp. 3–5; Gen George H. Decker (USA, Ret.), "Costing Strategy," U.S. Department of the Army, Office of the Chief of Staff, Systems Analysis Division, *DA Letter on Systems Analysis and Cost Effectiveness* (Washington, D.C.: Office of the Adjutant General, U.S. Department of the Army, 23 Apr 1964), Incl 9, p. 36.

[5] U.S. Department of the Army, Office of the Comptroller of the Army, Management Division, *Sound Business Management Practices for the Army* (Washington, D.C.: Management Division, Office of the Comptroller of the Army, U.S. Department of the Army, Jun 1951), pp. 2, 4.

[6] Gen George H. Decker, "The Challenge to Army Management," speech (Fort Belvoir, Va.: U.S. Army Management School, 3 Mar 1961), p. 1.

[7] *Sound Business Management Practices for the Army*, pp. 2, 25.

[8] Norman N. Barish, "Operations Research and Industrial Engineering: The Applied Science and Its Engineering," *Operations Research* 11, no. 3 (May–June 1963), pp. 388, 393. Operations research and systems analysis are relative newcomers. Industrial engineering, for example, goes back at least to the mid-nineteenth century (see George L. Parkhurst, "A Challenge to Operations Research," *Journal of the Operations Research Society of America* 3, no. 4 (November 1955), p. 376. In recent years, all of these methodologies have been subsumed under the general heading of management science.

[9] Hugh J. Miser, "Operations Research in Perspective," *Operations Research* 11, no. 5 (September–October 1963), p. 670; Oliver R. Dinsmore, *Requirements for Operations Research Training of Army Officers*, student research paper 66–4–129–U (Carlisle Barracks, Pa.: U.S. Army War College, 8 Apr 1966), p. 15.

[10] David Novick and G. H. Fisher, *The Role of Management Tools in Making Military Decisions*, RAND P–694 (Santa Monica, Calif.: RAND Corporation, 16 Jun 1955), p. 2.

[11] For example, there was a very active interchange of management ideas between the Army and American railroads in the nineteenth century. Brig. Gen. Herman Haupt, who commanded the U.S. Military Railroad Construction Corps during the Civil War and who had earlier been general superintendent and chief engineer of the Pennsylvania Railroad (1850–1856), was a pioneer in "scientific" management (see Judith A. Merkle, *Management and Ideology: The Legacy of the International Scientific Management Movement* [Berkeley: University of California Press, 1980], p. 86). And although some authorities credit American engineer Harrington Emerson with introducing the "line and staff" concept in American industry after observing the Franco-Prussian War, the Army Corps of Engineers is usually cited as the source of the line and staff organization of American railroads earlier in the nineteenth century (see John Beishline, *Military Management for National Defense* [New York: Prentice-Hall, 1950], pp. 145–46; and David Lowell Hay, *Bomber Businessmen: The Army Air Forces and the Rise of Statistical Control, 1940–1945*, Ph.D. diss. [University of Notre Dame, Apr 1994], p. 343).

[12] James E. Hewes, Jr., *From Root to McNamara: Army Organization and Administration, 1900–1963* (Washington, D.C.: U.S. Army Center of Military History, 1975), p. 5. Hewes' detailed study is the single best source for the development of Army organization and administration in the twentieth century. The bureaus, each headed by a general officer expert, were the Adjutant General, Judge Advocate General, Inspector General, Ordnance, Quartermaster, Subsistence, Pay, and Medical departments; the Corps of Engineers; and the Signal Corps.

[13] U.S. Senate, 56th Congress, 1st sess., Senate Document no. 221, *Report of the Commission Appointed by the President to Investigate the Conduct of the War Department in the War with Spain*, vol. I (Washington, D.C.: Government Printing Office, 1900), p. 113.

[14] Ibid.

[15] "Report of the Secretary of War," *Annual Reports of the War Department for the Fiscal Year Ended June 30 1899*, vol. I (Washington, D.C.: Government Printing Office, 1899), p. 46.

[16] "Statement of the Honorable Elihu Root, Secretary of War, before the Committee on Military Affairs of the U.S. Senate on the Bill (S.3917) to Increase the Efficiency of the Army, 12 Mar 1902," in *The National Defense: Hearings before the Committee on Military Affairs, House of Representatives, Sixty-Ninth Congress, Second Session (Historical Documents Relating to the Reorganization Plans of the War Department and to the Present National Defense Act)*, pt. 1 (Washington, D.C.: Government Printing Office, 1927).

[17] The Root reform program and its historical context are discussed in detail by Hewes, *From Root to McNamara*, preface and ch. 1, from which this account is drawn.

[18] Hewes, *From Root to McNamara*, p. x.

[19] "Statement of the Honorable Elihu Root, Secretary of War, before the House of Representatives Committee on Military Affairs, 13 Dec 1902," in *The National Defense*, pt. 1, p. 120.

[20] Hewes, *From Root to McNamara*, p. 15.

[21] Ibid., pp. 17–18.

[22] See, for example, Ellis Johnson, "A Survey of Operations Research in the U.S.A.," *Operations Research* 5, no. 2 (June 1954), p. 43; Stephen P. Waring, *Taylorism Transformed: Scientific Management Theory since 1945* (Chapel Hill, N.C.: University of North Carolina Press, 1991), ch. 2; and Dinsmore, *Requirements for Operations Research Training of Army Officers*, p. 15. A contrary view is expressed by Erik Peter Rau in *Combat Scientists: The Emergence of Operations Research in the United States during World War II*, Ph.D. diss. (Philadelphia: University of Pennsylvania, 1999), p. 11 and note 20.

[23] J. W. Pocock, "Operations Research and the Management Consultant," *Journal of the Operations Research Society of America* 1, no. 3 (May 1953), p. 137. Gantt's principal published works include *Organizing for Work* (New York: Harcourt Brace, 1913) and *Industrial Leadership* (New Haven: Yale University Press, 1916). Emerson published his *Efficiency as a Basis for Operations and Wages* in 1909 (New York: *The Engineering Magazine*, 1909) and *The Twelve Principles of Efficiency* (New York: J. R. Dunlap, 1911) in 1911.

[24] Merkle, *Management and Ideology*, p. 7. The first full explication of Taylor's ideas appeared in his *The Principles of Scientific Management* (New York: Harper and Brothers, 1911). On Taylor and "scientific management" see, *inter alia*, C. Bertrand Thompson, *The Theory and Practice of Scientific Management* (Boston: Houghton-Mifflin, 1917); Frank B. Copley, *Frederick Winslow Taylor: Father of Scientific Management*, 2 vols. (New York: Harper and Company, 1923); A. G. H. Aitken, *Taylorism at the Watertown Arsenal: Scientific Management in Action, 1908–1915* (Cambridge, Mass.: Harvard University Press, 1960); Merkle, *Management and Ideology*; and Waring, *Taylorism Transformed: Scientific Management Theory since 1945*.

[25] Ibid., p. 46.

[26] Pocock, "Operations Research and the Management Consultant," p. 138.

[27] Thompson, *The Theory and Practice of Scientific Management*, p. 28. Thompson was a Taylor disciple.

[28] Merkle, *Management and Ideology*, pp. 33–34.

[29] Ibid., p. 50.

[30] Thompson, *The Theory and Practice of Scientific Management*, pp. 73–74 and 218–19. The Navy was also attracted to the Taylor system and introduced it in several shipyards (for example, Mare Island Shipyard in Vallejo, Calif.) between 1906 and 1911 (see Merkle, *Management and Ideology*, p. 50, and Thompson, *The Theory and Practice of Scientific Management*, pp. 202–03).

[31] Pocock, "Operations Research and the Management Consultant," p. 138; Merkle, *Management and Ideology*, p. 13.

[32] Kenneth Minogue, "The Managerial Millennium," review of Merkle, *Management and Ideology*, in *The Times* [of London] *Literary Supplement* 29 (May 1981), p. 4078.

[33] The Watertown Arsenal strike and subsequent reactions of Congress and organized labor are discussed in Thompson, *The Theory and Practice of Scientific Management*, pp. 91–93, 192–93, and 268.

[34] Hewes, *From Root to McNamara*, p. 19; Merkle, *Management and Ideology*, p. 121. Taylorism survived under the rubric of "work simplification," and time and motion studies of the type promoted by Taylor were carried out by Army "operations researchers" in the Pacific during World War II (see vol. I, ch. 1 of *History of Operations Research in the U.S. Army*).

[35] Merkle, *Management and Ideology*, pp. 49 and 248.

[36] Ibid., p. 11.

[37] Hewes, *From Root to McNamara*, p. 32.

[38] "History of the Purchase, Storage and Traffic Division, General Staff," in *Annual Report of the Assistant Chief of Staff, Director of Purchase, Storage and Traffic, for the F.Y. Ending June 30, 1919* (Washington, D.C.: 1919), pp. 18–19; Hewes, *From Root to McNamara*, p. 33.

[39] Hewes, *From Root to McNamara*, pp. 33–34.

[40] Ibid., pp. 38–39. March became acting chief of staff in March but did not assume the position officially until 20 May 1918.

[41] Edward M. Coffman, "The Battle against Red Tape: Business Methods of the War Department General Staff 1917–1918," *Military Affairs* 26, no. 1 (Spring 1962), p. 5.

[42] Harry M. DeWitt, Jr., Research Center, Management Division, Office of the Army Comptroller, "Presentation to the Comptroller Advisory Council," undated typescript from Office of the Army Comptroller files in U.S. Army Military History Institute (Carlisle Barracks, Pa.), p. 1; Hewes, *From Root to McNamara*, p. 48.

[43] The use of statistics for the purpose of controlling the activities of the modern state dates back at least to the French military architect Sébastien Prestre de Vauban in the eighteenth century. Vauban's treatise entitled *Project d'une dixme royale* ([The Hague], 1707) was among the first European "scientific management" documents (see Merkle, *Management and Ideology*, pp. 141–42).

[44] M. C. Brown, "Statistical Division, Organization and Functions," in *The Comptroller of the Army—A Presentation on Background, Statutory Basis, Organization, and Functions*, edited transcript of addresses to key officers of the General and Special staffs and of the Technical and Administrative services (Washington, D.C.: Office of the Comptroller of the Army, U.S. Department of the Army, 25 Oct 1949), p. 65.

[45] DeWitt, "Presentation to the Comptroller Advisory Council," p. 1; Hewes, *From Root to McNamara*, p. 43.

[46] Hewes, *From Root to McNamara*, pp. 41–44.

[47] Hewes, *From Root to McNamara*, p. 67. The post–World War I developments in Army organization and management as well as the World War II events are covered extensively in Hewes, *From Root to McNamara*, chs. II and III. Unless otherwise noted, Hewes' account is the basis for the following description of the Marshall Reorganization of 1942 and other World War II–era Army organization and management developments.

[48] Quoted by Hewes, *From Root to McNamara*, p. 67.

[49] Hewes, *From Root to McNamara*, p. 64. The General Staff did, of course, succeed in producing a series of strategic plans—the so-called Color and Rainbow plans—which were the basis of U.S. strategy in World War II.

[50] Ibid., p. 63.

[51] The Marshall Reorganization Plan was officially announced in Presidential Executive Order 9082 on 28 Feb 1942.

[52] John E. Freund and Frank J. Williams, *Elementary Business Statistics: The Modern Approach* (Englewood Cliffs, N.J.: Prentice-Hall, 1964), p. 7 (cited in Selim Seymour Podnos, *The Development of Army Comptrollership Functions during the Span 1942–1949, with Particular Reference to Management Control during World War II*, Ph.D. diss. [Washington, D.C.: George Washington University, 7 Jun 1966], p. 120).

[53] The AAF Management Control Directorate is discussed in Hewes, *From Root to McNamara*, pp. 84–86.

[54] The Statistical Control Division is discussed in detail in David L. Hay, *Bomber Businessmen: The Army Air Forces and the Rise of Statistical Control, 1940–1945*.

[55] Hay, *Bomber Businessmen*, p. 348.

[56] Ibid., abstract and pp. 344–45.

[57] Ibid., abstract and p. 348. Tex Thornton and nine others joined the Ford Motor Company in 1946 and constituted the original "Whiz Kids" (see Hay, *Bomber Businessmen*, abstract).

[58] Podnos, *The Development of Army Comptrollership Functions during the Span 1942–1949*, p. 120.

[59] The data collected by the Statistical Control Division was used extensively by the Operations Analysis Division (OAD) of the Management Control Directorate. Established in December 1942, the OAD applied the scientific techniques of operations research to the problems of the selection of strategic air targets, air tactics, bombing methods, maintenance, training, and munitions consumption. The establishment, organization, and operations of OAD and its use of OR techniques are discussed in some detail in vol. I, ch. 1, of this history.

[60] Hay, *Bomber Businessmen*, p. 347.

[61] Ibid., pp. 345–46.

[62] Hewes, *From Root to McNamara*, pp. 90–93 and 98.

[63] Minutes of Conference of Commanding Generals of Service Commands, Service of Supply, 4th sess., Washington, D.C., 31 Jul 1942, pp. 206 and 211 (cited in Richard M. Leighton, *History of the Control Division, ASF, 1942–1945*, unpubl typescript [Washington, D.C.: Historical Section, Control Division, Army Service Forces, Apr 1946], p. 8).

[64] Leighton, *History of the Control Division*, ASF, pp. 4–5.

[65] Col Clinton F. Robinson, remarks to Conference of Control Officers, ASF, Washington, D.C., 1 Jul 1942 (cited in Podnos, *The Development of Army Comptrollership Functions*, p. 45). Robinson has been called "the individual who, more than any other, shaped the course of management control in the ASF" (see Leighton, *History of the Control Division, ASF*, p. iii).

[66] *ASF Organization Manual M–301*, Jul 1943 (as reproduced in Podnos, *The Development of Army Comptrollership Functions*, p. 54).

[67] Leighton, *History of the Control Division, ASF*, pp. 266–67.

[68] The ASF Statistics and Progress Branch was the lineal descendant of the Statistics Service headed since World War I by Brig. Gen. Leonard P. Ayres, who retired on 30 June 1942. The Statistics Service was abolished on 12 June 1942 and reconstituted as the Statistics and Progress Branch of the ASF Control Division on 11 July 1942 (see Leighton, *History of the Control Division, ASF*, p. 134).

[69] *ASF Organization Manual M–301*, Jul 1943 (as reproduced in Podnos, *The Development of Army Comptrollership Functions*, p. 55). In September 1943, the Statistics and Progress Branch consisted of sixteen officers and eight civilians, eleven of whom had previous government statistics work experience (see Leighton, *History of the Control Division, ASF*, p. 269).

[70] Ibid. (as reproduced in Podnos, *The Development of Army Comptrollership Functions*, pp. 54–55). In the fall of 1943, the Administrative Management Branch consisted of twenty-eight officers and three civilians, including three industrial engineers who had worked for Sears, Roebuck, and Co. (see Leighton, *History of the Control Division, ASF*, p. 268).

[71] Ibid. (as reproduced by Podnos, *The Development of Army Comptrollership Functions*, pp. 55–56).

[72] Podnos, *The Development of Army Comptrollership Functions*, p. 69.

[73] Ibid., p. 94.

[74] Ibid., p. 63.

[75] Ibid., p. 67; DeWitt, "Presentation to the Comptroller Advisory Council," pp. 2–3.

[76] Decker, "The Challenge to Army Management," pp. 2–3. General Decker's remarks were made in 1961.

[77] DeWitt, "Presentation to the Comptroller Advisory Council," p. 1; Podnos, *The Development of Army Comptrollership Functions*, p. 131.

[78] Hewes, *From Root to McNamara*, pp. 88 and 96.

[79] Ibid., p. 88.

[80] The term "comptroller" or "controller" derives from the practice in the British army of the seventeenth century of maintaining a second master payroll to prevent fraud on the part of regimental commanders. This duplicate payroll was known as the "contra-roll," and the process of checking it against the regimental colonel's payroll was known as "contra-rolling" (see Lt Gen Raymond S. McLain, "Organization and Functions of the Office of the Comptroller of the Army: An Address to Newly Assigned Key Personnel" [Washington, D.C., 18 Sep 1950], p. 1).

[81] Harry M. DeWitt, Jr., *Comptrollership in the Armed Forces: A Summary and Comparative Evaluation of Comptrollership in Industry and the Department of Defense with Special Reference to the Army Comptroller* (Washington, D.C.: Institute of Engineering, May 1952), pp. ii–iii, 4, and 10; Podnos, *The Development of Army Comptrollership Functions*, pp. 3–5.

[82] Hay, *Bomber Businessmen*, pp. 319–22; DeWitt, *Comptrollership in the Armed Forces*, p. 11; Podnos, *The Development of Army Comptrollership Functions*, pp. 134–35.

[83] *A History of the Management Division, Office of the Comptroller of the Army, Covering the Period 2 January 1948 to 17 February 1950*, undated typescript from Office of the Comptroller of the Army files in U.S. Army Military History Institute (Carlisle Barracks, Pa.), p. 5.

[84] Ibid.; Col Kilbourne Johnston, "Background of the Comptrollership," in U.S. Department of the Army, Office of the Comptroller of the Army, ed., *The Comptroller of the Army—A Presentation on Background, Statutory Basis, Organization, and Functions* (Washington, D.C.: Office of the Comptroller of the Army, U.S. Department of the Army, 25 October 1949), p. 13; Podnos, *The Development of Army Comptrollership Functions*, pp. 136–37.

[85] DeWitt, *Comptrollership in the Armed Forces*, p. 23.

[86] *A History of the Management Division*, p. 5; DeWitt, *Comptrollership in the Armed Forces*, p. 23. See also U.S. War Department, Policies and Programs Review Board, *Final Report* (Washington, D.C.: War Department Policies and Programs Review Board, 11 Aug 1947).

[87] *A History of the Management Division*, p. 7.

[88] DeWitt, *Comptrollership in the Armed Forces*, p. 21; Johnston, "Background of the Comptrollership," p. 12.

[89] Lt Gen George H. Decker, "The Comptroller, A Staff Officer," speech (Fort Leavenworth, Kans.: U.S. Army Command and General Staff College, 17 Apr 1953), p. 4.

[90] Gen George H. Decker, "The Comptroller's Role in Management of the Army," speech (Fort Leavenworth, Kans.: U.S. Army Command and General Staff College, 2 Dec 1953), pp. 9–11.

[91] Podnos, *The Development of Army Comptrollership Functions*, p. 15.

[92] Lt Col M. C. Brown, "Statistical Division, Organization and Functions," in *The Comptroller of the Army—A Presentation on*

Background, Statutory Basis, Organization, and Functions, pp. 69 and 71 (Chart 19).

[93] DeWitt, *Comptrollership in the Armed Forces*, p. 93. On "management engineering," see also U.S. Department of the Army, Office of the Comptroller of the Army, Management Division, "What Is Management Engineering?" fact sheet (Washington, D.C.: Management Division, Office of the Comptroller of the Army, U.S. Department of the Army, 10 Feb 1955); and U.S. Department of the Army, *Department of the Army Pamphlet No. 20–345: Management Engineering in the Army Establishment* (Washington, D.C.: Headquarters, Department of the Army, Dec 1953).

[94] *A History of the Management Division*, p. 10.

[95] DeWitt, *Comptrollership in the Armed Forces*, p. v.

[96] Ibid., p. 12. See also Col Kilbourne Johnston, "Management Division, Organization and Functions," in *The Comptroller of the Army—A Presentation on Background, Statutory Basis, Organization, and Functions*, pp. 75–76.

[97] Johnston, "Management Division, Organization and Functions," p. 82.

[98] Ibid., pp. 75–76.

[99] Ibid., p. 77.

[100] Ibid., p. 80.

[101] Podnos, *The Development of Army Comptrollership Functions*, p. 152.

[102] Col W. P. Campbell, "Audit Division, Organization and Functions," in *The Comptroller of the Army—A Presentation on Background, Statutory Basis, Organization, and Functions*, pp. 60–61. The U.S. Army Audit Agency, formerly the Army Audit Agency, was later transferred to the newly established Office of the Inspector General and Auditor General in the Office of the Chief of Staff pursuant to *Department of the Army General Order No. 26*, 9 Aug 1974.

[103] Ibid.

[104] Ibid., p. 61.

[105] See Lt Col George E. Baya, "Discussion of National Security Act Amendments of 1949 (Public Law 216, 81st Congress)," in *The Comptroller of the Army—A Presentation on Background, Statutory Basis, Organization, and Functions*, pp. 3–6; DeWitt, *Comptrollership in the Armed Forces*, pp. 48–49.

[106] DeWitt, *Comptrollership in the Armed Forces*, pp. 48–49. Title IV was written by Ferdinand Eberstadt, who had been chairman of the first Hoover Commission's Task Force on National Security Organization (see Podnos, *The Development of Army Comptrollership Functions*, p. 153).

[107] Baya, "Discussion of National Security Act Amendments of 1949 (Public Law 216, 81st Congress)," p. 3; U.S. Department of Defense, Office of the Secretary of Defense, "Semiannual Report of the Secretary of Defense, July 1 to December 31, 1949," in U.S. Department of Defense, Office of the Secretary of Defense, *Semiannual Report of the Secretary of Defense and the Semiannual Reports of the Secretary of the Army, Secretary of the Navy, and Secretary of the Air Force, July 1 to December 31, 1949* (Washington, D.C.: Government Printing Office, 1950), p. 58.

[108] Decker, *The Comptroller's Role*, pp. 7–8.

[109] U.S. Department of the Army, Office of the Secretary of the Army, "Semiannual Report of the Secretary of the Army, July 1 to December 31, 1949," in *Semiannual Report of the Secretary of Defense and the Semiannual Reports of the Secretary of the Army, Secretary of the Navy, and Secretary of the Air Force, July 1 to December 31, 1949*, p. 127.

[110] Podnos, *The Development of Army Comptrollership Functions*, p. 154.

[111] Decker, "Costing Strategy," p. 36.

[112] Decker, *The Challenge to Army Management*, pp. 4–5.

[113] The literature on the various DOD and Army reorganization efforts in the late 1940s and in the 1950s is vast. The changes in DOD and Army organization during the 1950s were frequent, often complicated, and need not be reviewed in detail here. However, the various committees and commissions that provided recommendations on organization also addressed problems of management technique and financial management and will be mentioned in that context. The various reorganization studies and plans and their implementation is discussed in some detail in Hewes, *From Root to McNamara*, chs. IV–VII, and Francis T. Julia, Jr., *Army Staff Reorganization, 1903–1985*, CMH Pub 93–6 (Washington, D.C.: U.S. Government Printing Office for Analysis Branch, U.S. Army Center of Military History, 1987).

[114] Hewes, *From Root to McNamara*, p. 217.

[115] U.S. Department of Defense, Office of the Secretary of Defense, "Semiannual Report of the Secretary of Defense, January 1 to June 30, 1951," in U.S. Department of Defense, Office of the Secretary of Defense, *Semiannual Report of the Secretary of Defense and the Semiannual Reports of the Secretary of the Army, Secretary of the Navy, and Secretary of the Air Force, January 1 to June 30, 1951* (Washington, D.C.: Government Printing Office, 1951), p. 42.

[116] Ibid.

[117] U.S. Department of the Army, Office of the Secretary of the Army, "Semiannual Report of the Secretary of the Army, January 1 to June 30, 1951," in *Semiannual Report of the Secretary of Defense and the Semiannual Reports of the Secretary of the Army, Secretary of the Navy, and Secretary of the Air Force, January 1 to June 30, 1951*, pp. 83–84.

[118] U.S. Department of the Army, Office of the Secretary of the Army, "Semiannual Report of the Secretary of the Army, January 1 to June 30, 1954," in U.S. Department of Defense, Office of the Secretary of Defense, *Semiannual Report of the Secretary of Defense and the Semiannual Reports of the Secretary of the Army, Secretary of the Navy, and Secretary of the Air Force, January 1 to June 30, 1954* (Washington, D.C.: Government Printing Office, 1954), p. 147.

[119] Ibid., p. 148.

[120] Ibid.

[121] U.S. Department of the Army, Office of the Secretary of the Army, "Semiannual Report of the Secretary of the Army, January 1 to June 30, 1955," in U.S. Department of Defense, Office of the Secretary of Defense, *Semiannual Report of the Secretary of Defense and the Semiannual Reports of the Secretary of the Army, Secretary of the Navy, and Secretary of the Air Force, January 1 to June 30, 1955* (Washington, D.C.: Government Printing Office, 1955), p. 131.

[122] Ibid.

[123] U.S. Department of the Army, Office of the Secretary of the Army, "Semiannual Report of the Secretary of the Army, January 1 to June 30, 1956," in U.S. Department of Defense, Office of the Secretary of Defense, *Semiannual Report of the Secretary of Defense and the Semiannual Reports of the Secretary of the Army, Secretary of the Navy, and Secretary of the Air Force, January 1 to June 30, 1956* (Washington, D.C.: Government Printing Office, 1956), pp. 151–52.

[124] Alain C. Enthoven, "Introduction," in *A Modern Design for Defense Decision: A McNamara-Hitch-Enthoven Anthology*, ed. Samuel A. Tucker. ICAF National Security Management Seminar (Washington, D.C.: Industrial College of the Armed Forces, 1966), pp. 1–3. President William Howard Taft's Commission on Economy and Efficiency (1912) called for a comprehensive executive budget with expenditures classified by function, but implementation was delayed until passage of the Budget and Accounting Act in 1921, which established the Bureau of the Budget. In 1939, the Bureau of the Budget was moved into the newly established Executive Office of the President, and President Franklin

D. Roosevelt's Committee on Administrative Management proposed additional organizational changes.

[125] Hewes, *From Root to McNamara*, pp. 272 and 276–77.

[126] Decker, *The Comptroller's Role*, p. 12.

[127] Alain C. Enthoven, "Introduction," in *A Modern Design for Defense Decision*, p. 1.

[128] Hewes, *From Root to McNamara*, p. 277. McNeil, who had been the de facto comptroller of the Navy from 1945, served for a record time as DOD comptroller, leaving only on 1 November 1959. The performance budget was introduced in the federal government generally with the budget estimates for fiscal year (FY) 1951 and reached its apotheosis in the Department of Defense with the planning-programming-budgeting system introduced by Secretary of Defense McNamara in the 1960s.

[129] Ibid., p. 278. The Technical Services chiefs were not represented on the BAC and therefore had to justify their budget requests in detail before that body.

[130] Ibid., p. 280. In fact, the Army had already attempted to introduce a performance (or "program") budget that related the work to be done to budget requests. Such a budget had been presented to the House Appropriations Committee by the commander of Army Service Forces, General Brehon B. Somervell, in May 1944, but the war ended and the ASF were disbanded before the development of a systematic program budgeting process could be established (see Podnos, *The Development of Army Comptrollership Functions*, p. 116).

[131] Decker, *The Comptroller's Role*, p. 12; Hewes, *From Root to McNamara*, pp. 277–78. The new Army budget categories were military personnel, operations and maintenance, procurement and production, research and development, military construction, Army National Guard, Reserve personnel, National Guard military construction, and Army civilian components.

[132] Hewes, *From Root to McNamara*, p. 273.

[133] Ibid., p. 283.

[134] For a brief synopsis of the organization and work of the Davies Committee, see Paul L. Davies, "A Business Look at the Army," *Military Review* 34, no. 9 (December 1954), pp. 39–52.

[135] Davies, "A Business Look at the Army," pp. 39–40.

[136] Hewes, *From Root to McNamara*, pp. 282–83. The twenty-one major functional categories were military personnel, Army; tactical forces; training activities; central supply activities; major overhaul and maintenance of materiel; medical activities; Army-wide activities; Army Reserve and ROTC; joint projects; procurement of equipment and missiles, Army; research, development, test, and evaluation; military construction, Army; National Guard personnel, Army; operation and maintenance, Army National Guard; Reserve personnel, Army; military construction, Army National Guard; military construction, Army Reserve; operation and maintenance of facilities; promotion of rifle practice; Army industrial fund activities; and other operational activities.

[137] U.S. Department of Defense, Office of the Secretary of Defense, "Semiannual Report of the Secretary of Defense, January 1 to June 30, 1955," in U.S. Department of Defense, Office of the Secretary of Defense, *Semiannual Report of the Secretary of Defense and the Semiannual Reports of the Secretary of the Army, Secretary of the Navy, and Secretary of the Air Force, January 1 to June 30, 1955* (Washington, D.C.: Government Printing Office, 1955), p. 9.

[138] U.S. Department of Defense, Office of the Secretary of Defense, "Semiannual Report of the Secretary of Defense, January 1 to June 30, 1957," in U.S. Department of Defense, Office of the Secretary of Defense, *Semiannual Report of the Secretary of Defense and the Semiannual Reports of the Secretary of the Army, Secretary of the Navy, and Secretary of the Air Force, January 1 to June 30, 1957* (Washington, D.C.: Government Printing Office, 1957), p. 10.

[139] U.S. Department of Defense, *Department of Defense Comments on the Hoover Commission Report on Business Organization of the Department of Defense* (Washington, D.C.: U.S. Department of Defense, Mar 1956), p. 1.

[140] Hewes, *From Root to McNamara*, p. 283.

[141] Ibid., pp. 283 and 285.

[142] "Semiannual Report of the Secretary of Defense, January 1 to June 30, 1955," p. 10.

[143] "Semiannual Report of the Secretary of Defense, January 1 to June 30, 1957," p. 10.

[144] Hewes, *From Root to McNamara*, p. 278.

[145] Ibid., p. 279.

[146] DeWitt, *Comptrollership in the Armed Forces*, p. 81; Hewes, *From Root to McNamara*, p. 279.

[147] Hewes, *From Root to McNamara*, p. 279.

[148] Jaffe, *Quantitative Analysis and Army Decision Making*, p. 16.

[149] "Semiannual Report of the Secretary of the Army, January 1 to June 30, 1951," p. 84.

[150] U.S. Department of the Army, Office of the Secretary of the Army, "Semiannual Report of the Secretary of the Army, January 1 to June 30, 1950," in U.S. Department of Defense, Office of the Secretary of Defense, *Semiannual Report of the Secretary of Defense and the Semiannual Reports of the Secretary of the Army, Secretary of the Navy, and Secretary of the Air Force, January 1 to June 30, 1950* (Washington, D.C.: Government Printing Office, 1950), p. 68.

[151] Hewes, *From Root to McNamara*, p. 279; Jaffe, *Quantitative Analysis and Army Decision Making*, p. 17.

[152] "Semiannual Report of the Secretary of the Army, January 1 to June 30, 1955," p. 131.

[153] Ibid.

[154] "Semiannual Report of the Secretary of the Army, January 1 to June 30, 1956," p. 150.

[155] Ibid.

[156] "Semiannual Report of the Secretary of the Army, January 1 to June 30, 1955," pp. 132–33.

[157] Ibid., p. 131.

[158] Ibid., p. 133.

[159] "Semiannual Report of the Secretary of the Army, January 1 to June 30, 1956," pp. 145 and 147.

[160] Ibid., p. 145.

[161] Ibid., p. 146; Jaffe, *Quantitative Analysis and Army Decision Making*, p. 17.

[162] "Semiannual Report of the Secretary of the Army, January 1 to June 30, 1955," p. 133; "Semiannual Report of the Secretary of the Army, January 1 to June 30, 1956," p. 145.

[163] Enthoven, "Introduction," in *A Modern Design for Defense Decision*, p. 3.

[164] Alain C. Enthoven and Henry Rowen, *Defense Planning and Organization*, RAND P–1640 (Santa Monica, Calif.: RAND Corporation, Economics Division, 28 Jul 1959), p. 2.

[165] Ibid., p. 64.

[166] Decker, *The Challenge to Army Management*, p. 8.

[167] Ibid., pp. 8–9.

[168] Jaffe, *Quantitative Analysis and Army Decision Making*, pp. 17–18.

CHAPTER TWO

Systems Analysis and the McNamara Revolution

"Scientific" management of the Army reached a high point in the 1960s when Secretary of Defense Robert S. McNamara transformed the management of the Department of Defense (DOD) by introducing a new Planning, Programming, and Budgeting System (PPBS). This system was supported by the recently developed techniques of systems analysis and cost-effectiveness analysis and was used to determine the size, mix, and organization of the armed forces and which of various competing weapons systems to develop and buy. Under McNamara, military decision making was thoroughly centralized, military experience and judgment were largely replaced by systematic economic analysis, and traditional ways of doing things were overthrown. For a time, the DOD comptroller and the Office of Systems Analysis dominated defense decision making and were the most powerful agencies in the defense establishment. Some Army leaders resisted the changes imposed by Secretary McNamara, citing the inherent limitations of the new methods of analysis, the negative aspects of centralized decision making, and the value of military experience. But McNamara and the Whiz Kids prevailed, and the Army, like the other services, was forced to adapt to the "McNamara revolution" and to improve its own capability to apply PPBS and the new techniques of analysis.

The McNamara reforms have been called a revolution because they constituted an all-out attempt to change the way in which decisions were made in the defense establishment. But Secretary McNamara introduced no new trends; he simply accelerated a trend that had been building for some sixty years: the expanded use of advanced management techniques to improve the effectiveness and efficiency of operating systems and to maximize the return on the resources expended on defense. Secretary McNamara implemented reforms recommended at least since the days of General Brehon B. Somervell's Army Service Forces Control Division, but his reforms seemed more dramatic, since he moved faster and farther in centralizing control over the armed services than had his predecessors. In addition, he introduced a new generation of civilian academic and business personnel into the management of the armed services, men and women who were convinced of the efficacy of the new generation of advanced management techniques that they promoted vigorously within the government and Defense Department.

The new techniques of management introduced by McNamara, particularly the budgetary reforms embodied in PPBS, were, as Alain C. Enthoven wrote, "a continuation of the traditional search for better government" and have been characterized as "an extension of techniques of economic analysis long used in industry and of the systematic discipline employed in military operations research since World War II."[1] Indeed, systems analysis and cost-effectiveness analysis were closely related to operations research (OR) and other scientific management techniques, such as time and motion studies and industrial engineering, that had attracted the attention of earlier Army reformers; and all of these techniques were used, often simultaneously, to solve the complex problems of the Department of Defense in the 1960s.

The Problem

In the decade and a half after World War II, American responsibilities abroad expanded and it became clear that the Cold War with the Soviet Union was to be a long-term battle in which national economic health was a major factor. Moreover, the constantly increasing pace of technological change, the growing cost of sophisticated weapons systems, and a sharp reduction in the time available for making key decisions made more effective defense management essential. Despite the strenuous efforts to improve the organization and management of the Department of Defense during the 1950s, many deficiencies, real and perceived, remained when the Kennedy administration took office in January 1961.

Upon being sworn in as secretary of defense on 21 January 1961, McNamara faced a number of complex challenges, including the introduction of a new strategy of "flexible response" to replace the outdated Eisenhower doctrine of "massive retaliation." But in order to perfect and implement the new strategy, it was first necessary to resolve such long-standing problems as how to link strategic programs to the annual budget cycle, how to decide what new weapons systems and military organizations were needed to support the new strategy effectively, and how to manage the internal organization and operations of the Department of Defense itself. These problems were interrelated, and it was obvious that their solutions would have to be integrated as well.

The magnitude of the task facing Secretary McNamara and his associates was to be seen in the internal management of the Department of Defense itself. As McNamara himself later wrote, the DOD was "the greatest single management complex in history," with

> some 3,700,000 people—2,700,000 in uniform and 1,000,000 civilian employees—located all over the world. The Department spends over $50 billion a year—over half of the Federal Government budget. Its inventory of real property and equipment is worth over $150 billion. Its major installations—some 600 of them in the United States alone—are in reality municipalities with all of the housing, the utilities systems, maintenance and transportation requirements, policing needs, and schools and hospitals typical of our small cities. The Department operates, for support of its forces, airlines, shipping lines, a communication system, supply distribution systems, and maintenance establishments, each of which represents a major management task in its own right. It procures annually over four million different items of equipment and supplies.[2]

The internal management of such a massive and diverse organization demanded timely, accurate information and an effective process for making decisions. The need for information and an advanced decision-making system was made all the more necessary by the complexities of deciding upon an effective strategy and the weapons and organization to support that strategy, all at a cost bearable over the long term. The changes in the defense environment since 1945 had made such problems of choice much more difficult. As Secretary McNamara himself stated, "Our problems of choice among alternatives in strategy and in weapons systems have been complicated enormously by the bewildering array of entirely workable alternative courses which our technology can support."[3] McNamara's right-hand man, Defense Comptroller Charles J. Hitch, added:

> There is hardly a military task which cannot be accomplished in a multitude of ways—and many capabilities which we take for granted today have been wholly impossible over much of the span of military history. Further, the price tags associated with each of the alternatives are tending to become so large that choices must be made . . . it is hardly surprising that we have turned to analytical techniques to assist us in our choices.[4]

The weapons potentially available in the 1960s were far more complex, powerful, difficult to develop, and expensive than those of World War II. As Hitch pointed out:

> The great technical complexity of modern day weapons, their lengthy period of development, their tremendous combat power and enormous cost have placed an extraordinary premium on sound choices of major weapon systems. These choices have become, for the top management of the Defense Department, the key decisions around which much else of the Defense program revolves.[5]

Hitch went on to note that the revolution in military technology had also blurred the lines between the services in that by the 1960s most

military missions required the participation and coordination of two or more of the services. Thus, the principal concern of the DOD could not be what was good or necessary for the Army or the Navy or the Air Force alone, but what was good and necessary for the DOD as a whole. As he stated, the key decisions "must be directly related to our national security objectives, rather than simply to the tasks of just one of the military Services."[6]

Another factor complicating the decision-making process was the reduction in time available for making the critical decisions regarding strategy and tactics; the choice of new weapons and equipment and their development, production, and fielding; and the organization and preparation of military units for combat. Thus, "to reduce lead time and produce the most effective force structure consistent with current missions and state of the art technology," American military leaders were forced to rely more heavily than ever before on techniques drawn from operations research to make the complex decisions necessary.[7] Operations research and its cousins—systems analysis, cost-effectiveness analysis, simulations, war games, and theoretical studies—were all needed to overcome the reduction in decision time.

As Secretary McNamara saw it, the most pressing management problem was the lack of an effective decision-making process. As he wrote in 1968:

> From the beginning in January 1961, it seemed to me that the principal problem in efficient management of the Department's resources was not the lack of management authority. The National Security Act provides the Secretary of Defense a full measure of power. The problem was rather the absence of the essential management tools needed to make sound decisions on the really crucial issues of national security.[8]

Secretary McNamara saw several specific defects in the way the U.S. armed forces determined what weapons systems to buy, how the armed forces were to be structured, and what the overall level of defense effort should be. First, he believed that the existing process for making such decisions was too slow and less efficient than it might be. Second, the existing decision-making system was based on experience and intuition rather than on systematic scientific analysis of the facts involving quantitative estimates of cost and effectiveness. To speed up the defense decision-making process and to focus it on quantitative analysis of facts rather than guesswork, new tools of decision making were required. The result would be "more bang for the buck," a goal that had preoccupied his immediate predecessors. But economy was not the only objective. As Secretary McNamara himself wrote, "it is a mistake to equate our efforts towards improving effectiveness and efficiency solely with a desire to save money . . . improving the effectiveness of our military establishment . . . is the first priority."[9]

The rapid growth in military technology, the increase in the cost of military weapons and equipment, the economic burden of the Cold War with the Soviet Union, and the reduction in time available for making key decisions made clear to Secretary McNamara that what was required was a centralized DOD decision-making process based on verifiable facts rather than intuition, a process that would assist in picking effective solutions from among a large number of complex alternatives. Fortunately, by 1960 a number of advanced management tools and decision-making processes were available to provide Secretary McNamara what he needed.

The Agents of Change

Systems, programs, reforms, and analytical methods are not self-generating, nor are they the products of departments, offices, or positions. They are the product of individuals acting on the basis of their experience and their biases. The revolution in defense management represented by PPBS, systems analysis, and cost-effectiveness analysis was the product of many human minds. The three principal architects of the new system were Secretary Robert S. McNamara himself and his two main associates: Assistant Secretary of Defense (Comptroller) Dr. Charles J. Hitch and Assistant Secretary of Defense (Systems Analysis) Dr. Alain C. Enthoven. Secretary McNamara provided the vision and authority for the changes introduced, and his two acolytes, Hitch and Enthoven, provided the scientific and intellectual underpinnings for PPBS and the new analytical methods used to support it. In effect, there came to be "three separate approaches to defense policy . . . all of which influenced the final shape of the system: the

management theory of McNamara, the programming budgeting theories supported by Hitch, and the economic theories of Enthoven."[10] Although not entirely compatible, the three approaches shared a number of common elements and thus are usually considered as a unity.

McNamara, Hitch, and Enthoven were not the only proponents of the new methods of defense decision making. They were aided by a number of public-spirited men, some drawn from the usual ranks of the Ivy League and others from the new generation of technical experts who came to be called the Whiz Kids. The former included such well-known, distinguished public men as Cyrus R. Vance, Eugene M. Zuckert, Paul H. Nitze, Stephen Ailes, and William P. Bundy. The latter included McNamara, Hitch, and Enthoven themselves along with Henry S. Rowen, Harold Brown, and Adam Yarmolinksy as senior members and a host of young, brash, often arrogant economists, political scientists, operations researchers, and systems analysts who were often despised by the uniformed officers of the armed services as "downy-faced lads who seek pretentiously to ladle the fog of war with mathematically precise measuring cups."[11]

Despite often strong resistance from military leaders at all levels, McNamara and his associates prevailed in the battle to transform the Department of Defense. They did so by effective promulgation of their concepts of defense management, concepts that proved superior to the traditional ways of doing things. Their triumph thus represented a triumph of rational scientific methods over experience and intuition as the basis for defense decision making. It also represented the general acceptance of the principles of centralized control and functionalization as well as the applicability of business methods to the military services.

Robert S. McNamara

The high priest of the new religion of rational, scientific decision making was Robert S. McNamara. McNamara represented the rationalists, beginning with Elihu Root who had sought to apply pure reason and scientific methods to the problems of military organization and efficiency.[12] As James E. Hewes has written, McNamara was the epitome of the highly successful industrial manager—a true comptroller—unique only in his rapidity of absorbing information and making decisions.[13]

McNamara was very much a product of his own experience. He was born in San Francisco, California, on 9 June 1916, and was a 1937 Phi Beta Kappa graduate of the University of California, Berkeley, where he majored in economics.[14] He then earned an MBA degree at Harvard in 1939. Following a brief stint as an accountant in San Francisco, he returned to Harvard as an assistant professor of business and specialized in the application of statistical analysis to management problems. Initially rejected for military service in World War II, he designed and taught a course in statistics for Army Air Corps officers at Harvard University. He was later commissioned as a captain in the Army Air Corps and was assigned to the Statistical Control Division of the Army Air Forces Management Control Directorate under Col. Charles "Tex" Thornton.[15] There he was assigned to develop statistical procedures for managing the Army Air Forces' worldwide inventories and played an important role in the B–17 and B–29 bomber programs and in the development of plans for expanding air transport service across the "hump" from India to China.[16] By the end of the war, McNamara had been promoted to lieutenant colonel and had received the Legion of Merit for his services.

In 1946, Robert McNamara was one of nine alumni of the Army Air Forces Statistical Control Division (the original Whiz Kids), led by Tex Thornton, who offered their services to the Ford Motor Company as consultants.[17] McNamara subsequently joined Ford as a full-time manager and quickly rose through the ranks. He was named comptroller in 1949, became a vice president in 1957, and played a key role in Ford's recovery from the Edsel debacle by introducing the popular Falcon and the four-door Thunderbird models. On 9 November 1960, after some fourteen years in Ford management, McNamara was elected president of the Ford Motor Company, the first president of the company not to bear the family name.[18] McNamara's management style at Ford was based on using quantitative data to make or influence key decisions, and by 1961 he had reorganized Ford's entire financial control system accordingly.[19]

McNamara was sworn in as secretary of defense on 21 January 1961 and served in that position under presidents Kennedy and Johnson. As one observer has written, "None of the Secretaries of Defense ever grabbed the job by the scruff of the neck and caused quite the commotion that Secretary Robert Strange McNamara . . . precipitated with his 'human IBM' approach."[20] As secretary of defense, McNamara reshaped national and military strategy, reorganized the Defense Department along functional lines, and totally transformed its decision-making process by imposing centralized control and the use of scientific analysis. As a principal architect of the failed U.S. policy in Vietnam, McNamara earned the lasting enmity of many citizens and leaders, particularly those in uniform who believed his reliance on numbers led to a feckless and self-defeating strategy.

Having himself lost confidence in the policies he helped to shape, McNamara left the Defense Department on 29 February 1968 to become the president of the International Bank for Reconstruction and Development (World Bank). There he sought to bring the resources of the industrialized nations to bear on the problems of developing nations. He retired from the World Bank in 1982 and lived quietly, writing a memoir, *In Retrospect*, in 1995 to justify his actions while secretary of defense during the Vietnam War.[21]

By some accounts, McNamara was a pleasant and amiable man, but the more prevalent view described him as "intelligent, able, decisive, self-confident, hard-driving, [and] puritanical."[22] In appearance he was stern and formidable, the very image of an arrogant, uncompromising administrator more comfortable dealing with facts and numbers than with human beings. McNamara's professorial mien, accented by his rimless gold spectacles and slicked-back hair, pointed to the fact that he was an intellectual rather than a businessman. Indeed, both at Ford and at the Defense Department, he associated both on and off the job with academics.[23] As secretary of defense, McNamara insisted on selecting his own subordinates, and most of them were drawn from the ranks of academia.[24] Many of his key assistants had worked at the RAND Corporation, and they shared his interest in economics, statistics, and "scientific" management.[25]

McNamara's management philosophy was active, decisive, and based on the analysis of factual data rather than experience or intuition.[26] He expressed his credo with the statement: "Some of our gravest problems in society arise not from over management but out of under management."[27] McNamara was impatient with fuzzy thinking and insisted that concepts and plans be supported by analyses of factual data, preferably statistical data. He himself had an uncanny ability to absorb such data rapidly and in vast quantities, and he seemed to expect that others should have the same ability.

Charles J. Hitch

Charles J. Hitch was Secretary McNamara's principal assistant and provided the intellectual foundation as well as the practical details of the Planning, Programming, and Budgeting System that transformed DOD decision making in the 1960s. He was also instrumental in promoting the use of computers, systems analysis, cost-effectiveness analysis, and other quantitative methods. As the DOD comptroller, Hitch expressed his own role in the McNamara revolution as one of developing "the management techniques to permit the Secretary of Defense to play [an] active leadership role."[28]

Charles J. Hitch was born in Boonville, Missouri, on 9 January 1910.[29] He attended Kemper Military Academy and graduated from the University of Arizona in 1931 with a major in economics. He then studied economics briefly at Harvard before going to Oxford as a Rhodes Scholar in 1932. He received his M.A. degree from Oxford in 1935 and stayed on to teach economics and become a Fellow of Queen's College.[30] Early in World War II, he took leave from Oxford to serve first on the staff of W. Averell Harriman's Lend-Lease Mission in London (1941–1942) and then as an economist with the United States War Production Board before being inducted into the Army as a private in 1943. He was assigned to the Office of Strategic Services, where he served until the end of the war, rising to the rank of first lieutenant. In the immediate postwar period he served briefly in the Office of War Mobilization (1945–1946) before returning to Oxford and a stint as a visiting professor at the University of São Paulo in Brazil.

In 1948, Hitch left Oxford to join the RAND Corporation in Santa Monica, California, where he headed the Economics Division and pioneered the development of advanced techniques of quantitative analysis and the application of cost-benefit analysis to national defense programs, particularly the process of selecting weapons systems and strategies.[31] He was dedicated to the concept of interdisciplinary research, and with his colleagues at RAND he brought about substantial changes in American defense strategy and policy.

In March 1960, Hitch (by then chairman of the RAND Research Council) and Roland N. McKean published *Economics of Defense in the Nuclear Age*, a book based on their work at RAND that became "the bible of defense economics" and brought Hitch to the attention of both president-elect Kennedy and Robert McNamara.[32] He was appointed assistant secretary of defense (comptroller) on 17 February 1961 and served in that position until 31 July 1965. As DOD comptroller, Hitch planned and implemented PPBS and was a strong advocate of the new techniques of systems analysis and cost-effectiveness analysis. Much of his work in the application of operations research to defense decision making was later summarized in his book, *Decision Making for Defense*, published in 1965. Hitch characterized his work as DOD comptroller as building "a bridge between financial management and military planning to facilitate the application of operations research or systems analysis to military problems."[33] As his Defense Department colleague Alain C. Enthoven later wrote, PPBS "was the most important advance in public administration of our time. Charlie's vision and leadership were the crucial ingredients."[34]

Hitch left the Department of Defense in 1965 and subsequently served as a professor of economics and an administrator at the University of California, Berkeley, from 1 September 1965 until his appointment as president of the university on 1 January 1968. His term as president of UC Berkeley was marked by the turbulence of the free speech movement and opposition to the war in Vietnam as well as budget cuts intended to reduce the independence of the university. Following his retirement from the university on 30 June 1975, he served as president of Resources for the Future in Washington, D.C., from 1975 to 1979, and published *Modeling Energy-Economy Interactions*, a seminal work on strategies for dealing with energy shortages. He died on 11 September 1995.

By all accounts, Hitch was a quiet, soft-spoken man with a warm personality and a sense of humor. He enjoyed golf, playing dominoes, dancing, and an occasional good cigar. His colleagues at UC Berkeley characterized him as "an admirable human being and a gifted President."[35] But Hitch also had "a backbone of steel" and once he had arrived at a position through careful thought, he held his ground with determination.[36] Nor was he afraid to attack sacred cows, ask difficult questions, and demand rigorous analysis from subordinates and foes alike.

Hitch's management philosophy is to be found in his many books, such as *Economics of National Defense* and *Defense Decision Making*, in the many articles he published, and in his many public speeches. In his Phi Beta Kappa address at Trinity College in Hartford, Connecticut, on 28 April 1978, Dr. Hitch summarized the "management maxims" in which he believed:

1. While there are striking similarities in all large organizations, and intriguing analogies, there are differences which we ignore at our peril.
2. Despite my Pentagon experience, where some centralization of weapon and force structure decision seemed necessary, I am strongly wedded to decentralization of authority and responsibility in large organizations, and especially for R&D and other creative functions. The benefits of centralization are usually obvious and short term; the costs frequently hidden and long term.
3. Incentives are more important than rules and procedures in achieving the objectives of an organization. . . . We paid too little attention to incentives in the McNamara Pentagon. . . . The problems are hard in an organization with no bottom line.
4. Costs are important. We have an obligation in federal and state enterprises to achieve our objectives at minimum cost. But costs and benefits have to be considered broadly and with great sophistication.
5. And finally, the most important elements of an organization are its people. There is no substitute for good people, for the right person in the right place.[37]

One of the acknowledged founders of modern management science, Hitch was well-known in the military operations research community in the 1950s and 1960s. He frequently spoke at the annual Army

Operations Research Symposia, published articles in *Operations Research*, and served as the eighth president of the Operations Research Society of America from 1959 to 1960. He was later awarded the George E. Kimball Medal for his contributions to the society. Dr. Hitch made no sharp distinction between OR and the new techniques of analysis that he helped to introduce in the Defense Department. Speaking of his own work in the Defense Department, he told attendees at the second Army Operations Research Symposium in March 1963 that he felt that "one of our most important contributions with respect to operations research in the military establishment has been this attempt to create an environment in which quantitative analysis can flourish and be employed effectively."[38]

Alain C. Enthoven

It was through Dr. Alain C. Enthoven and his associates in the DOD Office of Systems Analysis that Secretary McNamara introduced into the Defense Department the use of systems analysis and cost-effectiveness analysis that generated an emphasis on statistics, computer technology, and scientific proof and transformed defense planning, programming, and budgeting. Alain Enthoven was thus a far more controversial figure than Charles Hitch and rivaled Secretary McNamara in his ability to attract criticism. In part, this was the result of his aggressive personality, but perhaps the criticism he attracted can be attributed more to the fact that he sat at the center of the effort to impose the new analytical methods on the reluctant military services. Enthoven was praised by Secretary McNamara for his role in improving the DOD decision-making process but was reviled by many military officers for being arrogant and using the techniques of systems analysis to override military judgment.[39] The comments of Gen. Ferdinand J. Chesarek, former Army comptroller (1966–1967) and assistant vice chief of staff (1967–1968), were typical of the strong condemnation of Enthoven by senior military officers. In an oral history interview with two Army War College students in 1971, General Chesarek castigated Enthoven as arrogant, self-important, meddling, and interested only in promoting himself.[40]

Enthoven was born in Seattle, Washington, on 10 September 1930.[41] He was a 1952 Phi Beta Kappa graduate of Stanford University with a major in economics. Like Hitch, he was a Rhodes Scholar at Oxford, where he earned a master of philosophy degree in 1954. Enthoven was awarded his doctorate in economics from the Massachusetts Institute of Technology (MIT) in 1956. He was also an instructor in economics at MIT from 1955 until the following year, when he joined the RAND Corporation as an economist. At RAND Enthoven worked for Hitch in the Economics Division. He remained at RAND until 1960, when he became an OR analyst in the Office of the Director of Defense Research and Engineering in Washington, D.C. When the Kennedy administration took office in 1961, he was named deputy comptroller and deputy assistant secretary of defense in the Office of the DOD Comptroller Charles J. Hitch and headed the Office of Systems Analysis.[42]

When Hitch left the Department of Defense in 1965, the Office of Systems Analysis was separated from the Office of the DOD Comptroller, and Alain Enthoven became assistant secretary of defense (systems analysis) on 10 September 1965. He remained in that position until 30 January 1969, when the administration of President Nixon took office. He then served from 1969 to 1971 as the vice president for economic planning at Litton Industries in Beverly Hills, California, and then as president of Litton Medical Products from 1971 to 1973. After leaving Litton Industries, Enthoven became the Marriner S. Eccles Professor of Public and Private Management in the Stanford University Graduate School of Business and professor of health care economics in the Stanford University School of Medicine. His career subsequently focused on economic aspects of the health services field, and he is today a well-known authority on the financing of medical delivery systems. Since gaining emeritus status at Stanford in 2000, Dr. Enthoven has been a Senior Fellow at the Stanford University Center for Health Policy. He has also served as a consultant, as a member of numerous corporate boards, government commissions, and civic groups, and as a visiting scholar in France and England.

The Office of Systems Analysis

With the introduction of PPBS, two offices were created in the Office of the DOD Comptroller. The Office of Programming was responsible for managing

the details of the PPBS process and ensuring that deadlines were met. The Office of Systems Analysis (OSA), under the direction of Alain C. Enthoven, was composed of a small group of "systems analysts" who had no operational responsibilities but "were supposed to sit back with their feet on the desks and think about the program."[43]

Although the OSA was not at the center of the decision-making process initially, it soon found a much more active role. DOD Comptroller Charles Hitch noted that the OSA staff was in "an excellent position to view the problems of national defense as a whole . . . in an advisory capacity, and not as overlords," and he characterized the functions of the OSA as "to raise the quality of analysis throughout the Department, to see that studies requested by the Secretary are responsive to his needs, to review studies for the Secretary, and where necessary to do or re-do studies."[44] Over time the Office of Systems Analysis grew in both size and influence, eventually becoming "a vital and integral part of the Defense Department decision-making process" inasmuch as systems analysis provided "the analytical foundation for the making of sound objective choices among the alternative means of carrying out [major military] missions."[45] In fact, it became one of the main centers of power in the defense establishment. As the main proponent of the new systematic methods of analysis, OSA was a key element in Secretary McNamara's effort to centralize defense decision making. Those individuals serving as principal DOD systems analysis executives between 1961 and 1976 are listed in Table 2–1.

Enthoven's status as head of OSA was determined in large part by the importance of PPBS and systems analysis in general during the McNamara regime.[46] The power and influence of the OSA stemmed from its mandate to assess the quality and thoroughness of analyses, such as a cost-effectiveness study of a particular weapon system, submitted by the services in support of their programs. OSA could, and did, reject such analyses on technical grounds and could also substitute its own analyses almost at will.[47]

Another aspect of the power of the OSA was that it enjoyed Secretary McNamara's full confidence and backing. Unable to obtain the quality of information he desired from the services, McNamara came to depend upon the OSA for assistance.[48] As one of the early members of OSA told Clark Murdock:

> For McNamara, the only limit to Systems Analysis' range was their usefulness. He had a high regard for Enthoven and his people. If McNamara needed something and asked SA for it he would get it quickly—good or bad, but quickly. And other groups didn't do that, at least nothing like on the scale of Systems Analysis. . . . They spoke McNamara's language: numbers. So the limits of Systems Analysis' responsibility were determined by the personal tastes of the Secretary of Defense.[49]

Accordingly, McNamara imposed almost no restrictions on the activities of the OSA and encouraged expansion of its influence.[50] One measure of the growing importance of the OSA was its steady growth in staff. Enthoven began with a staff of six but by March 1961 the number had already grown to thirteen.[51] On 10 September 1965, Enthoven was sworn in as assistant

Table 2–1—DOD Systems Analysis Executives, 1961-1976

Incumbent	*Took Office*	*Left Office*
Alain C. Enthoven	17 February 1961	20 January 1969
Ivan Selin (Acting)	31 January 1969	30 January 1970
Gardiner L. Tucker	30 January 1970	30 March 1973
Leonard Sullivan	21 May 1973	13 March 1976

Source: U.S. Department of Defense, Office of the Secretary of Defense, Historical Office, *Department of Defense Key Officials*, 1947–1992 (Washington, D.C.: Historical Office, Office of the Secretary of Defense, U.S. Department of Defense, 1992), p. 41.

Note: The title of the key DOD systems analysis executive changed from time to time. Alain C. Enthoven was deputy comptroller and deputy assistant secretary of defense until 10 September 1965, when he became assistant secretary of defense (systems analysis). The position title was changed to director, defense program analysis and evaluation, on 11 April 1973 and was redesignated as assistant secretary of defense (program analysis and evaluation) on 11 February 1974.

secretary of defense (systems analysis), and his office assumed additional responsibilities, particularly in the installations and logistics and manpower areas. At that time, the staff numbered some sixty analysts, about one-third of whom were military officers, organized in four divisions.[52] By April 1966, the staff of the assistant secretary of defense (systems analysis) had reached 203.[53]

The character of the work performed by the OSA also changed and expanded over time. Initially, all of the staff were engaged in systems analysis, but by 1965–1966 only about 10–25 percent of their time was devoted to actually doing systems studies, although more studies were being done due to the increased size of the office.[54] This change occurred in part because of the growing capability of the services to conduct systems analysis studies. As service analytical capabilities increased, the OSA did fewer studies of its own and focused on reviewing the work of the services, the independent contractors working for the services, the Joint Staff, and the Institute for Defense Analyses, which conducted analyses for both the Joint Chiefs of Staff and the Office of the Secretary of Defense. As one OSA analyst told Clark Murdock, the only reason OSA still did analytical studies at all was to keep the services "honest," since "analysis and facts can always be slanted by them to prove what they want to prove."[55]

Although Enthoven's Office of Systems Analysis clearly sat at the center of defense decision making during the McNamara era, its influence was not, in fact, unlimited, particularly as the services learned to "play the game." As Murdock has noted:

> the centralization of power in the Systems Analysis Office must be qualified; while it is clear that OSD replaced the services as the primary determinant of national defense policy, service evasion of OSD policy remained a distinct possibility, but not as strong a one as in the 1950s.[56]

The power of the OSA was also diminished somewhat after September 1965 when Robert N. Anthony replaced Hitch as DOD comptroller and Enthoven was made assistant secretary of defense (systems analysis). Before leaving, Hitch had foreseen conflicts between Anthony and Enthoven and had insisted that OSA be removed from the direct control of the comptroller. As various OSA members later told Clark Murdock, while Hitch was comptroller, "SA was automatically fed into the budget; but once separate offices were created, SA often was not even consulted in decisions taken during the budget phase," and "Anthony was doing his best to undermine the programming system," which was, in Murdock's words, "the key to OSA's influence."[57]

The "Whiz Kids"

The Office of Systems Analysis and after it the Office of the Assistant Secretary of Defense (Systems Analysis) were staffed by a collection of young, intellectually arrogant systems and economic analysts who came to be known collectively as the "Whiz Kids."[58] Led by Enthoven, himself a "Whiz Kid" from the RAND Corporation, the typical Whiz Kid was young (around thirty years old), smart, aggressive, and willing to kick sacred cows.[59] For the most part, they had a high level of education unseasoned by experience in military operations. The open backing of the secretary of defense himself produced high morale among the analysts assigned to the OSA and contributed in no small part to their attitudes of self-importance and even arrogance in dealing with senior military personnel.[60]

Many military officers at all levels resented the fact that their hard-won experience and expertise should be subject to verification and even dismissal by beardless youths on the authority of mathematical calculations.[61] This resentment was prompted in large part by the arrogance of the young, overconfident Whiz Kids who were responsible for implementing the PPBS and the use of the new analysis techniques. The Whiz Kids were often rude, skeptical of authority, lacking in military experience, ignorant (or simply dismissive) of military protocol, and disrespectful toward the military personnel with whom they had contact.[62] As one former Headquarters, Department of the Army, staff officer recalled:

> One major challenge we faced was working with Department of Defense representatives. When Robert McNamara was appointed as Secretary of Defense, he brought with him a group of young analysts who were soon referred to as the "Whiz Kids." These bright youngsters, schooled in systems analysis, were soon challenging studies, research, and proposed acquisitions by all the services. It was disconcerting for a senior officer, accustomed to military subordinates who saluted, stood

> at attention, and responded with "Yes, sir" and "No, sir" to be questioned by young civilians who, in some cases, were rude and reflected an air of superiority.[63]

Another commentator has noted that the lack of understanding between the military men and the systems analysts arising from differing backgrounds and experience would have been "readily soluble if it were not for the attitudes of arrogance that occasionally become evident on the part of either party in the scientist-military relationship."[64] Fortunately, the problem abated somewhat as military personnel and civilian analysts became more familiar with each other and learned to work together with a minimum of friction. The more mature systems analysts reached out to their military clients in an attempt to gain their acceptance by explaining the advantages of the new methods, and eventually military personnel became more adept at systems analysis and thus better able to confront the Whiz Kids on their own ground.[65]

The Solution

Secretary McNamara's solution to the problems he perceived in defense policy and management was derived both from the guidance provided by President Kennedy and his own beliefs and philosophy of management. On 28 March 1961, President Kennedy outlined eight principles that were to guide his defense policies:

1. The primary purpose of our arms is peace, not war.
2. Our arms will never be used to strike the first blow in any attack.
3. Our arms must be adequate to meet our commitments and insure our security, without being bound by arbitrary budget ceilings.
4. Our arms must be subject to ultimate civilian control and command at all times, in war as well as peace.
5. Our strategic arms and defenses must be adequate to deter any deliberate nuclear attack on the United States or our allies.
6. The strength and deployment of our forces in combination with those of our allies should be sufficiently powerful and mobile to prevent the steady erosion of the free world through limited wars, and it is this role that should constitute the primary mission of our overseas forces.
7. Our defense posture must be both flexible and determined.
8. Our defense posture must be designed to reduce the danger of irrational or unpremeditated general war—the danger of an unnecessary escalation of a small war into a larger one, or of miscalculation or misinterpretation of an incident or enemy intention.[66]

President Kennedy also called for the elimination of waste and duplication in the Department of Defense, stating, "The defense establishment must be lean and fit, efficient and effective, always adjusting to new opportunities and advances, and planning for the future."[67] This guidance from the president was incorporated with McNamara's own views on defense policy and management to form his solutions to the problems facing him as secretary of defense. At the core of his program was the belief that "the United States is well able to spend whatever it needs to spend on national security . . . [but] . . . this ability does not excuse us from applying strict standards of effectiveness and efficiency to the way we spend our Defense dollars."[68]

Immediately upon taking office in January 1961, Secretary McNamara began work on several significant changes in defense policy and management. Among the most prominent changes were centralization of control of the decision-making process in the hands of the secretary of defense in an effort to overcome service parochialism; the reorganization of various defense activities along functional lines; and the replacement of the Eisenhower doctrine of "massive retaliation" with a strategy of "flexible response." The accomplishment of these three goals, however, was dependent on the introduction of two substantial changes in defense management. The first was an attempt to solve the long-standing problem of relating strategy, plans, and programs to the annual budget in such a way that the cost of performing the various missions could be seen clearly. The second was the adoption of new, more efficient decision-making processes that relied on scientific quantitative analyses rather than military experience and intuition to assist in determining the best of several alternatives. All of these efforts were aimed at achieving "meaningful control of the far-flung activities of the Department of Defense," a goal that had eluded his seven predecessors.[69] In Secretary McNamara's view, his efforts were also focused on establishing "a rational foundation as opposed to

an emotional foundation for the decisions as to what size force and what type of force this country will maintain."[70]

The mechanism by which Secretary McNamara sought to align strategic plans with the annual defense budget came to be known as PPBS, described by McNamara himself as "a mission-oriented planning and programming process to assist in defining and balancing the total effort."[71] The objective of PPBS, as defined by Enthoven, was to make "the budgetary process a much more effective means of weighing alternatives, selecting optimum strategies, and building the necessary forces structure."[72] At the core of the new "systematic quantitative techniques to assist in making programme decisions" were systems analysis and cost-effectiveness analysis.[73] Both of these new tools relied heavily on economic theory and quantitative methods to form the framework for analyzing the complex problems faced by defense decision makers in their efforts to maximize the use of scarce resources.[74]

PPBS and the new analytical techniques were the foundation stones for Secretary McNamara's efforts to develop what has been described as "an elegantly programmed system which related resources to military output in a manner that made possible the 'rational' evaluation of alternatives and the easy conversion of policy decisions into budgetary proposals."[75] In the end, Secretary McNamara's "elegantly programmed system" would replace entirely the dysfunctional method of developing strategy and force structure by bargaining for defense dollars by the three services, each "more concerned with their own parochial interests than producing a coherent military strategy and force structure."[76]

Planning, Programming, and Budgeting System

The centerpiece of Secretary McNamara's efforts to solve the long-standing problem of how to link strategy, plans, and programs with the annual defense budget effectively was PPBS. At the core of PPBS was the concept of "program packaging"—defined by Enthoven as "the organizational control and centralized management of functionally alike activities."[77] The concept of the program budget was, of course, not a new idea at all; it had been used in industry since the 1920s. In the Department of Defense, too, there had been some progress toward program budgeting during the 1950s. Both President Dwight D. Eisenhower and Army Chief of Staff General Maxwell D. Taylor had seen the wisdom of viewing the armed forces as a whole rather than as separate ground, air, and sea forces; and Wilfred J. McNeil, the DOD comptroller from September 1949 to November 1959, had introduced many elements of program budgeting.[78] However, in the early 1960s, the existing DOD budget system was still clearly unsatisfactory.[79] As a DOD comptroller study group noted in 1962:

> Despite the major improvements that have been made during recent years in financial management procedures for the Department of Defense, it was recognized in the spring of 1961 that further advances were required. Two needs were recognized as being particularly urgent. One of these was for a means of classifying military activities in terms of their missions, so that activities having similar missions could be more easily combined for decision-making purposes. A critical need also existed for an extension of the planning horizon in order to display the long-range implications of programs.[80]

The defects of the existing system were also recognized in Congress and the defense analytical community. In 1959 and again in 1960, Representative George Mahon, the chairman of the House Defense Appropriations Committee, wrote to the secretary of defense stressing the need to look at the defense budget in terms of major military missions and their associated costs and the need for better information regarding costs as well as a better means of linking costs to missions.[81] Analysts at the RAND Corporation, including Hitch, who would soon be called to serve as the DOD comptroller, also concluded that changes were necessary and laid out their recommendations in a book entitled *The Economics of Defense in the Nuclear Age*, published in March 1960.[82] Hitch later noted that

> [t]he functional arrangement of the budget, while still very useful in the management of certain classes of Defense activities, does not focus on the key decision-making area which is of principal concern to top management in the Defense Department, namely, the sound choice of major weapon systems in relation to military tasks and missions. It does not produce the data in the form needed to relate directly the cost of weapon systems to their military effectiveness; and because its time horizon

> is generally limited to only one year, it does not disclose the full time-phased costs of proposed programs.[83]

As soon as the Kennedy administration took office in January 1961, work began on reforming the defense planning and budgeting process. Primary responsibility for that task fell to the newly appointed Assistant Secretary of Defense (Comptroller) Dr. Hitch. As Hitch later recalled:

> The first task that confronted us in the Department of Defense in the spring of 1961 was the development of a program structure which would have two characteristics—
> (a) It would reflect the goals or missions of the Department of Defense and the means of achieving them.
> (b) It would allocate to the elements of the program all the resources and dollars required by the Department.[84]

The first half of 1961 was taken up with reviewing and adjusting the previous administration's FY 1962 budget. Meanwhile, Hitch worked out his proposed new system, which he called a Five-Year Force Structure and Financial Program, and presented it to Secretary McNamara in May 1961, recommending that it be developed and implemented incrementally over a period of eighteen months.[85] Secretary McNamara approved the proposed system, but even though the FY 1963 budget planning cycle was already far advanced, he shortened the development and implementation period from eighteen to six months so that the new system could be used to prepare the FY 1963 defense budget due to Congress in January 1962.[86] Although Secretary McNamara hoped to submit the DOD budget to Congress in a series of functionally oriented "program packages," Congress rejected that approach, and the McNamara team had to reconcile their proposed system with the desire of Congress to retain elements of the old budgeting process.[87]

It was not until July that Hitch and his associates began to devote their full attention to the new planning, programming, and budgeting system.[88] On 16 August 1961, Secretary McNamara issued a memorandum to the service secretaries in which he charged the DOD comptroller (Hitch) to conduct "a comprehensive review of the Department's existing financial and nonfinancial information systems and develop a plan for a DOD integrated system for relating programming, budgeting and financing, accounting, and progress and status reporting."[89]

Working with representatives from the various services, Hitch and his subordinates worked on the study from September 1961 through April 1962. It soon became apparent that the existing system would have to be completely reworked. As Hitch later noted, it was clear that

> First, a link had to be forged between military planning and budgeting.
> Second, the forces and weapons systems had to be grouped in relation to their principal military missions—the way in which major decisions have to be made.
> Third, resource and dollar costs had to be tied directly to the forces and weapons systems so that the financial implications of the decisions made could be predicted with some degree of accuracy.
> Fourth, forces, programs, and their costs had to be projected over a period of years so that their future, as well as present, cost implications could be appreciated.
> Fifth, dollar costs had to be broken down into three categories—research and development, initial investment and annual operating.
> Finally, since we will continue to budget and the Congress will continue to appropriate funds in terms of budget categories and appropriations—a "torque converter" had to be provided to enable a ready translation of programs into budget categories and vice versa.[90]

The result was a three-step process in which a new programming step was inserted to link military planning and the annual budget.[91] As Hitch described it, the new, integrated planning, programming, and budgeting system would

> (1) Provide for more orderly, continuous program review in contrast to the hectic program-budget review crammed into just a few months of the year, which had been the practice in the past;
> (2) Disclose the full financial implication of program decisions;
> (3) Keep future military planning roughly in balance with probable resources and dollar availabilities—thereby minimizing the number of false starts and reducing the number of marginal and excessive support programs; and
> (4) Promote unified, balanced over-all Defense programs in place of unilaterally balanced Army, Navy, and Air Force programs.[92]

He went on to note that "the new programming procedure should also greatly facilitate the application of operations research or systems analysis to Defense problems, by relating resources and dollars to forces and weapons organized by missions."[93]

By September 1961, Hitch and his associates had begun to work on the FY 1963 budget for submission to the Congress in early January 1962. The new PPBS was used to prepare the FY 1963 budget estimates, which were presented in "program package" form. For the first time the defense budget proposals emphasized the cost of the various military missions of the Department of Defense without regard to the service that might perform them.[94]

As its name implies, PPBS was a three-step process. The first step, planning, was essentially a responsibility of the Joint Chiefs of Staff and the military departments, and the last step, budgeting, was essentially a civilian responsibility. As DOD Comptroller Hitch told the Military Operations Subcommittee of the House Committee on Government Operations in July 1962, before the introduction of PPBS by Secretary McNamara:

> Planning was done in terms of military forces and major weapons systems projected over a period of years. Budgeting was done in terms of the familiar functional categories—military personnel, operations and maintenance, procurement, etc.—projected just one year ahead . . . military plans were prepared without regard to resource limitations and . . . to a great extent the order of priority of forces, weapons systems, and activities was determined on the basis of the needs of the individual Military Department and not the needs of the Defense establishment as a whole.[95]

PPBS solved those problems by integrating the various service plans in a comprehensive way over a five-year period. The real innovation of the McNamara era was the introduction of the intermediate step, programming, to link the planning and budgeting steps and project the defense program five to eight years into the future. Programming was thus the crucial step in the system developed and implemented by Hitch at the direction of Secretary McNamara, but as Hitch himself noted, "Programming is not a substitute either for military planning or for budgeting, but rather is the essential link between the two."[96]

The Impact of the Planning, Programming, and Bugeting System

The McNamara Planning, Programming, and Budgeting System had a profound impact throughout the Department of Defense and the U.S. government in general. For the first time, the services were required to justify their budget requests using systematic quantitative analyses of the competing alternatives. In practice, only those programs and proposals that advanced Secretary McNamara's stated goals were funded, except on those occasions when the "rational decision-making process" was overturned by outside political forces.[97] Thus, over time PPBS supplanted the traditional defense budgeting system despite the declarations of Secretary McNamara and others that that was not their intention.[98] DOD Comptroller Hitch crowed:

> We have provided for the Secretary of Defense and his principal military and civilian advisors a system which brings together at one place and at one time all of the relevant information which they need to make sound decisions on the forward program and to control the execution of that program. And we have provided the necessary flexibility in the form of a program change control system. Now, for the first time the largest business in the world has a comprehensive Defense Department-wide plan that extends more than one year into the future. And it is a realistic and responsible one—programming not only the forces, but also the men, equipment, supplies, installations, and budget dollars required to support them. Budgets are in balance with programs, programs with force requirements, force requirements with military missions, and military missions with national security objectives. And the total budget dollars required by the plan for future years do not exceed the Secretary's responsible opinion of what is necessary and feasible. With this management tool at his command, the Secretary of Defense is now in a position to carry out the responsibilities assigned to him by the National Security Act, namely, to exercise "direction, authority, and control over the Department of Defense"—and without another major reorganization of the Defense establishment.[99]

The introduction of PPBS significantly changed the balance in foreign and defense policy making. First, it shifted the focus from the legislative to the executive branch "by removing the conflict between military need and the budgetary constraint from the congressional committees to within the organization

of the Department of Defense."[100] Second, it greatly enhanced the authority of the secretary of defense and his assistant secretaries at the expense of the various services. Once scientific analysis became the primary tool for selecting among competing alternatives, the arguments were effectively controlled by the secretary and his assistants inasmuch as the analyses were performed primarily at the Office of the Secretary of Defense (OSD) level.[101]

PPBS has also been called "the biggest step toward the unification of the armed forces since the National Security Act of 1947."[102] As Secretary McNamara himself noted, "the new planning system allowed us to achieve a true unification of effort within the Department without having to undergo a drastic upheaval of the entire organizational structure."[103] Before the introduction of PPBS the decentralization of decision making led to a situation in which the services each acted on the basis of their own interests and priorities and engaged in various techniques of budget gamesmanship that produced unnecessary expenditures and the acquisition of unneeded weaponry.[104] The introduction of PPBS reduced the influence of "the traditional, sometimes parochial," views of the individual services on the budgeting process, and since none of the new mission-oriented program packages were connected to any given organization, there was no interference in the process by groups interested in promoting a specific program.[105] As Hitch noted, the use of PPBS brought the Department of Defense under control of the secretary of defense "by imposing realistic planning, with balance among elements and, in some areas, an approach toward optimality."[106]

Perhaps the most far-reaching effect of PPBS was to make the use of modern analytical techniques absolutely essential in all Department of Defense activities. DOD Comptroller Hitch stated that

> the most significant contribution that we have made in the Office of the Secretary of Defense since 1961 is to organize military planning, programming, and budgeting in such a way that facilitates the use of analytical techniques as an aid in decision-making. . . . I feel that one of our most important contributions with respect to operations research in the military establishment has been this attempt to create an environment in which quantitative analysis can flourish and be employed effectively.[107]

Having observed Secretary McNamara's success with PPBS in the Department of Defense, in 1965 President Lyndon Johnson decreed that PPBS be used throughout the federal government. As President Johnson himself explained, "The objective of this program is simple: to use the most modern management tools so that the full promise of a finer life can be brought to every American at the least possible cost."[108] On 12 October 1965, Johnson's budget director, Charles Schultze, issued general instructions for the implementation of PPBS by all major federal departments and agencies effective with the FY 1968 budget, and President Johnson directed all Cabinet officers and agency directors to establish a "Central Staff for Program and Policy Planning accountable directly to you."[109] The goals sought by President Johnson were to

> (1) Identify our national goals with precision and on a continuing basis.
> (2) Choose among those goals the ones that are most urgent.
> (3) Search for alternative means of reaching those goals most effectively at the least cost.
> (4) Inform ourselves not merely on next year's costs—but on the second, and third, and subsequent year's costs—of our programs.
> (5) Measure the performance of our programs to insure a dollar's worth of service for each dollar spent.[110]

The application of PPBS to government departments and agencies outside the Department of Defense subsequently enjoyed only limited success and had many detractors. Even Charles Hitch, the architect of PPBS in the DOD, later wrote:

> I thought at the time that this was foolish, almost certain to lead to confusion and likely to end up discrediting the management techniques it was trying to promote. Both happened. For one thing, a tremendous amount of preliminary research performed for a decade at RAND alone by several hundred professionals had gone into the development of applications for military planning. Nothing remotely comparable had been done in any other area of government.[111]

He went on to write that there were far too few capable people training in the techniques of PPBS and systems analysis; the problems faced by most

civilian departments were different from the military planning problems that had been resolved through the use of systems analysis; the objectives and relationships were much more diverse and complex; and the political component was far greater.

The New Tools of Analysis

PPBS relied on new analytical tools developed during the 1950s, particularly systems analysis and cost-effectiveness analysis, that were designed to make the decision-making process more precise.[112] As Secretary McNamara himself stated, PPBS "would be a shell without substance . . . were it not backed by the full range of analytic support which operations research and other modern management techniques can bring to bear on national security problems."[113] The new analytical techniques were strengthened by the newly developed machinery for gathering, analyzing, and presenting data embodied in the digital computer. The computer and the new techniques made centralized decision making both more efficient and more effective, but they did not, as critics sometimes claimed, replace the human decision maker.

The "Defense Economists"

The development of the new analytical techniques and their introduction into the defense decision-making process was largely the work of economists rather than the mathematicians and physical scientists who dominated the operations research field. Traditionally, economists had defined their interests in military affairs in terms of four objectives: "(1) maximizing total supply; (2) facilitating conversion and reconversion of industrial capacity; (3) optimizing resource allocation between the military and civilian sectors; and (4) securing a fair distribution of goods within the civilian sector."[114] By the 1950s, however, the interests of economists had begun to broaden to include "the organization and management of the Defense Establishment and the armament industries, and . . . analysis of the requirements for weapons systems and forces; that is, the central issues of defense policy and programming."[115] Therefore, the analytical methods used by economists came to be applied to questions regarding the allocation of funds among the services, force structure, basing, logistics, and research and development as well as to many other issues.[116]

The development of PPBS and the techniques of systems analysis and cost-effectiveness analysis and their application to the defense decision-making process were largely the work of a group of so-called defense economists working at the RAND Corporation in Santa Monica, California. Among the members of that rather small group were Charles J. Hitch, Henry Rowen, W. W. Kaufmann, Alain C. Enthoven, Stephen Enke, and T. C. Schelling.[117] It was they who first applied elements of economic theory—particularly the concepts of marginal analysis, general equilibrium theory, and input-output analysis—to higher level problems of national defense.

The RAND approach was based on the OR methods developed during World War II but expanded the range of academic disciplines brought to bear on the new, more complex problems. In the early 1950s, analysts at RAND began to take up problems of strategic planning and defense economics. They found that the questions they were studying frequently involved costs and benefits of future systems and were thus amenable to the techniques of economic analysis. The RAND analysts thus sought to use not only the older OR methods but also the concepts drawn from systems engineering, which focused on the whole as greater than the sum of its parts, and from economic analysis, with its emphasis on maximizing output for a given set of inputs.[118] On the whole, the new techniques of analysis developed at RAND in the 1950s were broader in scope and less quantitative in method than traditional operations research.[119] Moreover, at RAND the study process was one in which all aspects of a given problem were studied intensely by specialists from various fields who then synthesized their findings, including such factors as time and costs, to propose a solution.[120] Their interdisciplinary approach came to be called systems analysis and was first used by RAND's Albert Wohlstetter in 1952 to study the readiness of Strategic Air Command bases to defend against a Soviet preemptive attack.[121]

By the late 1950s, RAND economists were applying program budgeting and systems analysis to public policy, and they worked hard to spread the new gospel of systems analysis and cost-effectiveness analysis. In 1955 and again

in 1959, RAND conducted an intensive five-day course for defense decision makers entitled "An Appreciation of Analysis for Military Decisions," designed to introduce decision makers to the strengths and weaknesses of OR and the analytic approach to military problem solving and long-range military planning.[122] In 1958 they published *Efficiency in Government Through Systems Analysis*, and Charles J. Hitch and Roland N. McKean's *The Economics of Defense in the Nuclear Age* followed in 1960.

The Definition of Systems Analysis

There are numerous definitions of what has come to be called systems analysis, most of which need not concern us here.[123] At bottom, systems analysis is no more than "a systematic, quantitative approach to the complex military-economic problems encountered in the defense program," and Secretary McNamara often referred to it as "quantitative common sense."[124] One of its chief promoters in the Department of Defense, Alain C. Enthoven, defined it as "the application of methods of quantitative economic analysis and scientific method, in the broadest sense to the problems of choice of weapon systems and strategy."[125] In describing its underlying philosophy, Col. James H. Hayes has noted that

> 1. Systems analysis adopts the philosophy that all military decisions are, in their broadest sense, economic decisions because they involve the allocation of scarce national resources among the competing requirements of the various services;
> 2. Systems analysis assumes a rationality in nature and the systems created by man;
> 3. There is a different viewpoint concerning facts. . . . A systems analysis, by its nature, is designed to challenge, to inquire, and to create something new, if required.[126]

The official military definitions are somewhat more precise. For example, the April 1965 edition of *Army Regulation No. 320–5*, the official dictionary of U.S. Army terms, defines systems analysis as "An orderly study of a management system or an operating system using the techniques of management analysis, operations research, industrial engineering or other methods to evaluate the effectiveness with which missions are accomplished and to recommend improvements."[127] The official Air Force definition is perhaps more to the point when it identifies systems analysis as "the methodical examination of alternatives in terms of both quantitative and qualitative estimates of costs, other resources, and benefits. Its objective is to evaluate the over-all implications of alternative courses of action."[128] Perhaps the best practical and straightforward definition of systems analysis is the one provided by a student at the United States Army War College, Col. Donald Bridenbaugh:

> Systems Analysis is a systematic study of a problem which requires a decision. The purpose of the study is to unearth and analyze all feasible alternate objectives and explore the implications of these alternative objectives, particularly with regard to effectiveness and cost, so that the decision-maker is provided with sufficient data on which to base his choice.[129]

The Methodology of Systems Analysis

Systems analysis may be better defined by examining its methodology. Although there is no rigid formula for systems analysis methodology, one of its "inventors," Alain Enthoven, has noted that "systems analysis is a discipline with a logic of its own, derived largely, but by no means entirely, from economics and operations research."[130] His colleague at RAND and in the DOD, Charles Hitch, described the methodology of systems analysis as "a continuous cycle of defining military objectives, designing alternate systems to achieve those objectives, evaluating these alternatives in terms of their effectiveness and cost, questioning the objectives and the other assumptions underlying the analysis, opening new alternatives, and establishing new military objectives."[131]

The traits that define good systems analysis include the use of scientific method, the use of quantifiable data and mathematical techniques, and explicitness in all stages of the analytical process.[132] Moreover, as Edward Quade has noted, the answers derived by the analytical method must be "reproducible, accessible to critical examination, and readily modified as new information becomes available," and "Systems analysis must be tempered with and used alongside experience, judgment, and intuition. It cannot replace these other approaches, but it can help build a framework in which they can operate more efficiently."[133]

Several authors have listed the sequence of steps in a typical systems analysis, but Hitch identified the five essential steps as the following:

1. The definition of the objective(s);
2. The description of alternative means by which the objective(s) may be accomplished;
3. Determination of the costs associated with each alternative;
4. Construction of a model of the situation (i.e., a "set of relationships among the objectives, the alternative means of achieving them, the environment and the resources");
5. Selection of criteria for choosing the preferred alternative.[134]

Of course, the final steps are to evaluate the alternatives in terms of cost and effectiveness and recommend the preferred alternative to the decision maker. Edward Quade has sought to portray this process graphically, as shown in Figure 2–1.

Each element, or step, in the systems analysis process must be carefully crafted and constantly reviewed. Systems analysis is a circular process and involves the continual reassessment of the assumptions, objectives, alternatives, and criteria for choice. As Enthoven has pointed out, it is

> a continuing dialogue between the policymaker and the systems analyst, in which the policymaker asks for alternative solutions to his problems, makes decisions to exclude some, and makes value judgments and policy decisions, while the analyst attempts to clarify the conceptual framework in which decisions must be made, to define alternative possible objectives and criteria, and to explore in as clear terms as possible (and quantitatively) the cost and effectiveness of alternative courses of action.[135]

The systems analysis process parallels the steps of the scientific method per se, but as Edward Quade points out, there are certain distinctions between the typical scientific problem and the typical military systems analysis problem, to wit:

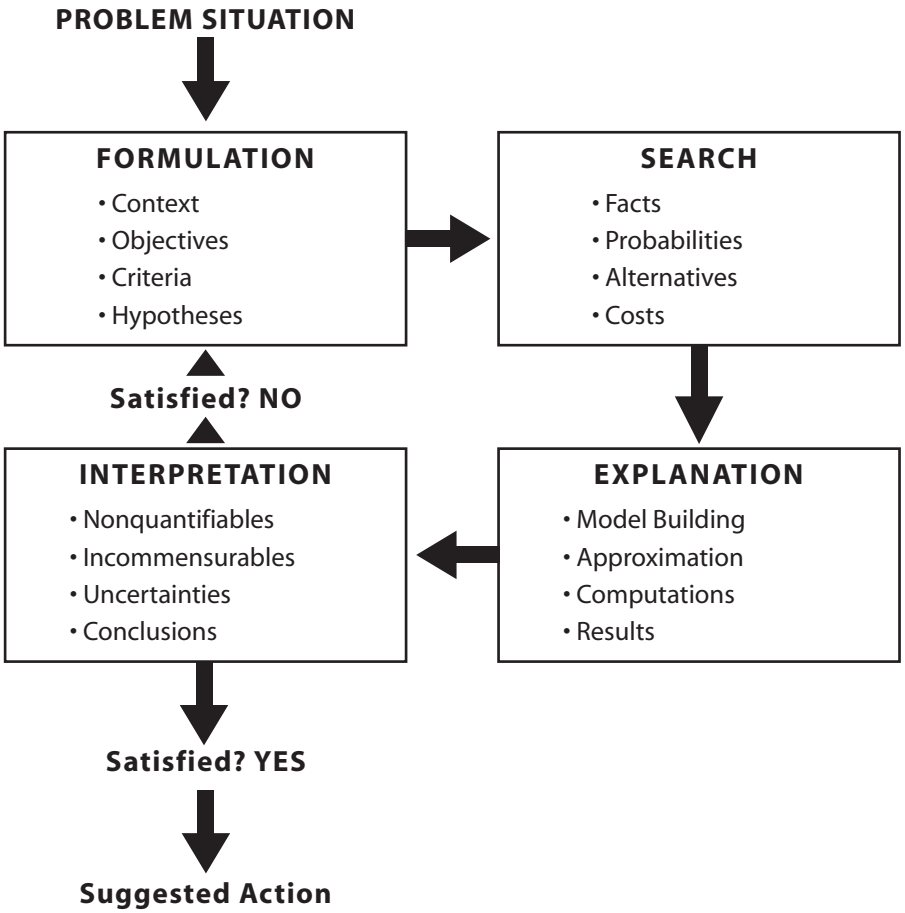
1. There are relatively many more factors that can only be estimated rather than measured or experimented with.
2. The results of field tests, or experiments made on the proving ground, are likely to differ radically from results obtained under combat conditions—hence "degradation" factors are required.
3. There is usually no way of verification for the overall conclusions of the study.
4. There is a time limit after which the answer frequently becomes worthless.[136]

The results of any systems analysis are directly dependent on the quality of the underlying assumptions. Although usually there is no single best set of assumptions, all of the assumptions that underlie any analysis must be rigorously examined to determine which of them affect the outcome and to what degree.[137] Similarly, objectives and alternatives must be carefully crafted. As Albert Wohlstetter observed, "a systems analysis is likely to be most helpful if the analyst has taken care to examine closely the character and source of the problem confronting the decision-maker, the objectives he wants to achieve, the obstacles he must surmount to achieve them, and what achieving them does for him."[138]

Various measures may be taken to facilitate the design of suitable alternatives. Among these are sensitivity analyses that address variations in the values of the parameters in question, and contingency analyses that examine "how a system chosen with one assumption about the environment would measure up to the performance of its alternative."[139] Developing criteria of military effectiveness by which the alternatives are to be judged presents a more difficult problem. As Hitch has pointed out, "reliable quantitative data often are not available, and even where such data are available there is usually no common standard for measuring military worth."[140]

The clear definition of objectives and criteria are all the more necessary, according to Hitch, because of the uncertainties inherent in the future that a systems analysis seeks to define.[141] These uncertainties are of several kinds: planning factors, the enemy and his reactions, strategic, technological, and statistical.[142] Some uncertainties, such as statistical uncertainty, can be handled in the model by Monte Carlo or other techniques, but true uncertainties regarding the future "are beyond the practical ability of analysts to predict."[143] Although a good analysis will bring out and clarify any uncertainties, even the best systems analysis cannot eliminate all uncertainties; but, as Charles Hitch has written, "Every bit of the total problem that can be confidently analyzed removes one more bit of uncertainty from our process of

Figure 2–1—The Systems Analysis Process



Source: Edward S. Quade, ed., *Analysis for Military Decisions* (Chicago: Rand McNally, 1966) p. 11, Figure 1

making a choice."[144] The analyst must then "face this uncertainty squarely, treat it as an important element in the problem, and take it into account in formulating recommendations."[145]

The "Good" Systems Analyst

The systems analyst assists the decision maker by "gathering facts, ordering them, interpreting them, and displaying them so that the area of uncertainty is squeezed to the smallest."[146] The "good" systems analyst possesses "a logical mind, the ability to deal effectively with people, and a professional approach," and he or she must be able to "sort through a voluminous amount of data, perceive problems as they really exist, and devise a better way of accomplishing the given objectives."[147] He or she will also bring out and clarify any uncertainties in the analysis rather than conceal them.[148] The good systems analyst will design systems that, in the face of uncertainties, will operate well in a large variety of situations.[149] The existence of multiple objectives, multiple alternatives, complex relationships of cost and effectiveness among alternatives, and the great uncertainties involved in every systems analysis problem makes great demands upon the analyst's ingenuity, experience, judgment, and common sense.[150] Charles Hitch thus characterized the "useful and productive analyst" as one distinguished by "his ability to formulate (or design) the problem; to choose appropriate objectives; to define the relevant, important environments or situations in which to test the alternatives; to judge the reliability of his cost and other data; and finally, and not least, his ingenuity in inventing new systems or alternatives to evaluate."[151]

The good analyst is not the advocate for any particular alternative system but rather sorts the various possible alternatives into two groups: those

that should be considered and those that clearly do not warrant further attention.[152] The analyst then presents to the decision maker the findings about the costs and effectiveness of the various alternative systems, making explicit the assumptions made and the criteria used in the analysis. In presenting the results to the decision maker, the systems analyst differs from the military staff officer in that rather than making a specific recommendation of the single best course of action, the analyst presents "all alternatives, all the facts, all the reasoning process, and all pertinent considerations pertaining to each alternative."[153] Accordingly, many analysts carry three separate estimates through the calculations: an optimistic one, a pessimistic one, and a best or single most likely one.[154] In any event, as Enthoven has stated, "a good systems analyst should be able to give a clear nontechnical explanation of his methods and results to the responsible decision-makers."[155]

Operations Research and Systems Analysis Compared

Many commentators see military systems analysis as a direct lineal descendant of operations research Hitch, for example, calls military systems analysis "an extension of operations-research techniques of World War II to problems of broader context and longer range."[156] Indeed, OR and systems analysis do share some essential elements, such as a well-defined objective or objectives, alternative methods by which objectives may be achieved, the use of a model to compare the various alternatives, and the establishment of criteria for choosing among alternatives. OR and systems analysis also differ in several important ways, but, as Quade has noted, "there is no clear line of demarcation between operations research and what we are calling systems analysis; the difference is a matter of degree."[157] A simple distinction between the two techniques is provided by Air Force Capt. Gerald J. Garvey:

> "Operations research" refers primarily to the analysis of specific weapon systems; that is, it refers to the problem of designing optimum characteristics into the various component parts of our defense posture. On the other hand "systems analysis" has through usage come to refer more generally to the top-level problem of designing, or at least of defining, the optimum characteristics of the defense system as a whole, of which the objects of operations research are the parts.[158]

OR in World War II focused primarily on improving the operating efficiency of existing weapons systems and tactics. OR analyses thus were limited in character, related to operations in the immediate future, had to consider only a small number of interdependent factors, generally used fairly obvious rules or criteria for choosing one alternative over another, and usually had some operational data available.[159] Most of the problems encountered were for all practical purpose matters of applied physics and included such problems as determining the optimum number of ships in a convoy, the optimum spacing between ships, or the ratio of escort vessels to cargo ships, or the design of improved bombing, radar operating, or search and reconnaissance techniques.[160]

The scope of OR expanded in the late 1940s and early 1950s to include broader questions of strategy and policy, and operations researchers also began to consider economic issues. Nevertheless, for the most part the focus continued to be on optimizing the operation of a given weapon system, tactic, or strategy in the present rather than developing forces for the future or choosing among competing alternatives under conditions of great uncertainty. In time, however, economic considerations came to the fore, and more sophisticated techniques of economic analysis were introduced. The application of those new economic analysis techniques to the broader and longer-range problems of force composition and development programs focused on such issues as "what military forces it is desirable to have, what kinds and quantities of equipment should be procured, what kinds of weapons systems should be developed."[161] To paraphrase the Army's chief of research and development in 1963, Lt. Gen. Dwight E. Beach, OR seeks to find better ways of using existing mouse traps, while systems analysis is concerned with whether to build mouse traps or to use some other method of mouse destruction and how many mouse traps or other mouse destruction devices of what type should be acquired.[162]

The systems analysis approach is thus oriented toward the consideration of broad strategic and policy questions and toward making difficult choices among competing alternatives under conditions of great

uncertainty.[163] Compared to OR, it is less scientific in orientation and method, more concerned with political and economic factors, and has "the objective of recommending policy, rather than merely understanding and predicting it."[164] Systems analysis is also largely an interdisciplinary activity, drawing from many fields, such as economics, physics, mathematics, psychology, political science, and various branches of engineering as well as OR per se.[165] While the problems taken up by the OR analyst may be solved, the systems analyst deals with "a range of problems to which there can be no 'solution' in a strict sense because there are no clearly defined objectives that can be optimized or maximized."[166] Moreover, because systems analysis involves multiple values and uncertainties, it cannot be "objective" in the sense that OR is objective. While for the OR analyst "the objectives are given, assumptions about the environment are specified, and so forth" and the "task is to calculate an optimum solution for a fixed level of resources," for the systems analyst the problem is to analyze alternative objectives and explore their implications rather than finding an optimum solution.[167] The systems analyst also uses basic economic concepts such as marginal product and marginal cost rather than the sophisticated mathematical techniques common in OR.[168] Edward Quade summarized many of the differences between OR and systems analysis when he wrote:

> The operations-research analyst is usually trying to use mathematics, or logical analysis, to help a client improve his efficiency in a situation in which everyone has a fairly good idea of what "more efficient" means. The systems analyst, on the other hand, is likely to be forced to deal with problems in which the difficulty lies in deciding what ought to be done, not simply in how to do it. In such a situation, far more attention must be devoted to establishing objectives, criteria, and alternatives. The total analysis is thus a more complex and less neat and tidy procedure which is seldom suitable for a quantitative optimization over the whole problem.[169]

Cost-Effectiveness Analysis

Cost-effectiveness analysis is the most prominent of the subroutines of systems analysis associated with the McNamara revolution. As such, it is an integral part of most systems analyses and the principal method for comparing the various alternatives. Some form of cost-effectiveness analysis had always been used by the military services in the process of selecting new weapons and equipment, but by the 1950s new and sharper analytical tools were available, and budget constraints made costs even more pertinent in military decision making.[170] What was new about the methods of cost-effectiveness analysis applied during the McNamara era was not new principles but the application to complex military problems of new systematic methods utilizing mathematical and statistical analytical techniques, often with the aid of high-speed digital computers.[171]

Resources are always limited, and the military decision maker must make complex choices from among the available and effective strategies and weapons systems at least partially on the basis of their costs. The objective of cost-effectiveness analysis, as DOD Comptroller Hitch has noted, is "to get the most defense out of any given level of available resources or, what is logically equivalent, to achieve a given level of defense at the least cost."[172]

Traditionally, the military departments relied on what has been called the priorities (or requirements) approach to decision making, an approach that did not analyze the problem in terms of costs and objectives but rather ranked items according to the urgency with which they were perceived to be needed.[173] The older military requirements approach did not consider the alternatives in terms of their costs and effectiveness, and thus Secretary McNamara turned to systems analysis—that is, to cost-effectiveness analysis.[174] The use of cost-effectiveness analysis proved to be most useful in studying long-range planning problems in which there are several viable ways to achieve an objective.

There is no one best definition of cost-effectiveness analysis. The 23 April 1964 Department of the Army letter on systems analysis and cost-effectiveness defined cost-effectiveness analysis as

> an orderly logical comparison of the alternate ways of solving a problem, considering both the cost, and the relative effectiveness, of each alternative. This method assumes an attitude of careful objectivity. The method aims at finding a more precise range of answers to a question, not at justifying a conclusion.[175]

Cost-effectiveness analysis can also be defined partly in terms of what it is not. Some of what cost-effectiveness analysis is not were enumerated

in the same 23 April 1964 Department of the Army letter:

> Cost effectiveness is *not* (as we sometimes hear said) a search for least-cost solutions to military problems, effectiveness be damned.
> It is *not* a smokescreen behind which military judgment is supplanted with economic theory.
> It is *not* a concept which describes a characteristic of a single thing. (Thus a statement of the form "The cost-effectiveness of this system is high," is nonsense.)
> It is *not* an attempt to supplant "leadership" with "management."
> It is *not* the exclusive business of top-level defense officials, or of R&D, or of Comptrollers.[176]

And, as Edward Quade has noted, while cost-effectiveness analysis "cannot replace experience, experiment, intuition, or judgment," it can provide "a framework in which they can operate more efficiently."[177]

Quade also wrote that "the difference between cost-effectiveness analysis, operations research, and systems analysis is a matter of emphasis. There is no clear line of demarcation; the differences are a matter of degree."[178] In general, the problem involved in each type of analysis is different. In the most general terms, a cost-effectiveness analysis focuses on determining the adequate alternative with the least cost; OR seeks to find a more efficient way of doing something, usually without regard to cost; and a systems analysis normally focuses on whether or not something should be done at all, usually in the future.[179]

There are three general approaches for conducting cost-effectiveness analyses.[180] In the first, the desired level of effectiveness is specified and then the resources required to attain the specified effectiveness are determined. In the second, the process is reversed; a given amount of money (resources) is specified and an attempt is made to determine the most effective system that can be bought for the money. In the third approach, both costs and effectiveness are varied, using a cost/effectiveness ratio criterion.

The actual methodology of cost-effectiveness analysis is similar to that of systems analysis, the steps of a cost-effectiveness analysis being essentially the same as those of a good systems analysis. The costs involved are the resources expended on the development, introduction, and continued operations of system, to include initial procurement, spare parts, the costs of training personnel to operate the system, and so forth. These resources, including, whenever, possible intangibles such as time and expertise, are usually expressed in dollar terms to facilitate comparison. Of course, some scarce resources—for example, the professional skill of a doctor—cannot be expressed in monetary terms. While it is not possible to account for every element of cost, the estimates must be accurate enough to allow discrimination among the alternatives. Cost estimates are often tested by sensitivity analysis in which repetitive analyses are conducted using different quantitative values in order to determine if the results are sensitive to the values assigned.[181]

Cost-effectiveness techniques are germane to most systems analysis studies and provide "a method of explicit analysis to aid the decision maker in judging alternatives, either to select the alternative that contributes the most for a given cost or to select the one that achieves a given objective for the least cost."[182] Cost-effectiveness studies also "bring out in a quantitative fashion the need for considering both cost and effectiveness relationships, individually and collectively . . . and tend to pinpoint their own weaknesses, and hence provide strong indicators of where the 'gaps' are for more refined analysis."[183] They are also particularly useful in an environment with multiple uncertainties and flexibility in the use and interchangeability of resources (people, dollars, and hardware) because

> [t]he cost effectiveness analysis examines systematically and relates costs, effectiveness, and risks of alternative ways of accomplishing an objective and designing additional alternatives (proposed courses of action) if those examined are found wanting. A cost effectiveness analysis seeks to quantify what can be logically calculated so that the decision maker knows the extent to which intuitive judgment must be used in making a decision.[184]

For that reason, cost-effectiveness analysis is especially useful in facilitating decisions regarding weapons development, force structure, logistical policy, and manpower policy problems.

The Use of Models

The use of a model, or representation of the real world, is a central element of military systems analysis in general and cost-effectiveness analysis in particular.[185] The principal purpose of a model is to provide a means of comparing alternatives as to cost, effectiveness, and other

factors so as "to predict some portions of the future" or "to determine the optimum mix among various weapons or elements of a system."[186] A model "assists in simplifying the problem, in identifying the significant components and interrelationships, in determining which variables are especially important for the decision at issue, and which variables can be suppressed."[187] According to Edward Quade, the standard systems analysis technique of constructing an appropriate model of the situation "enables judgment to be applied efficiently . . . and thereby . . . helps the expert to arrive at a clearer understanding of his subject matter."[188]

Models are employed for different purposes in the defense planning process. As Seth Bonder has noted, they can be used

> for quantitative evaluation purposes to provide essentially point estimate predictions of a proposed system's cost and effectiveness as information for decision making. Alternatively, the models can be used for analysis purposes to provide management with:
> - Insights into directional trends to increase his understanding of the system dynamics.
> - Guidelines for the development of data-collection plans—what data is important and how accurate it must be.
> - Guidelines for the development of technological and modeling research plans.[189]

Indeed, in some systems analyses, there is no need to build an explicit formal model at all; "the essential thing is a listing of the alternatives and an examination of their implications and costs in order that they may be compared."[190]

A model may be defined as "a simplified representation of reality on which to make predictions about the effects of alternative courses of action."[191] Put another way, a model is "simply certain relationships expressed in some way to simulate real or expected condition in order to foresee the expected outcome of a course of action."[192] In systems analysis, a model may take the form of any logical or mathematical simplification of the real world.[193] In a formal sense, a model is composed of two elements: the variables and the relationships among the variables.[194] There are three basic types of models: iconic, analog, and symbolic, with the symbolic type being the most prevalent used in cost-effectiveness analysis.[195] Mathematical models can range from simple graphs to complex equations, and models can also take the form of a simulation, war game, or field maneuver.[196] Game theory models and war games are two kinds of models commonly used in military analyses.[197] War-gaming can take several different forms, including mathematical games, machine games, board and bookkeeping games, and games using human umpires.[198] The selection of a suitable model depends on the question posed and the time available for its solution.[199] In any event, the use of a model "should be consistent with its structure, verification, and ease of interpretation."[200] There is no universal model; thus, most cost-effectiveness models are developed specifically for a given study.[201]

Of necessity, a model is an abstract of the real situation and can never be an exact reproduction of reality. For that reason, "the analyst who develops a model must concentrate on those aspects of the real situation that are important and he must aggregate minor aspects."[202] Two aspects of model construction are particularly difficult: the quantification of the various elements, especially intangible elements, and the treatment of uncertainty.[203] The degree to which the analyst is able to deal successfully with the issues of quantification and uncertainty determines the usefulness of the model for the decision maker.

Defects in the model used are certain to affect the evaluation of alternatives adversely, particularly if the model is untested. McNamara's Whiz Kids often placed a high value on their models, even when empirical evidence to support them was thin or lacking altogether; thus, not all of the decisions made by the McNamara team were supported by properly evaluated alternatives.[204] One of the most persistent and severe critics of systems analysis, Seth Bonder, has also noted that many of the models for the analysis of military systems used during the McNamara era purported to be predictive without the necessary testing.[205] Models and simulations also have a tendency to become important in their own right rather than as means to an end. As RAND analyst R. D. Specht warned:

> We have learned that new tools—high-speed computers, war gaming, game theory, linear and dynamic programming, Monte Carlo, and others—often find important application, that they are often powerful aids to intuition and understanding. Nevertheless, we have learned to be more interested in the real world than in the idealized model we prepare for analysis—more interested in the practical problem that demands

> solution than in the intellectual and mechanical gadgets we use in the solution.[206]

The Impact of Systems Analysis

The advocates of systems analysis and cost-effectiveness analysis used the new methods to attack a wide variety of problems. The introduction of Secretary McNamara's innovations in defense management thus had a profound impact not only on the way in which decisions were made regarding planning, programming, and budgeting in the Department of Defense but also with respect to the focus of authority within the department, the organization of defense activities, the development of national military strategy, and the development of new weapons systems. In general, the imposition of the new analytical methods served to increase the authority of the secretary of defense at the expense of the civilian and uniformed leaders in the various services and to take from them responsibility for selected elements of defense intelligence, logistics, communications, and strategic planning. However, systems analysis and cost-effectiveness analysis also helped defense managers to avoid broad, unsupported generalizations, to establish requirements, to compare alternatives, and to allocate resources effectively.[207] They did so by highlighting critical issues requiring executive decision, by providing a factual basis to guide those decisions, by clarifying the relationship between alternative courses of action, and by indicating which alternatives were best in terms of overall defense objectives.[208]

The impact of systems analysis and cost-effectiveness analysis was felt most directly in the process of choosing what new weapons systems to develop, procure, and deploy during the 1960s. As was noted in the 23 April 1964 Department of the Army letter,

> the technique of systems analysis offers a more precise way to evaluate the program; compare it with other competing systems; keep it related to developing technology in related fields; and offer options for the hard decisions about continuing the program, modifying it, or possibly abandoning it (the hardest decision of all).[209]

However, critics argued that Secretary McNamara's insistence on extensive analysis seriously delayed the production and fielding of many urgently needed new weapons systems. PPBS and the need to conduct extensive systems and cost-effectiveness analyses meant that "a weapons system could not be proposed without considering trade-offs that existed with other systems performing similar functions," and that process took time.[210] The result was a lengthening of the lead time for acquiring new weapons, but the proponents of the new analytical techniques insisted that the weapons eventually produced were all the better for the analytical time and effort expended.[211] Other military and civilian leaders were slow to accept the new analytical methods because they feared that they necessarily led to development and purchase of the weapon or equipment that was lowest in cost. DOD Comptroller Hitch sought to dispel that misconception when he wrote the following:

> But opposition to cost-effectiveness studies stems not only from a suspicion of quantitative analysis but also from the conviction—completely unsubstantiated but nevertheless firmly held—that these studies inevitably lead to decisions favoring the cheapest weapon. Nothing could be further from the truth. Cost-effectiveness analysis is completely neutral with respect to the unit cost of a weapon.[212]

One example of the influence of systems analysis on weapons systems during the McNamara era was the decision to improve the air and sea lift capacity of the U.S. armed forces, a decision that involved several of the operations research and systems analysis (ORSA) elements active at the time.[213] Soon after taking office Secretary McNamara charged Deputy Assistant Secretary of Defense for Systems Analysis Alain Enthoven with determining how many transport aircraft the Department of Defense should order. The task was given to a group of rapid-deployment analysts in Enthoven's office led by John Keller. The Keller group found there was a good case for both a larger transport aircraft and more of them. They presented their analysis to Secretary McNamara in the fall of 1963. Meanwhile, analysts at the Planning Research Corporation were working out a new concept for prepositioning equipment overseas aboard ships. McNamara then asked for an independent analysis by the Joint Chiefs of Staff (JCS), and the JCS Special Studies Group, a team of military systems analysts organized in 1962, studied the problem and delivered their

report in July 1964. The Special Studies Group analysis has been called a "landmark in systems analysis."[214] It provided the basis for a forward deployment strategy and generated the development of the C–5A cargo plane and the fast-deployment logistics ship, mainstays of U.S. strategic power in the last half of the twentieth century.

Criticisms of the McNamara Reforms

Beyond the complaints about arrogant Whiz Kids and the centralization of decision-making power in the hands of the secretary of defense, the introduction of PPBS, systems analysis, and cost-effectiveness analysis also generated a great deal of legitimate criticism and complaint, particularly among senior military officers, both during Secretary McNamara's term of office and later. Secretary McNamara himself acknowledged that his program of reform and innovation "caused considerable controversy" and "would necessarily change traditional ways of doing things, and limit the customary ways of spending Defense money."[215] Nevertheless, he was willing to endure the criticisms and turmoil in the interest of putting the management of the Department of Defense on a "scientific" basis and thus solving many long-standing defense problems.

Criticism and opposition to the McNamara revolution fell into several broad categories. First, there were concerns about the inherent limitations of the new analytical methods. Second, there were concerns about poor performance on the part of systems analysts and manipulation of the process by senior civilian managers. Third, the advocates of the new methods failed to create an adequate understanding of the new methods among military decision makers and staff officers. Fourth, there were many heartfelt complaints about the degree to which the new analytical methods diminished the influence of military expertise and experience. Finally, there were profound philosophical concerns about the applicability of mathematical analysis to war.

Despite the dissatisfactions and forebodings of the critics, PPBS and systems analysis gradually gained general acceptance, in part because the military services had little choice but to make their peace with Secretary McNamara's approach and to use the new methods themselves to justify in quantitative ways their share of the defense budget.[216] The Air Force and some of the Army's technical branches were even attracted to the ideas of technical determinism inherent in systems analysis and became advocates of its use in every possible situation. Others accepted it for that most pragmatic of reasons: the civilian bosses liked it. Thus, in time opposition to the new analytical methods waned, and they became a routine part of the DOD decision-making process. As Craig Powell wrote in the October 1965 issue of *Armed Forces Management*:

> It appears, then, that the majority of volleys that have been fired at the principles of Systems Analysis have been blanks. It is evident that both at DOD level and within the Service Departments, systems analysis is considered sound application of the economic theory and scientific method to the problems of Defense management, and is generally accepted as a good thing.[217]

The Inherent Limitations of the New Analytical Methods

Both the advocates and the opponents of systems analysis and cost-effectiveness analysis expressed concerns about the degree to which the inherent limitations of the new analytical methods compromised their usefulness as tools in the defense decision-making process. Most commentators, however, stressed that the new methods were "neither a panacea nor a Pandora's box," and conceded that while systems analysis and cost-effectiveness analysis could make decision makers aware of the complexities of a problem, they seldom answered all the questions and were by no means "a substitute for imagination, experience or intuition."[218] Moreover, advocates and critics alike acknowledged that scientific analysis required "hard work, long hours, and highly qualified analysts," resources that are not always available.[219] Among the negative characteristics of the new methods often cited by critics were a "pretension to universality of its solutions, its intolerance of tradition and authority, quantification, simplification, and lack of flexibility."[220] Areas of particular concern included the frequent absence of pertinent data needed for an analysis; the difficulties of identifying and measuring

criteria of military effectiveness; the use of assumptions not explicitly stated; the construction of suitable models to compare alternatives; and the inability of mathematically based analytical techniques to properly account for intangible factors and uncertainties in the analysis.

The men who "invented" PPBS, systems analysis, and cost-effectiveness analysis and brought them to the Department of Defense were the first to recognize their inherent faults, limitations, and pitfalls. Secretary McNamara believed that "the dynamics of efficient management in so complex an institution as the Defense Department necessarily require the use of modern managerial tools," but even he had few illusions about the application of quantitative analysis to defense problem solving and wrote:

> There are many factors which cannot be adequately quantified and which therefore must be supplemented with judgment seasoned by experience. Furthermore, experience is necessary to determine the relevant questions with which to proceed with any analysis. I would not, if I could, attempt to substitute analytical techniques for judgment based upon experience.[221]

DOD Comptroller Hitch, for one, declared himself "a leading, internal critic of SA" and in particular a critic of "the overemphasis on techniques and elaborate computer models; the corresponding underemphasis on careful and sensitive definition of objectives; and the neglect of intangibles, externalities, and uncertainties."[222] In a paper read for him at the second Army Operations Research Symposium in 1963, Hitch wrote of the new analytical techniques:

> First, they do not constitute anything like a panacea. Second, their use constitutes a hazard: The potential danger in improper use and unwarranted confidence can be just as great as the potential benefit from proper use and appropriate confidence. Third, . . . proper application involves rather more art than it does science, and Fourth, the state-of-the-analytical-art is presently embryonic.[223]

Regarding the inherent difficulties of conducting viable analyses, Hitch wrote:

> Systems analysis or cost-effectiveness studies are by no means a panacea for all the problems of defense. Costs in general can be measured quantitatively, although not always with the degree of precision we would like. Measuring effectiveness or military worth poses a much more difficult problem. Reliable quantitative data are often not available. And even when such data are available, there is usually no common standard of measurement. This is particularly true with regard to systems analyses involving complex new technologies. Here, even reliable cost data are seldom available. Accordingly, the preferred alternative can rarely, if ever, be determined simply by applying a formula.[224]

Hitch's colleague both at RAND and in the Department of Defense, Alain Enthoven, also acknowledged that there were a number of legitimate criticisms of the new methods:

> One criticism I have heard is that emphasis on quantitative analysis risks ignoring those factors that cannot be reduced to numbers, or at least over-emphasizing those that can. . . . Another criticism sometimes made is that application of the "flat of the curve" argument to force or performance requirements may lead people to ignore the decisiveness of a narrow edge in superior performance . . . it is argued that the systems analysis approach may be biased against the new and in favor of the old. . . . A similar argument has it that cost-effectiveness analysis is biased against new systems to replace those already in operation because the new system is charged with its initial investment as well as operating costs, while the old systems is only charged with its operating cost. . . . Finally, sometimes it is said that systems analyses oversimplify complex problems.[225]

As Hitch pointed out, analytical techniques can be no better than the data used to feed them. Many critics noted that there were frequent problems with the data applied to PPBS, systems analysis, and cost-effectiveness analysis in the McNamara era. Dr. Marion R. Bryson, who noted that "sophisticated analytical techniques do not make the data any better," listed a number of such data-related faults, including failure of the analyst to recognize the nature of his data; consulting the data analyst too late; omitting data that do not support a certain preconceived conclusion; and overuse of data (which he calls "data enrichment").[226]

Most of the experts agree that perhaps the most difficult problem in systems analysis is identifying the criteria for military effectiveness and determining a proper measure of their impact. In the absence of generally accepted standards for measuring the relationship between the effectiveness of a military system and its costs, analysts often fall into the trap of oversimplifying "definitions of effectiveness in order to establish quantifiable relationships" or confuse measures of performance with measures of effectiveness.[227] Some of the more common errors having to do with the selection of proper criteria for evaluating effectiveness

include ignoring absolute scale of objective or cost, setting the wrong objective or scale of objective, ignoring uncertainty, ignoring effects on other operations, adopting wrong concepts of cost, ignoring the time dimension, trying to use an "overdetermined" test, and applying good criteria to the wrong problem.[228]

No method of analysis is entirely satisfactory when it comes to dealing with the uncertainties of the future. The new analytical methods introduced by Secretary McNamara and the Whiz Kids were certainly no exception, as their advocates freely acknowledged.[229] However, through the use of sophisticated mathematical techniques they did serve to significantly reduce the impact of such uncertainties. As Secretary McNamara noted, "I am sure that no significant military problems will ever be wholly susceptible to purely quantitative analysis. But every piece of the total problem that can be quantitatively analyzed removes one more piece of uncertainty from our process of making a choice."[230]

Poor Performance of Analysts

Some of the criticism directed at the new analytical techniques was the result of poor performance on the part of analysts, which led to a loss of credibility for systems analysis as a whole and contributed to the misperception and manipulation of analyses by decision makers with an agenda. A number of factors contributed to poor performance on the part of analysts, and even before the McNamara era, Ellis A. Johnson, then perhaps the leading proponent of OR, had warned that analysts and supervisors needed to act forcefully to maintain and increase the quality of their work.[231] One RAND analyst, Edward S. Quade, faced the problems of poor analyst performance head on, noting that "blunders and fallacies sometimes occur in analyses."[232] Quade sought to alert both analysts and decision makers by listing some of the most common pitfalls:

1. Failure to spend an adequate share of the effort on the formulation of the problem.
2. Failure to give inadequate (*sic*) attention to criteria and objectives.
3. Failure to recognize the iterative character of analysis.
4. Elimination of alternatives by means of arbitrary restraints.
5. The attempt to do more than is possible with the time and manpower available.
6. Compromising reality in the model to make it analytically tractable.
7. Emphasis on the statistical to the neglect of real uncertainty.
8. More interest in the model than in the problem it is being used to solve.
9. Failure to put adequate effort on treating the factors which are difficult to quantify.
10. Failure to attempt to use the model in order to improve the design of the system.
11. Optimizing on the analyst's own criteria.
12. Lack of realization that inquired can never be complete; overambition.[233]

Another factor that contributed to poor analysis was failure to understand the problem. The success of systems analysis depends to a great degree on how well attuned the analyst is to the needs of the customer. In too many cases, the analyst lacked firsthand knowledge and experience as to the pertinent military factors involved in their work.[234] But the effective systems analyst understood military affairs and the military ethos as well and tailored his approach accordingly.

The great expansion of analytical work in the early 1960s made the maintenance of strict quality control standards even more difficult. One key Army OR executive, Abraham Golub, the technical adviser to the deputy chief of staff for operations, summarized the problem when he wrote:

> In the decade of the sixties, under the combined influence of Secretary McNamara's support, Dr. Enthoven's publicity, and expanding budgets, "ORSA Activity" simply mushroomed. . . . I watched all this happen with mounting concern over the general lack of what might best be called "Quality Control." Now, I don't mean to say that everything that was done in that era was bad, but it seemed like every job shop in the country could get a piece of the action by simply advocating a "Systems Approach" to any problem.[235]

Golub went on to note that, as a result, the number of marginally adept ORSA analysts expanded, much of the work done ranged "from marginal to simply 'bad,'" and criticism of ORSA grew to the point that even Congress and President-elect Nixon "got on the bandwagon."[236]

Misperceptions and Manipulation

Many criticisms arose because the advocates of the new analytical methods failed to convince decision

makers that the new methods actually produced greater military effectiveness and also failed to fully inform decision makers of the limitations of the new methods. Such failures frequently resulted in misperceptions regarding systems analyses, cost-effectiveness analyses, and attempts to manipulate the analysis to support preconceived conclusions. To the uninitiated, systems analysis and cost-effectiveness analysis were "black arts" and thus thoroughly misunderstood. As a result, poorly informed critics leveled a number of charges against the new analytical methods. For example, they alleged:

- "In systems analysis, high speed electronic computers operated by crew-cut, young "Whiz Kids," are making major defense decisions."
- "Systems analysis is quantitative analysis; cost effectiveness is a substitute for judgment."
- "Systems analysis tends to disregard the military opinion of the relative value of the 'narrow edge' of superior operational performance, when considering the 'on the flat of the curve' concept."
- "Systems analysis is prejudiced against the introduction of new systems in favor of the retention of old."[237]

Several factors explain the criticisms that arose from the failure of ORSA practitioners to educate decision makers in the new analytical methods:

> First, the ORSA community lived in different worlds than the decisionmakers. Communication was difficult. The decisionmaker had technical breadth, the practitioner, technical depth.
> Second, ORSA types tend to be technique-oriented, rather than result-oriented.
> Third, the babel of technical jargon which guaranteed that decisionmakers cannot get the message quickly.
> Fourth, the tendency to present too much data for the decisionmaker to use, due in part to our modern computers.
> Fifth, incomplete staff work.
> Sixth, failure to establish the personal credibility necessary to convince decisionmakers.
> Seventh, is timeliness or urgency of study.[238]

Chief among the misperceptions of the faults, limitations, and pitfalls of the new techniques by nonanalysts was an unwarranted faith in the efficacy of systems analysis. All too often the customers of systems analysis were willing to accept blindly the conclusions of a systems study, particularly if the results of the study supported their own preconceived position.[239] R. D. Specht, an analyst at RAND, noted, "We have learned that while the world may be filled with practical people to whom any analysis is anathema, there is also too large a supply of those who have an exaggerated and unquestioning faith in the power of the analyst."[240] Specht's colleague at RAND, Alain Enthoven, also wrote that "many of the misgivings one hears expressed about the application of operations research or systems analysis to national policy questions seem to be based on the misapprehension that systems analysts believe that effectiveness can be measured in terms of a single number or scale as "bang for a buck."[241]

Another serious problem was the attempt by some decision makers to rig the outcome of analysis so as to support their own preconceived conclusions. In the face of unexpected alternatives or answers, some military clients were unhappy and demanded changes. As Willard E. Wilks warned: "Rule One of systems analysis, as defined at RAND is—do not accept the problem as stated by the client."[242] Seth Bonder was particularly concerned about this potential for skewing the results of systems analysis by rigging the analysis to support preconceived conclusions and wrote:

> The Office of the Secretary of Defense provided little or no guidance regarding political and budget constraints prior to performance of major systems studies. . . . The absence of effective communication and interaction between the services and the Systems Analysis Office created an apparent mistrust between them in the use of systems analysis studies. This resulted in an emphasis on conducting studies to substantiate requirements to the Systems Analysis Office rather than studies to determine requirements. This distinction is an operational one which can have a marked effect on the quality of systems analysis studies. Studies to substantiate requirements, such as required management positions, stifle the analyst and destroy the creative elements necessary to developing a thorough understanding of the system.[243]

The Diminution of Military Experience and Expertise

Perhaps the most heartfelt and persistent criticism of PPBS and the new analytical methods came from senior military officers who were concerned that the new centralized DOD decision-making system gave substantially greater weight to the calculations

of the young civilian systems analysts than to the professional judgment and intuition of experienced military leaders. Such criticisms arose less from any "military vs. civilian" conflict or even from denial of the efficacy of PPBS or the new methods of analysis than from a conflict between the old and new ways of making crucial decisions regarding the nation's defense.[244] As John J. Clark has written, the crux of the matter was that

> [t]he managerial concepts recently introduced to the United States Department of Defense place much less reliance than in the past on professional military judgment and experience and significantly more on quantitative and qualitative analysis, engineering and scientific studies, computer calculations, and cost-effectiveness yardsticks. The final determination of forces requirements, the key process in shaping the nation's military alignment, will no longer be decided by the Services or the Joint Chiefs of Staff but will rest with the Secretary of Defense and his assistants, military and civilian.[245]

The proponents of the new methods, such as Hitch and Enthoven, made a point of declaring that systems analysis was not a "substitute for sound and experienced military judgment," and that they were "in no way attempting to usurp the Service's function of the design of our forces."[246] But they remained adamant in their belief that the new methods were far superior to a reliance on the experience, judgment, and intuition of military officers.[247] Their argument was summarized by Enthoven and K. Wayne Smith, who wrote that "under financial pressure the Services will seek to keep the prestige items—the major combat units and the glamorous weapon systems—and cut back the unglamorous support items essential to readiness. The result is the hollow shell of military capability, not the substance."[248] Thus, despite the insistence of the barons of systems analysis that military experience and judgment were still held in high regard, the charge that the use of systems analysis seriously degraded the influence of military experience and judgment was not without foundation. It was clear to all that military experience and judgment would only be relied upon as a last resort after all means of "scientific" analysis had been exhausted.[249]

Anger and frustration over the new regime led a few senior military officers to express their opposition forcefully. A few were even prepared to echo the opinion of General George S. Patton, Jr., who shortly before World War II was informed that an auditor had uncovered a money shortage in one of his subordinate commands and replied vigorously, "All goddamn auditors ought to be in the bottom of hell."[250] Although some senior military officers no doubt hoped that McNamara and his Whiz Kids would soon join Patton's auditors, most expressed their concerns in more tactful ways. Writing in the September 1963 issue of *Armed Forces Management*, retired Army Chief of Staff George H. Decker warned that "while it is true that many good results can be expected from individual, civilian-dominated, independent review of military department proposals, due recognition must be given to the value of judgment of experienced military leaders."[251] And in a speech to the National Press Club in Washington, D.C., on 4 September 1963, Admiral George W. Anderson, Jr., said:

> I am concerned that . . . there may not be a full appreciation of the decisiveness of a narrow edge of performance, both to achieve maximum safety, and to succeed in combat . . . we feel emotionally aroused as well as dispassionately concerned if the recommendations of the uniformed chiefs of our services, each backed up by competent military and civilian professional staffs, are altered or overruled without interim consultation, explanation and discussion. . . . Both the experienced military man and the operations analysts are important contributors to the decision-making process. However, I am disturbed because now, in the Department of Defense, the operations analyst—properly concerned with 'cost effectiveness'—seems to be working at the wrong echelon—above the professional military level rather than in an advisory capacity to the military who should thoroughly appreciate this assistance. Specialists cannot, without danger, extrapolate their judgments into fields in which they do not have expert knowledge.[252]

Both sides had some justification for their position, but as the author of the 23 April 1964 Department of the Army letter on systems analysis and cost-effectiveness noted:

> Much of this talk is unfortunate, for it sets up false premises. Some of the arguments are in reality disagreements over the level at which certain studies are accomplished, or the level at which decisions are taken. They have little to do with the merits or demerits of cost effectiveness as a method. The

> contributions of both of these approaches are indispensable to sound decision making. Judgment based on experience and intuition must enter into the process at all levels. Without it, effectiveness cannot be established. But judgment needs and deserves the continuous support of all the facts and analyses which can be assembled.[253]

In general, the military critics of systems analysis were willing to accept the validity of the scientific underpinnings of the new management methods but were less willing to accept the proposition that effective defense decisions could be attained without regard to military experience and expertise. Moreover, many military officers were convinced that much of the analytical effort was directed at supporting the preconceived notions and plans of Secretary McNamara and his senior civilian managers.[254] However, the military opponents of the McNamara innovations were often guilty of not "doing their homework" and thus yielded the high ground to the civilian analysts in the DOD.[255]

Another frequent complaint of military personnel was that the life-and-death issues associated with war had become dominated by the electronic routines of computers. To be sure, systems analysts made frequent use of the speed, reliability, and low cost of high-speed digital computers to perform the calculations they believed necessary to solve a given problem. But the principal advocates of the new analytical methods, Hitch and Enthoven in particular, went to great lengths to dispel the notion that systems analysis and computers were somehow synonymous. Hitch and Roland N. McKean argued: "It cannot be stated too frequently or emphasized enough that economic choice is a way of looking at problems and does not necessarily depend upon the use of any analytical aids or computational devices."[256] Hitch also wrote, "I am the last to believe that an 'optimal strategy' can be calculated on slide rules or even high-speed computers. Nothing could be further from the truth."[257] Hitch's colleague, Alain Enthoven, who was reported to favor slide rules and the backs of envelopes for making calculations, believed the issue was something of a red herring and wrote:

> Analysis cannot supplant decision-making. Defense policy decisions cannot be calculated. . . . Some critics seem to believe that defense policies are being made on computers and that "optimal strategies" are being calculated on slide-rules. Nothing could be farther from the truth. Our approach is simply based on a belief that quantities are relevant and have to be considered carefully in the making of policy decisions. As far as I know, no responsible Defense official believes that it is possible to calculate the answers to major national security policy questions.[258]

Analytical Methods and the Nature of War

Although there were few critics who denied the usefulness of the new analytical techniques altogether, some argued that systems analysis and cost-effectiveness analysis should not be applied to matters of national defense or the conduct of war. For them, such matters were not suitable subjects for quantification and mathematical analysis. One such severe critic of systems analysis, Seth Bonder, argued forcefully that systems analysis was "a purely intellectual activity," was "inappropriately performed," and ought never to have been "used in the management of defense resources."[259] And another strong critic of the McNamara approach to defense decision making, Eliot A. Cohen, writing in the November 1980 issue of *The American Spectator*, noted that the systems analysis approach had been criticized by any number of knowledgeable military experts, such as S. L. A. Marshall, Hyman Rickover, Curtis LeMay, and Hanson Baldwin, but that it had appealed particularly to social and natural scientists who were the majority of this country's strategists and students of military affairs.[260] Cohen's main criticism of systems analysis was that

> [i]t does not treat war as a unique phenomenon that requires application and experience—real or vicarious—in order to be understood. . . . Centralized control of military forces may be necessary but it should come from an understanding of war as a complicated and difficult art, not from overweening confidence in the lore of economics.[261]

He goes on to point out that if we accept systems analysis we must also accept its fundamental, yet often hidden, propositions.[262] Among those hidden propositions is the idea that there is no distinct field of military or political-military study and knowledge because all knowledge is essentially economic. Among the propositions implicit in the new methods of analysis was the idea that we can know "how much is enough," even about war, a proposition that is patently

absurd. Many proponents of systems analysis also believed that their methods were useful not only for the direction of procurement and other logistical and administrative activities but for the formulation of strategy and tactics as well. Such beliefs, enshrined in such works as Hitch and McKean's *Economics of Defense in the Nuclear Age*, aroused a great deal of concern, particularly among military personnel, that the advocates of systems analysis showed "insufficient respect for the human factors that go into successful military defense planning," and that the new analytical techniques dismissed such vital but intangible factors in war as morale, discipline, leadership, integrity, and courage.[263] Thus, as Air Force Capt. Gerald J. Garvey has noted:

> The strongest and frequently the most persuasive charge leveled against the use of mathematical analytical techniques is that they tend to ignore something known as the "human factor." It is often alleged by critics of analysis that human nature can never be quantified; that the logic of human events is never so inexorable as mathematical formulas imply; that life is shot full of uncertainties and statistical hazards which tend to be simplified away in abstract conceptualism of the type made famous (or infamous) by modern defense analysis.[264]

Concern over the applicability of the new analytical techniques to warfare was sometimes manifested by military officers as a concern that their traditional role as leaders was being somehow reduced and subordinated to their new role as managers of resources. This concern was widespread and often intense, but as the 23 April 1964 Department of the Army letter stated:

> Attention to cost and alternatives sometimes carries a connotation of being a "desk soldier" and an unsoldierly concern for "management" as opposed to "leadership." This notion reflects the soldier's attitude toward combat in which he is personally involved. But it represents a one-sided view of military responsibility. Planning the intelligent use of resources is an integral element of military leadership at every level. At levels above battalion, and particularly in time of peace, it necessarily assumes a progressively larger share of attention. The true professional soldier is meeting this challenge with the same skill and ingenuity that he has devoted to the other demanding tasks of his calling.[265]

In truth, the application of scientific business management techniques and methods of economic analysis to the making of American defense policy have not been altogether satisfactory. Such businesslike aspects of the Army as weapons development, procurement, fiscal accounting, and inventory control have undoubtedly been improved, but the use of techniques suitable, even necessary, for controlling the administrative and logistical activities of the Army have spilled over into areas traditionally considered the province of the military professional alone. Many military officers are uncomfortable with the application of what they consider to be business methods to clearly military matters such as combat leadership, command and control, and the formulation of strategy and tactics. This uneasiness perhaps reflects an independent discovery of the distinction that Claus von Clausewitz posits between "the preparation for war" and "the conduct of war itself."[266]

President Calvin Coolidge is reputed to have once said that "the business of America is business."[267] While that may be true, the wholesale application of methods of economic analysis to the direction of our military institutions raises some rather important questions. Is making war really just like making an automobile? Is the Army just another large corporation and thus to be managed by methods designed to produce a favorable balance sheet at the end of the year? Can an army be efficient? Should it be? Are the methods suitable for managing the preparation for war equally useful for directing the conduct of war? And finally, the key question: Is war a rational undertaking subject to the operation of immutable laws and thus amenable to rational methods of control? Voices continue to be raised on both sides of the issue of the efficacy of using industrial management techniques to manage the Army. Only one thing is certain: the system can never be fully rationalized because it is composed, like all large bureaucratic enterprises, of that most irrational element—human beings. War, being a peculiarly human activity, is not a matter amenable to fractional economic analysis, to computer modeling, or to numerical precision.

Conclusion

Since the late nineteenth century, Army leaders, in an effort to gain and maintain some measure of rational control over increasingly large, complex, and

costly military activities, have repeatedly turned to the business and industrial community for techniques and experts to help solve the enormous problems of managing the military affairs of a great modern world power. That process reached its apogee in the early 1960s with the so-called McNamara revolution in defense decision making, but it did not stop there. The McNamara reforms simply marked the end of one era and the beginning of another, an age in which military leaders were forced to employ the techniques of economic analysis and obey its dictates irrespective of their professional judgment regarding the needs of their services. PPBS, systems analysis, and cost-effectiveness analysis were not intended by their advocates solely for the management of the Army's logistical and administrative operations. McNamara and his followers sought to extend the use of their scientific methodology to matters such as strategy and tactics, which earlier had been the exclusive province of the military professional.

The massive influx of civilian experts from business and academia into the management levels of the Department of Defense also transformed the relationship between professional military officers of experience and knowledge and civilians temporarily in the military service. While the traditional civilian control of the military in the political sense continued to be observed, to it was added a new and more novel concept of civilian expertise controlling military affairs and military professionals at every level. Ignorant of the battlefield except in the abstract and extravagant in the exercise of their newfound authority, the civilian advocates of "scientific" management imposed the standards and values of the marketplace and classroom on people and activities that had nothing whatsoever to do with profit or loss in the economic sense but rather with the entirely human business of war.

The centralized defense decision-making process established by Secretary McNamara and the Whiz Kids was not, as even they admitted, a panacea. Of course, the new methods did achieve many of their goals. After 1961, PPBS, systems analysis, and cost-effectiveness analysis became established procedures in the DOD. As a result, defense planning and budgeting were significantly improved, and the independence of the services in the choice of new weapons and strategies was curtailed in favor of a coordinated DOD-wide program that better assigned priorities, avoided duplication, and eliminated unnecessary development and procurement. DOD Comptroller Hitch offered the opinion that he and his colleagues had successfully created "an environment in which quantitative analysis can flourish and be employed effectively."[268] He also stated that OR (in which he included systems analysis) had made "two tremendously important contributions of lasting significance":

> (1) First, it has had a favorable influence on attitudes [i.e., it has stimulated "scientific" inquiry] . . . (2) Secondly, operations research has demonstrated the tremendous range of alternatives open to those who make military decisions—what economists call opportunities for substitution. . . . In fact the invention of new alternatives, new weapons systems, new ways to accomplish military objectives, may prove to be the operations researcher's most constructive and valuable role.[269]

Perhaps the salient characteristic of Secretary McNamara's reforms was the increased emphasis on planning for the future. As Donald Meals wrote in 1961:

> A decade ago existing systems were to be rendered optimal in their performance. Now our dominant role is that of guiding developmental decisions toward effective future systems. We deal with equipment we may never see, much less test, in combat. As a result, new emphases have emerged. Among these are: 1. Studies of strategy seeking to identify basic courses of military action; 2. Determination of requirements imposed by changes in national strategy and technology; 3. Performance specifications or the translation of requirements into operational terms; 4. Comparison of systems to assist in selecting from candidates; 5. Development of tactical doctrine or the optimal utilization of the chosen system.[270]

Despite the achievements of McNamara and the Whiz Kids, much remained to be done. For one thing, the acceptance of PPBS and the new analytical methods took time. As late as 1967, William P. Snyder wrote that the extension of systems analysis in the military services still faced many obstacles, including the scarcity of qualified analysts; the reluctance of decision makers to create the institutional environment necessary for quality analytical work; and continuing skepticism regarding the new analytical techniques.[271] Enthoven and Smith also noted that there was still "much unfinished business"

when the McNamara cohort left the Pentagon in 1969. That unfinished business, they wrote, fell into four principal categories: "(1) Need for More Effective and Balanced Outside Review and Interrogation, (2) Improving the Quality of Information Presented to the Secretary of Defense, (3) Lack of Adequate Financial Discipline, and (4) Strengthening Some Procedural Links."[272]

Speaking at the thirteenth Army Operations Research Symposium in 1974, Abraham Golub noted: "In the two or three year period centered around 1970, many members of the military ORSA Community began to react to the mounting criticism," and symposium themes and addresses began to question and critique the current state of operations research and systems analysis.[273] Golub went on to identify a number of actions needed to improve the state of the analytical art. His recommendations included the need to:

- Define the type of services we are providing
- Purge the analytic quacks and earn greater credibility.
- Sharpen up the procedures and techniques we now take for granted.
- Use military operations research resources more efficiently, especially computer.
- Remove obstacles to innovation in ORSA.
- Develop a code of ethics to be applied to contractor organizations.
- Adapt to change in the Defense environment and declining Defense funding.
- Develop a hierarchy of models with varying levels of resolution.
- Develop a disciplined set of measures of effectiveness applicable to Army systems.
- Gain a better understanding of the ways in which night operations differ from day operations.
- Structure a better framework and methods for storage and retrieval of the accumulated body of ORSA work and knowledge.[274]

McNamara resigned from his position as secretary of defense effective 29 February 1968, in part because of his failure to properly manage the war in Vietnam, but his ghost continues to walk the halls of the Pentagon, and the question of whether or not the new scientific methods of defense management that he introduced in the early 1960s were good or bad remains still unanswered today. Surely such methods did not successfully solve all of the military's pressing problems, and in some cases they even exacerbated existing problems or created new ones. But they had some positive effects, particularly in the more efficient management of the services' businesslike operations so necessary in the preparation for war. The real question perhaps is not whether the use of such methods is effective or ineffective but whether there is, in fact, any other alternative. In the end, both the advocates and the opponents of the analytical techniques introduced by Secretary McNamara acknowledged that they still had to rely on experience, judgment, and intuition to answer the most important questions about waging war.

CHAPTER TWO NOTES

[1] Alain C. Enthoven, "Introduction," in *A Modern Design for Defense Decision: A McNamara-Hitch-Enthoven Anthology,* Samuel A. Tucker, ed. (Washington, D.C.: Industrial College of the Armed Forces [ICAF], 1966), p. 5; Lt Gen August Schomburg (Commandant, ICAF), "Foreword," in *A Modern Design for Defense Decision*, Tucker, ed., p. iii.

[2] Robert S. McNamara, *The Essence of Security: Reflections in Office* (New York: Harper & Row, 1968), p. 87; Robert S. McNamara, "Managing the Department of Defense," in *A Modern Design for Defense Decision*, Tucker, ed., p. 12.

[3] McNamara, "Managing the Department of Defense," p. 14.

[4] Charles J. Hitch, "Operations Analysis in the Department of Defense," in U.S. Department of the Army, Office of the Adjutant General, *Department of the Army Letter on Systems Analysis and Cost Effectiveness* (Washington, D.C.: Office of the Adjutant General, U.S. Department of the Army, 23 Apr 1964), Incl 6, p. 2.

[5] Charles J. Hitch, *Decision-Making for Defense,* H. Rowan Gaither Lectures in Systems Science (Berkeley and Los Angeles: University of California Press, 1965), p. 23.

[6] Ibid.

[7] Edmund T. Pratt, Jr., "Challenges in Army Operations Research," in *Proceedings of the [Second] United States Army Operations Research Symposium, 26, 27, 28 March 1963, Durham, North Carolina, Part I* (Durham, N.C.: Operations Research Technical Assistance Group, U.S. Army Research Office-Durham, 1963), p. 92.

[8] McNamara, *The Essence of Security*, p. 88.

[9] Robert S. McNamara, "Decision-Making in the Department of

Defense," in *A Modern Design for Defense Decision*, Tucker, ed., p. 23.

[10] Gregory Palmer, *The McNamara Strategy and the Vietnam War: Program Budgeting in the Pentagon, 1960–1968*, Contributions in Political Science, no. 13 (Westport, Conn.: Greenwood Press, 1978), pp. 48–49.

[11] Jack Raymond, *Power at the Pentagon* (New York, Evanston, and London: Harper & Row, 1964), p. 288.

[12] James E. Hewes, *From Root to McNamara: Army Organization and Administration, 1900–1963* (Washington, D.C.: U.S. Army Center of Military History, 1975), p. 366.

[13] Ibid., p. 304.

[14] The following details of McNamara's biography are drawn primarily from the article by George C. Herring in Roger J. Spiller and Joseph G. Dawson III, eds., *Dictionary of American Military Biography*, vol. II: H–P (Westport, Conn.: Greenwood Press, 1984), pp. 699–702; the article by John F. Vukovits in Charles R. Shrader, gen. ed., *Reference Guide to United States Military History, 1945 to the Present* (New York: Facts on File, 1995), pp. 206–07; and Raymond, *Power at the Pentagon*, pp. 281–83.

[15] See ch. 1, above.

[16] Hewes, *From Root to McNamara*, p. 86, note 4.

[17] David L. Hay, *Bomber Businessmen: The Army Air Forces and the Rise of Statistical Control, 1940–1945* Ph.D. diss. (University of Notre Dame, Apr 1994), abstract.

[18] James M. Roherty, *Decisions of Robert S. McNamara: A Study of the Role of the Secretary of Defense* (Coral Gables, Fla.: University of Miami Press, 1970), p. 65.

[19] Hay, *Bomber Businessmen*, p. 326.

[20] Raymond, *Power at the Pentagon*, p. 10.

[21] Robert S. McNamara with Brian VanDeMark, *In Retrospect: The Tragedy and Lessons of Vietnam* (New York: Random House, 1995).

[22] Raymond, *Power at the Pentagon*, p. 10; Douglas Kinnard, "McNamara at the Pentagon," *Parameters: The Journal of the United States Army War College* 10, no. 3 (September 1980), p. 23.

[23] Palmer, *The McNamara Strategy and the Vietnam War*, p. 49. While an executive at Ford, McNamara lived in the college community of Ann Arbor rather than in upscale Grosse Pointe where most Ford executives lived (see Raymond, *Power at the Pentagon*, p. 282).

[24] Kinnard, "McNamara at the Pentagon," p. 22.

[25] Claude Witze, "Cost/Effectiveness—Tool or Club?" in *Department of the Army Letter on Systems Analysis and Cost Effectiveness*, Incl. 10, pp. 32–33.

[26] For a brief synopsis of McNamara's management views, see Solis Horwitz, "The Management Concept of Mr. Robert S. McNamara, The Secretary of Defense," *Army Management Views* IX, pt. 1 (1963–1964), pp. 1–24.

[27] McNamara, *The Essence of Security*, p. 119.

[28] Charles J. Hitch, "Management Problems of Large Organizations," *Operations Research* 44, no. 2 (March–April 1996), p. 258.

[29] The following details of Hitch's biography are drawn primarily from "Hitch, Charles Johnston," *Who Was Who in America, Volume XI: 1993–1996* (New Providence, N.J.: Marquis Who's Who, 1996), p. 131; Raymond, *Power at the Pentagon*, pp. 302–05; Alain C. Enthoven, "Tribute to Charles J. Hitch," *OR/MS Today* (December 1995), www.lionhrtpub.com/orms/orms-12-95/hitch-tribute.html, downloaded 5 April 2004; Frederick E. Balderston, Clark Kerr, and Angus E. Taylor, "In Memoriam—Charles Johnston Hitch, Economics: Berkeley" (University of California, 1995) http://dynaweb.oac.cdlib.org:8088/dynaweb/uchist/public/inmemoriam/immemorium1995/, downloaded 5 April 2004; "Charles J. Hitch, 8th President of ORSA, 1959–1960," www.informs.org/History/Gallery/Presidents/ORSA/charlesj_8.htm, downloaded 29 November 2004; and the article by Charles R. Shrader in Shrader, gen. ed., *Reference Guide to United States Military History, 1945 to the Present*, p. 192. Copies of all documents cited as downloaded from the Internet are in the possession of the author.

[30] Hitch was the first American Rhodes Scholar ever invited to stay at Oxford as a faculty member (see Enthoven, "Tribute to Charles J. Hitch," p. 1).

[31] Witze, "Cost/Effectiveness—Tool or Club?" p. 33; John G. Waggener, "Scientific Military Decision Making," *Military Review* 49, no. 10 (October 1969), p. 62; John C. Ries, *The Management of Defense* (Baltimore: The Johns Hopkins University Press, 1964), p. 189, note 64.

[32] Enthoven, "Tribute to Charles J. Hitch," p. 2; Raymond, *Power at the Pentagon*, p. 303; Witze, "Cost/Effectiveness—Tool or Club?" p. 33; Waggener, "Scientific Military Decision Making," p. 62; Ries, *The Management of Defense*, p. 189, note 64.

[33] Charles J. Hitch, "The New Approach to Management in the U.S. Defense Department," *Management Science* 9, no. 1 (October 1962), p. 1.

[34] Enthoven, "Tribute to Charles J. Hitch," p. 2.

[35] Balderston, Kerr, and Taylor, "In Memoriam—Charles Johnston Hitch," p. 2.

[36] Enthoven, "Tribute to Charles J. Hitch," p. 4.

[37] Hitch, "Management Problems of Large Organizations," pp. 263–64.

[38] Charles J. Hitch, "Operations Research in the Office of the Secretary of Defense," in *Proceedings of the [Second] United States Army Operations Research Symposium . . . Part I*, p. 9.

[39] Lewis Sorley, "Enthoven, Alain Charles," in *Reference Guide to United States Military History, 1945 to the Present*, Shrader, gen. ed., p. 185.

[40] See Gen Ferdinand J. Chesarek (USA Ret.), *Oral History Interviews with General Ferdinand J. Chesarek by Lt. Col. Richard Lawrence and Lt. Col. James Agnew*, USAWC/USAMHI Senior Officers Oral History Program, Interv no. 1, 25 Feb 1971 (Carlisle Barracks, Pa.: U.S. Army War College/U.S. Army Military History Institute, 1971), pp. 50–52 passim.

[41] The following details of Enthoven's biography are drawn primarily from "Enthoven, Alain Charles," *Who's Who in America–2004*, 58th ed., vol. I: A–K (New Providence, N.J.: Marquis Who's Who, 2004), p. 1489; Sorley, "Enthoven, Alain Charles," pp. 1, 185; "Alain C. Enthoven," Stanford Graduate School of Business faculty biography, http://gobi.stanford.edu/facultybios/bio.asp?ID=40, downloaded 5 April 2004; "Alain C. Enthoven," short biographical sketch dated June 2000, www.nhshistory.net/cventhoven.htm, downloaded 5 April 2004. Copies of all material downloaded from the Internet are in the possession of the author.

[42] The Office of Systems Analysis, originally known as the Weapons Systems Analysis Directorate, was a subordinate element of the Office of the Assistant Secretary of Defense (Comptroller).

[43] Wilbur B. Payne, "Operations Research—A View from the Pentagon," in *Proceedings of the [Third] United States Army Operations Research Symposium, Part I: Unclassified Papers* (Durham, N.C.: Operations Research Technical Assistance Group, U.S. Army Research Office-Durham, May 1964), p. 5.

[44] Hitch, "Operations Research in the Office of the Secretary of Defense," pp. 9–10; Hitch, *Decision-Making for Defense*, p. 57.

[45] Hitch, *Decision-Making for Defense*, p. 57.

[46] Palmer, *The McNamara Strategy and the Vietnam War*, p. 49. Later, the focus of power would shift, first to the Joint Chiefs and the services under the concept of "participatory management" during the first Nixon administration and then back to the successor of OSA, the Office of the Assistant Secretary of Defense (Program Analysis and Evaluation) (see Seth Bonder, "Systems Analysis: A Purely Intellectual Activity," in *Proceedings of the Thirteenth Annual United States Army Operations*

Research Symposium (AORS XIII), 29 October–1 November 1974, Fort Lee, Virginia, Volume II [Fort Lee, Va.: U.S. Army Concepts Analysis Agency, 1974], p. 802).

[47] Charles J. Hitch, *Statement of Assistant Secretary of Defense Charles J. Hitch, before the Military Operations Subcommittee of the House Committee on Government Operations* (Washington, D.C.: U.S. Congress, House of Representatives, Committee on Government Operations, 25 Jul 1962), pp. 7–8.

[48] Clark A. Murdock, *Defense Policy Formation: A Comparative Analysis of the McNamara Era* (Albany, N.Y.: State University of New York Press, 1974), pp. 77–78. According to Murdock, McNamara quickly became disenchanted with inane Pentagon briefings (at one such briefing McNamara was shown a picture of an airplane in flight and was told, "here is an airplane going fast") and the low quality (from his point of view) of military staff work, which, as one OSA analyst related, was "all waffled—that is, staff committee work reflecting the compromises typical of committees."

[49] Quoted in Murdock, *Defense Policy Formation*, p. 79.

[50] Murdock, *Defense Policy Formation*, p. 85.

[51] Ibid., p. 76; Gerald Regis Wetzel, *Analysis of Balance: An Allocation of Officer Resources to Maximize Efficiency of Operations Research in the Army,* M.B.A. thesis (George Washington University, 30 Sep 1969), p. 17.

[52] Craig Powell, "Have the Services Learned to Live with the Office of Systems Analysis?" *Armed Forces Management* 12, no. 1 (October 1965), p. 76. The four division chiefs were Russell Murray (responsible for all general purpose, tactical, air and sealift, and Reserve and National Guard forces); Fred Hoffman (responsible for strategic and air defense forces, to include tactical nuclear capabilities); Harold Asher (responsible for costing); and Steven Enke (responsible for economic studies).

[53] Wetzel, *Analysis of Balance*, p. 17.

[54] Murdock, *Defense Policy Formation*, p. 86.

[55] Ibid., p. 91. Of course, the OSA was also more than capable of analyzing the facts in such a way as to support its position.

[56] Ibid., p. 86.

[57] Ibid., p. 100.

[58] The sobriquet of "Whiz Kids" was a play on "Quiz Kids," a popular 1930s radio game show, and had earlier been applied to Robert McNamara and his associates from the Army Air Forces Statistical Control Division who worked at Ford Motor Company after World War II. "Whiz Kids" were also to be found in the Office of the Assistant Secretary of Defense (Comptroller) and other DOD offices, but they dominated the OSA.

[59] Herman R. Staudt, *The D.O.D. Decision Making Process,* M.S. thesis (Massachusetts Institute of Technology, 1 May 1968), p. 85, based on interviews with OSA staff members.

[60] Murdock, *Defense Policy Formation*, p. 85.

[61] Allen W. Wiegand, "Military Participation in Systems Analyses," *Signal* 21, no. 4 (December 1966), p. 7.

[62] William P. Snyder, *Case Studies in Military Systems Analysis,* ICAF National Security Management Seminar (Washington, D.C.: Industrial College of the Armed Forces, 1967), p. 2.

[63] Note, Col Robert Gerard (USA, Ret.) to the author, 15 Jun 2004.

[64] Wiegand, "Military Participation in Systems Analyses," p. 8.

[65] Murdock, *Defense Policy Formation*, p. 100.

[66] U.S. Department of Defense, Office of the Secretary of Defense, "Annual Report of the Secretary of Defense for Fiscal Year 1961," in U.S. Department of Defense, Office of the Secretary of Defense, *Annual Report of the Secretary of Defense and the Annual Reports of the Secretary of the Army, Secretary of the Navy, Secretary of the Air Force, for Fiscal Year 1961* (Washington, D.C.: Government Printing Office, 1962), pp. 4–5.

[67] Quoted in "Annual Report of the Secretary of Defense for Fiscal Year 1961," p. 5.

[68] McNamara, *The Essence of Security*, p. 88.

[69] Snyder, *Case Studies in Military Systems Analysis*, p. 1.

[70] Robert S. McNamara, "The Foundation for Defense Planning and Budgeting," in *A Modern Design for Defense Decision: A McNamara-Hitch-Enthoven Anthology*, Tucker, ed., pp. 34–35.

[71] McNamara, "Managing the Department of Defense," p. 15.

[72] Enthoven, "Introduction," in *A Modern Design for Defense Decision*, Tucker, ed., p. 7.

[73] McNamara, "Managing the Department of Defense," p. 15.

[74] Snyder, *Case Studies in Military Systems Analysis*, p. iii.

[75] Murdock, *Defense Policy Formation*, p. 1.

[76] Ibid.

[77] Alain C. Enthoven, "Systems Analysis and Decision Making," *Military Review* 43, no. 1 (January 1963), p. 7.

[78] Raymond, *Power at the Pentagon*, p. 302.

[79] On the defects of the pre-1961 defense planning and budgeting system see, *inter alia*, Hitch, *Decision-Making for Defense*, pp. 23–26; Hitch, "Management Problems of Large Organizations," p. 259; Hitch, *Statement . . . before the Military Operations Subcommittee*, p. 38.

[80] U.S. Department of Defense, Office of the Assistant Secretary of Defense (Comptroller), Directorate for Systems Planning, *Study Report on the Programming System for the Office of the Secretary of Defense* (Washington, D.C.: Directorate for Systems Planning, Office of the Assistant Secretary of Defense [Comptroller], U.S. Department of Defense, 25 Jun 1962), p. I–1.

[81] Hitch, *Decision-Making for Defense*, pp. 26–27.

[82] Ibid., p. 27. See Charles J. Hitch and Roland N. McKean, *The Economics of Defense in the Nuclear Age,* RAND R–346 (Santa Monica, Calif.: RAND Corporation, Mar 1960).

[83] Hitch, "The New Approach to Management in the U.S. Defense Department," p. 2.

[84] Charles J. Hitch, "The Systems Approach to Decision-Making in the Department of Defense and the University of California," *Operations Research* 19 (Special Conference Issue: Decision-Making) (Apr 1968), p. 38.

[85] Hitch, *Decision-Making for Defense*, p. 29; Hitch, "Management Problems of Large Organizations," p. 259. The Five-Year Force Structure and Financial Program was later renamed the Five-Year Defense Program (FYDP).

[86] Ibid.

[87] Murdock, *Defense Policy Formation*, p. 50.

[88] Hitch, "The New Approach to Management in the U.S. Defense Department," p. 3. Hitch headed a task force to review strategic forces in the FY 1962 budget, and Paul Nitze headed a task force to review the conventional forces (see Hitch, "Management Problems of Large Organizations," p. 258).

[89] Quoted in *Study Report on the Programming System for the Office of the Secretary of Defense*, p. I–1.

[90] Hitch, "The New Approach to Management in the U.S. Defense Department," p. 2.

[91] Hitch, *Decision-Making for Defense*, pp. 28–29.

[92] Hitch, "The New Approach to Management in the U.S. Defense Department," p. 4. The new planning, programming, and budgeting system was designed to achieve seven major goals: (1) planning oriented around major missions; (2) ability to relate resource inputs to military output; (3) coordination of long-range planning with budgeting; (4) continuous appraisal of programs; (5) progress reporting; (6) ability to make cost-effectiveness studies; and (7) integration of OSD information systems (see *Study Report on the Programming System for the Office of the Secretary of Defense*, pp. I–1 to I–3).

[93] Ibid.

[94] *Study Report on the Programming System for the Office of the Secretary of Defense*, p. I–1.

[95] Hitch, *Statement . . . before the Military Operations Subcommittee*, pp. 2–3.

[96] Charles J. Hitch, "Plans, Programs, and Budgets in the Department of Defense," *Operations Research* 11, no. 1 (January–February 1963), p. 6. The description of the PPBS cycle, which was complex and changed over time, has been described often and need not be repeated here. For a brief overview of PPBS and its application in HQDA, see Brig. Gen. Leonard C. Shea, "Planning, Programming, and Budgeting at Department of the Army Headquarters," *Army Management Views* IX, pt. 1 (1963–1964), pp. 65–89. On the details of the PPBS cycle, see, *inter alia*, Maj Lorentz A. Feltes, "Planning, Programming, and Budgeting: A Search for a Management Philosopher's Stone," *Air University Review* XXVII, no. 2 (January–February 1976), pp. 85–95; "Annual Report of the Secretary of Defense for Fiscal Year 1961," pp. 25–28; U.S. Department of Defense, Office of the Secretary of Defense, "Annual Report of the Secretary of Defense for Fiscal Year 1962," in U.S. Department of Defense, Office of the Secretary of Defense, *Annual Report of the Secretary of Defense and the Annual Reports of the Secretary of the Army, Secretary of the Navy, Secretary of the Air Force, for Fiscal Year 1962* (Washington, D.C.: Government Printing Office, 1963), pp. 30–33; Murdock, *Defense Policy Formation*, pp. 50–53 and pp. 81–86; and Roherty, *Decisions of Robert S. McNamara*, pp. 74–81.

[97] McNamara's use (and abuse) of the PPBS is discussed in Ronald Randall, "Presidential Use of Management Tools from PPB to ZBB," *Presidential Studies Quarterly* XII, no. 2 (Spring 1982), p. 187.

[98] In his FY 1961 report to Congress, Secretary McNamara promised that "The new procedures . . . will supplement, not replace, the traditional budget structure. They will provide an additional way of looking at Defense activities, thus facilitating the rational analysis of our national security problems" (see "Annual Report of the Secretary of Defense for Fiscal Year 1961," p. 25).

[99] Hitch, *Decision-Making for Defense*, p. 39.

[100] Palmer, *The McNamara Strategy and the Vietnam War*, p. 129.

[101] Ries, *The Management of Defense*, p. 189.

[102] John J. Clark, "The Management of National Defence by Systems Analysis: An Evaluation," *The Royal United Service Institution Journal* 109, no. 636 (November 1964), p. 300.

[103] McNamara, *The Essence of Security*, p. 95.

[104] Charles J. Hitch, "Management Problems of Large Organizations," *Operations Research* 44, no. 2 (March–April 1996), p. 258.

[105] Gen George H. Decker, "Costing Strategy," in *Department of the Army Letter on Systems Analysis and Cost Effectiveness*, Incl 9, p. 38.

[106] Hitch, "The Systems Approach to Decision-Making in the Department of Defense and the University of California," p. 38.

[107] Hitch, "Operations Analysis in the Department of Defense," pp. 4–6.

[108] Lyndon B. Johnson, "Introduction of New Government-Wide Planning and Budgeting System," in *A Modern Design for Defense Decision*, Tucker, ed., p. 213.

[109] Ibid., p. 213 note and p. 214; Murdock, *Defense Policy Formation*, p. 187, note 18.

[110] Johnson, "Introduction of New Government-Wide Planning and Budgeting System," p. 214.

[111] Hitch, "Management Problems of Large Organizations," pp. 260–61. Also quoted in Enthoven, "Tribute to Charles J. Hitch," pp. 2–3.

[112] The nature and application of the new techniques of analysis were summarized in a 23 April 1964 Department of the Army letter "intended to provide to all Army agencies guidance and information on the subjects of systems analysis and cost effectiveness . . . procedures and techniques, [which] if properly and thoughtfully used, can materially assist the decision maker" (see *Department of the Army Letter on Systems Analysis and Cost Effectiveness*, p. 1). See also U.S. Department of the Army, *Department of the Army Pamphlet No. 7–5: Mathematics of Military Action, Operations and Systems* (Washington, D.C.: Government Printing Office, Jan 1968), the only comprehensive Army publication regarding operations research.

[113] McNamara, *The Essence of Security*, p. 95.

[114] Clark, "The Management of National Defence by Systems Analysis: An Evaluation," p. 298.

[115] Alain C. Enthoven, "Economic Analysis in the Department of Defense," *American Economic Review—Papers and Proceedings* 53, no. 2 (May 1963), p. 413.

[116] Clark, "The Management of National Defence by Systems Analysis: An Evaluation," p. 298.

[117] Palmer, *The McNamara Strategy and the Vietnam War*, p. 7.

[118] Roger A. Forder, "Operational Analysis in Defence—A Retrospect" (Defence Evaluation and Research Agency, 2000), p. 19, Internet download, August 2003; copy in possession of the author.

[119] Hay, *Bomber Businessmen*, p. 322.

[120] William T. Bradley, *Operations Research in the Armed Services*, student individual study (Carlisle Barracks, Pa.: U.S. Army War College, 18 Feb 1957), p. 26.

[121] Hugh J. Miser, "Science and Professionalism in Operations Research," *Operations Research* 35, no. 2 (March–April 1987), pp. 316–17; Hay, *Bomber Businessmen*, p. 322.

[122] Edward S. Quade, ed., *Analysis for Military Decisions* (Chicago: Rand McNally, 1966), p. v. The course lectures were subsequently published in U.S. Air Force Project RAND, *An Appreciation of Analysis for Military Decisions Presented in the RAND Corporation's Systems Analysis Course*, RAND B–90 (Santa Monica, Calif.: RAND Corporation, 19 Jan 1959), and in Quade, ed., *Analysis for Military Decisions*.

[123] A number of the common definitions of operations research, systems analysis, and cost-effectiveness analysis are included in U.S. Department of the Army, Army Study Advisory Committee, *Main Report: Army Study Advisory Committee Examination of the Army's Operations Research/Systems Analysis Personnel Requirements* (Washington, D.C.: Office of the Director of Special Studies, Office of the Chief of Staff, Department of the Army, 30 Aug 1966), app. A.

[124] U.S. Department of the Army, Office of the Chief of Staff, Systems Analysis Division, "Systems Analysis as a Part of the Total Management Process (Part I)," in *Department of the Army Letter on Systems Analysis and Cost Effectiveness*, Incl 1, p. 2; McNamara, "Managing the Department of Defense," p. 15. In the same article, McNamara also noted that systems analysis "takes a complex problem and sorts out the tangle of factors. It aims to assist the decision maker by furnishing him with quantitative estimates of the effectiveness and costs of each of the alternative course which he could choose."

[125] Enthoven, "Systems Analysis and the Navy," p. 161. Elsewhere ("Operations Research at the National Policy Level," p. 149) Enthoven identifies systems analysis as "operations research at the national policy level."

[126] James H. Hayes, "Basic Concepts of Systems Analysis," *Military Review* 45, no. 4 (April 1965), pp. 5–6.

[127] U.S. Department of the Army, *Army Regulation No. 320–5: Dictionary of United States Army Terms* (Washington, D.C.: Government Printing Office, Apr 1965), p. 405. Oddly enough, the 23 March 1994 edition of *Joint Chiefs of Staff Publication No. 1–02*, the official DOD dictionary of military terms, *does not* contain a definition of either systems analysis or cost-effectiveness analysis.

[128] U.S. Air Force, *Air Force Regulation No. 173–1: Air Force Cost Analysis Program* (Washington, D.C.: Government Printing Office, 27 Sep 1965), p. 2.

[129] Donald D. Bridenbaugh, *Must the Military Staff Officer Be a Specialist in Systems Analysis?* USAWC student essay (Carlisle Barracks, Pa.: U.S. Army War College, 18 Mar 1968), p. 4.

[130] Enthoven, "Systems Analysis and Decision Making," p. 8.

[131] Hitch, "Plans, Programs, and Budgets in the Department of Defense," p. 8.

[132] Snyder, *Case Studies in Military Systems Analysis*, pp. 215–16.

[133] Quade, *Military Systems Analysis*, p. 28.

[134] Charles J. Hitch and Ronald N. McKean, "Economic Choice in Military Planning," in *Managerial Economics and Operations Research: A Non-Mathematical Introduction*, Edwin Mansfield, ed. (New York: W. W. Norton, 1966), pp. 215–17. See also Charles J. Hitch, "Analysis for Air Force Decisions," in U.S. Air Force Project RAND, *An Appreciation of Analysis for Military Decisions*, p. 2–2, and Hitch, *Statement . . . before the Military Operations Subcommittee*, p. 6. Hitch notes that operations research and systems analysis both have the same essential elements. See also Quade, *Military Systems Analysis*, pp. 7–8 and 12; Waggener, "Scientific Military Decision Making," pp. 65–66; and James H. Hayes, "Systems Analysis," *Army* 14, no. 7 (February 1964), p. 42.

[135] Enthoven, "Systems Analysis and Decision Making," p. 17.

[136] Quade, "The Pitfalls of Analysis," pp. 15–3 to 15–4.

[137] Enthoven, "Systems Analysis and the Navy," pp. 173–76.

[138] Wohlstetter, "Objectives," pp. 7–3.

[139] Quade, *Military Systems Analysis*, p. 23.

[140] Hitch, *Statement . . . before the Military Operations Subcommittee*, p. 6.

[141] Hitch, "Analysis for Air Force Decisions," p. 2–10. See also Hitch and McKean, "Economic Choice in Military Planning," p. 217; Charles J. Hitch, "An Appreciation of Systems Analysis," *Journal of the Operations Research Society of America* 3, no. 4 (November 1955), p. 473; and Charles J. Hitch, *Economics and Military Operations Research*, RAND P–1250 (Santa Monica, Calif.: RAND Corporation, 8 Jan 1958), pp. 12–13.

[142] Hitch, "Analysis for Air Force Decisions," pp. 2–5 and 2–6; and Hitch, "An Appreciation of Systems Analysis," pp. 469–70.

[143] Quade, *Military Systems Analysis*, p. 22.

[144] Hitch, "Operations Research in the Office of the Secretary of Defense," p. 7.

[145] Quade, *Military Systems Analysis*, p. 22.

[146] "Systems Analysis—An Informal Summary (Part II)," in *Department of the Army Letter on Systems Analysis and Cost Effectiveness*, Incl 2, p. 1. It should be noted that systems analysis is generally not an individual activity but is more commonly the work of an interdisciplinary team.

[147] U.S. Army Institute of Administration, *Systems Analysis Handbook*, USAIA Special Text 18–151 (Fort Benjamin Harrison, Ind.: U.S. Army Institute of Administration, Jun 1976), p. 8.

[148] Alain C. Enthoven, "Choosing Strategies and Selecting Weapon Systems," in *A Modern Design for Defense Decision*, Tucker, ed., p. 141.

[149] R. D. Specht, "RAND," in U.S. Air Force Project RAND, *An Appreciation of Analysis for Military Decisions*, pp. 1–21.

[150] Hitch, *Decision Making for Defense*, p. 55.

[151] Ibid., p. 54.

[152] Peter D. Fox, "A Theory of Cost-Effectiveness for Military Systems Analysis," *Operations Research* 13, no. 2 (March–April 1965), p. 191.

[153] Hayes, "Basic Concepts of Systems Analysis," p. 11.

[154] Enthoven, "Choosing Strategies and Selecting Weapon Systems," p. 141.

[155] Enthoven, "Systems Analysis and the Navy," p. 162.

[156] Hitch, "An Appreciation of Systems Analysis," pp. 466–67.

[157] Quade, *Military Systems Analysis*, p. 2.

[158] Gerald J. Garvey, "Analysis, Tool for Decision-Making," *Air University Review* (January–February 1966), p. 9. David Novick and G. H. Fisher, *The Role of Management Tools in Making Military Decisions*, RAND P–694 (Santa Monica, Calif.: RAND Corporation, 16 Jun 1955), pp. 15–16, provide a still more detailed description of the differences: "(1) In systems analysis, the time horizon of the problem extends far out into the future; (2) The number of interdependent factors considered in a systems analysis is much larger than in a typical operations research study, and hence the 'context' of the problem is much broader in the case of systems analysis; (3) The element of uncertainty is more important in systems analysis, and hence must be dealt with explicitly; (4) The problem of time phasing of equipment must be treated explicitly; (5) Very often some consideration must be given to enemy reactions; (6) Systems analysis usually calls for a broader concept of objectives and criteria appropriate to the broader and longer range problems of decision being analyzed."

[159] Edward S. Quade, "Introduction," in U.S. Air Force Project RAND, *An Appreciation of Analysis for Military Decisions*, p. viii; Hitch, "An Appreciation for Systems Analysis," p. 466; and Hitch, "Analysis for Air Force Decisions," p. 2–1.

[160] Herman Kahn and Irwin Mann, *Techniques of Systems Analysis*, RAND Memorandum 1829–1 (Santa Monica, Calif.: RAND Corporation, Jun 1957), p. 2 and p. 4, note 1.

[161] Hitch, *Economics and Military Operations Research*, p. 2.

[162] Lt Gen Dwight E. Beach, "The Need for Operations Research," in *Proceedings of the [Second] United States Army Operations Research Symposium, 26, 27, 28 March 1963, Durham, North Carolina, Part I* (Durham, N.C.: Operations Research Technical Assistance Group, U.S. Army Research Office-Durham, 1963), p. 3.

[163] Bruce L. R. Smith, *The RAND Corporation: Case Study of a Nonprofit Advisory Corporation* (Cambridge, Mass.: Harvard University Press, 1966), p. 8.

[164] Quade, "Introduction," pp. ix–x.

[165] Hugh J. Miser, "The Environment for Effective Operations and Systems Research," in *Proceedings of the [Second] United States Army Operations Research Symposium, 26, 27, 28 March 1963, Durham, North Carolina, Part I*, p. 200.

[166] Smith, *The RAND Corporation*, p. 9.

[167] Murdock, *Defense Policy Formation*, p. 56.

[168] Ibid.

[169] Quade, *Military Systems Analysis*, p. 2.

[170] "Some Thoughts on Cost Effectiveness from the Army Viewpoint (Part III)," in *Department of the Army Letter on Systems Analysis and Cost Effectiveness*, Incl 3, p. 2. See also Claude Witze, "Cost/Effectiveness—Tool or Club?" pp. 31–32. Witze notes that before the 1960s cost and effectiveness criteria had been used by the services "as an in-house tool to help determine requirements," but by 1964 all requirements passed up for departmental approval had to be accompanied by cost-effectiveness studies for perhaps four or five alternative solutions.

[171] Hitch, *Statement . . . before the Military Operations Subcommittee*, pp. 6–7.

[172] Hitch, *Decision-Making for Defense*, p. 52.

[173] Charles J. Hitch and Ronald N. McKean, "Economic Choice in Military Planning," pp. 218 and 220.

[174] Murdock, *Defense Policy Formation*, p. 54. Murdock notes that both Secretary McNamara and DOD Comptroller Charles Hitch used the terms "systems analysis" and "cost-effectiveness analysis" interchangeably.

[175] "Some Thoughts on Cost Effectiveness from the Army Viewpoint (Part III)," p. 2. Cost-effectiveness analysis is not the same as cost analysis, yet another method often applied in systems analysis. Cost analysis

involves the totality of costs associated with a weapons system or course of action and the distribution of those costs to various categories (see Smith, "Overview of the Role of Cost Analysis," pp. 102–03).

[176] Ibid., p. 1.

[177] Edward S. Quade, *The Limitations of a Cost-Effectiveness Approach to Military Decision-Making,* RAND P–2798 (Santa Monica, Calif.: RAND Corporation, Sep 1963), p. v.

[178] Ibid., p. 3, note *.

[179] Ibid.; U.S. Army Combat Developments Command Combat Support Group, *Methodology Notebook for Action Officers, Part II* (Fort Belvoir, Va.: Organization and Evaluation Division, U.S. Army Combat Developments Command Combat Support Group, Mar 1970), p. IX–1.

[180] U.S. Army Combat Developments Command, *Methodology Notebook for Action Officers, Part I* (Fort Belvoir, Va.: Technical Operations, Inc., May 1967), p. VIII–8.

[181] U.S. Army Combat Developments Command Combat Support Group, *Methodology Notebook for Action Officers, Part II*, IX–3.

[182] Waggener, "Scientific Military Decision Making," pp. 63–64; Malcolm Hoag, "The Relevance of Costs," in *Analysis for Military Decision*, Quade, ed., p. 92.

[183] "An Example of a Cost-Effectiveness Analysis—The Analyst's Thoughts (Part IV)," pp. 16–17.

[184] U.S. Army Combat Developments Command Combat Support Group, *Methodology Notebook for Action Officers, Part II*, p. IX–2.

[185] Bonder, "Systems Analysis: A Purely Intellectual Activity," *Military Review* 51, no. 2 (February 1971), p. 15.

[186] Hayes, "Basic Concepts of Systems Analysis," p. 8.

[187] U.S. Army Combat Developments Command Combat Support Group, *Methodology Notebook for Action Officers, Part II*, p. IX–3.

[188] Quade, *The Limitations of a Cost-Effectiveness Approach to Military Decision-Making*, p. 8.

[189] Bonder, "Systems Analysis: A Purely Intellectual Activity," *Military Review* 51, no. 2 (February 1971), p. 18.

[190] Quade, *Military Systems Analysis*, p. 18.

[191] Forder, "Operational Analysis in Defence—A Retrospect," p. 20.

[192] U.S. Army Combat Developments Command Combat Support Group, *Methodology Notebook for Action Officers, Part II*, p. IX–3.

[193] Forder, "Operational Analysis in Defence—A Retrospect," p. 20.

[194] Garvey, "Analysis, Tool for Decision-Making," p. 11.

[195] Edward R. McCauley, "Weapon Systems Analysis," in *10th Annual United States Army Operations Research Symposium—Preprints: Contributed Papers* (Durham, N.C.: United States Army Research Office-Durham, 1971), p. 63.

[196] U.S. Army Combat Developments Command Combat Support Group, *Methodology Notebook for Action Officers, Part II*, p. IX–3.

[197] Hitch, "Analysis for Air Force Decisions," p. 2–9.

[198] M. G. Weiner, "War Gaming Methodology ," in U.S. Air Force Project RAND, *An Appreciation of Analysis for Military Decisions*, p. 10–1.

[199] U.S. Army Combat Developments Command Combat Support Group, *Methodology Notebook for Action Officers, Part II*, pp. VIII-4–VIII-5.

[200] Bonder, "Systems Analysis: A Purely Intellectual Activity," *Military Review* 51, no. 2 (February 1971), pp. 18–19.

[201] U.S. Army Combat Developments Command Combat Support Group, *Methodology Notebook for Action Officers, Part II*, p. VIII–5.

[202] Ibid., p. VIII–4.

[203] Quade, *Military Systems Analysis*, p. 20.

[204] Palmer, *The McNamara Strategy and the Vietnam War*, pp. 31–32.

[205] Bonder, "Systems Analysis: A Purely Intellectual Activity," in *Proceedings of the Thirteenth Annual United States Army Operations Research Symposium (AORS XIII), 29 October–1 November 1974, Fort Lee, Virginia, Volume II*, p. 801. See also Bonder, "Systems Analysis: A Purely Intellectual Activity," *Military Review* 51, no. 2 (February 1971), pp. 14-23 passim.

[206] Specht, "RAND—A Personal View of Its History," p. 838, quoted in Quade, *Military Systems Analysis*, p. 27.

[207] Paul L. Peck, Jr., "Management and the Systems Analysis Mystique," in *7th United States Army Operations Research Symposium—Preprints: Unclassified Contributed Papers* (Durham, N.C.: U.S. Army Research Office-Durham, 1968), p. 95.

[208] "Systems Analysis as Part of the Total Management Process (Part I)," pp. 1–2.

[209] "Systems Analysis—An Informal Summary (Part II)," p. 3.

[210] Murdock, *Defense Policy Formation*, p. 94.

[211] Ibid., pp. 145–46.

[212] Hitch, *Decision-Making for Defense*, pp. 46–47. Elsewhere (*Decision-Making for Defense*, p. 43) Hitch complained that "the suspicion still persists in some influential quarters that somehow or other cost-effectiveness studies put 'dollars before national security,' or will result in our going to war with 'cut-rate, cut-quality, cheapest-to-buy weapons.' Virtually every attempt we have made to explain the inexorable logic of relating cost to military effectiveness seems to shatter itself on the argument—'Nothing but the best will do for our boys.'"

[213] The story is told in "Systems Analysis by Land, Sea, and Air," in *Managerial Economics and Operations Research: A Non-Mathematical Introduction*, Edwin Mansfield, ed. (New York: W. W. Norton, 1966), pp. 224–29 passim.

[214] "Systems Analysis by Land, Sea, and Air," p. 229.

[215] McNamara, *The Essence of Security*, p. 89.

[216] Eliot A. Cohen, "Systems Paralysis: Social Scientists Make Bad Generals," *The American Spectator* 13 (November 1980), p. 26.

[217] Powell, "Have the Services Learned to Live with the Office of Systems Analysis?" p. 76.

[218] Snyder, *Case Studies in Military Systems Analysis*, pp. 5–6.

[219] William P. Snyder, "An Illustrative Example of Systems Analysis," in *A Modern Design for Defense Decision*, Tucker, ed., app. II, p. 216.

[220] Palmer, *The McNamara Strategy and the Vietnam War*, p. 5.

[221] McNamara, *The Essence of Security*, p. xi; McNamara, "Managing the Department of Defense," p. 15.

[222] Hitch, "Management Problems of Large Organizations," pp. 259–60.

[223] Hitch, "Operations Research in the Office of the Secretary of Defense," p. 7.

[224] Hitch, *Decision-Making for Defense*, p. 53.

[225] Enthoven, "Systems Analysis and the Navy," pp. 180–82.

[226] Marion R. Bryson, "Dirty Data and Other Assorted Goodies," in *Proceedings of the [Eighth] United States Army Operations Research Symposium, 21-23 May 1969* (Durham, N.C.: U.S. Army Research Office-Durham, 1969), pp. 15–17.

[227] Fox, "A Theory of Cost-Effectiveness for Military Systems Analysis," p. 192.

[228] Roland N. McKean, "General Issues of Criteria," in U.S. Air Force Project RAND, *An Appreciation of Analysis for Military Decisions*, pp. 9–8 to 9–15 passim.

[229] See, for example, Hitch, "Management Problems of Large Organizations," pp. 259–60.

[230] McNamara, "Managing the Department of Defense," p. 15.

[231] Ellis A. Johnson, "The Long-Range Future of Operational Research," *Operations Research* 8, no. 1 (January–February 1960), p. 21.

[232] Quade, "The Pitfalls of Analysis," p. 15–1.

[233] Ibid., pp. 15–14 to 15–25 passim.

[234] Hayes, "Systems Analysis," p. 45.

[235] Abraham Golub, "Present & Future ORSA Trends—A Forecast for the US Army," in *Proceedings of the Thirteenth Annual United States Army Operations Research Symposium (AORS XIII), 29 October–1 November 1974, Fort Lee, Virginia, Volume I*, pp. 15–16.

[236] Ibid., p. 16.

[237] Powell, "Have the Services Learned to Live with the Office of Systems Analysis?" pp. 75–76.

[238] Norman A. Reiter, Jerry Selman, and Dr. Victor Selman, "On the Uses of ORSA Studies for Policy Decisions," in *Proceedings of the Thirteenth Annual United States Army Operations Research Symposium (AORS XIII), 29 October–1 November 1974, Fort Lee, Virginia, Volume II* (Fort Lee, Va.: U.S. Army Concepts Analysis Agency, 1974), p. 840.

[239] Bridenbaugh, *Must the Military Staff Officer Be a Specialist in Systems Analysis?* p. 9.

[240] Specht, "RAND," in U.S. Air Force Project RAND, *An Appreciation of Analysis for Military Decisions*, pp. 1–22.

[241] Enthoven, "Systems Analysis and Decision Making," p. 13.

[242] Willard E. Wilks, "Is Rand Corp. Really a 'Dark Presence' Behind the Defense Throne?" *Armed Forces Management* 12, no. 5 (February 1966), p. 75.

[243] Bonder, "Systems Analysis: A Purely Intellectual Activity," *Military Review* 51, no. 2 (February 1971), p. 21.

[244] Enthoven, "Choosing Strategies and Selecting Weapon Systems," p. 137.

[245] Clark, "The Management of National Defence by Systems Analysis: An Evaluation," p. 299.

[246] Hitch, *Decision-Making for Defense*, p. 53; Hitch, "Operations Analysis in the Department of Defense," p. 6.

[247] See, for example, Hitch ("Analysis for Air Force Decisions," p. 2–15) who wrote that "while unaided intuition is sometimes strikingly successful . . . it can also fall flat on its face . . . one of the troubles with intuition is that you don't know whether it is good or not with an analytic check."

[248] Alain C. Enthoven and K. Wayne Smith, *How Much Is Enough? Shaping the Defense Program, 1961–1969* (New York, Evanston, and London: Harper & Row, 1971), p. 335.

[249] "Systems Analysis—An Informal Summary (Part II)," p. 2.

[250] Quoted in W. P. Campbell, "Audit Division, Organization and Functions," in *The Comptroller of the Army—A Presentation on Background, Statutory Basis, Organization, and Functions* (Washington, D.C.: Office of the Comptroller of the Army, U.S. Department of the Army, 25 Oct 1949), p. 60.

[251] Decker, "Costing Strategy," p. 39.

[252] Quoted in Roherty, *Decisions of Robert S. McNamara*, p. 98; and Witze, "Cost/Effectiveness—Tool or Club?" p. 31.

[253] "Some Thoughts on Cost Effectiveness from the Army Viewpoint (Part III)," p. 5.

[254] Kinnard, "McNamara at the Pentagon," p. 25.

[255] Maj Gen William B. Bunker (Deputy Commanding General, U.S. Army Materiel Command), "Introduction of Luncheon Speaker," in *Proceedings of the [Third] United States Army Operations Research Symposium, Part I [Unclassified Papers]*, p. 181.

[256] Hitch and McKean, "Economic Choice in Military Planning," p. 218.

[257] Hitch, *Decision-Making for Defense*, p. 53.

[258] Enthoven, "Operations Research at the National Policy Level," p. 157. See also Enthoven, "Systems Analysis and the Navy," p. 161; Powell, "Have the Services Learned to Live with the Office of Systems Analysis?" p. 75; and Enthoven, "Operations Research at the National Policy Level," pp. 158–59, where he states categorically, that "we make rather little use of computers in the Programming Office . . . computers are not 'running the wars of the future.' . . . Personally, I happen to be rather skeptical of most attempts that I have seen to do systems analysis by means of large computer war games." Elsewhere ("Choosing Strategies and Selecting Weapon Systems," p. 143) Enthoven declared that "systems analysis is not synonymous with the application of computers . . . the computer simulation approach so far has not been particularly fruitful as a method of weapon systems analysis."

[259] Bonder, "Systems Analysis: A Purely Intellectual Activity," in *Proceedings of the Thirteenth Annual United States Army Operations Research Symposium (AORS XIII), 29 October–1 November 1974, Fort Lee, Virginia, Volume II*, p. 794.

[260] Cohen, "Systems Paralysis," p. 23.

[261] Ibid., p. 27.

[262] Ibid., p. 25.

[263] Snyder, *Case Studies in Military Systems Analysis*, p. 2; Raymond, *Power at the Pentagon*, p. 303.

[264] Garvey, "Analysis, Tool for Decision-Making," p. 13.

[265] "Some Thoughts on Cost Effectiveness from the Army Viewpoint (Part III)," p. 5.

[266] Carl von Clausewitz, *On War*, II.1; translated and edited by Michael Howard and Peter Paret (Princeton: Princeton University Press, 1976), pp. 131–32.

[267] The actual quote, from a speech by President Coolidge given before the American Society of Newspaper Editors in Washington, D.C., on 17 Jan 1925, entitled "The Press under a Free Government," is "After all, the chief business of the American people is business" (Cyndy Bittinger, "The Business of America Is Business?" at www.calvin-coolidge.org/pages/history/research/ccmf/bitt02.html, downloaded 6 January 2005; copy in possession of the author).

[268] Hitch, "Operations Research in the Office of the Secretary of Defense," p. 9.

[269] Hitch, *Economics and Military Operations Research*, pp. 6–8 passim.

[270] Donald W. Meals, "Trends in Military Operations Research," *Operations Research* 9, no. 2 (March–April 1961), pp. 253–54.

[271] Snyder, *Case Studies in Military Systems Analysis*, p. 149.

[272] Enthoven and Smith, *How Much Is Enough?* p. 309.

[273] Golub, "Present & Future ORSA Trends—A Forecast for the US Army," p. 16.

[274] Ibid., pp. 17–18.

CHAPTER THREE

The Headquarters, Department of the Army, Response to the McNamara Revolution, 1961–1973

The introduction of the Planning, Programming, and Budgeting System (PPBS) and of new techniques of analysis, as well as the centralization of decision making in the hands of the secretary of defense that accompanied them, posed a challenge for the Army and the other services. To cope with the new decision-making process, each of the services was obliged to adopt the new techniques and to develop analysts of their own capable of dealing with the Whiz Kids in the Office of the Secretary of Defense (OSD). They were also forced to reorganize their existing operations research (OR) activities to deal with a broader range of issues and with greater central direction of effort. Despite the misgivings of many senior officers regarding the McNamara regime, the services responded actively and gradually built up a capability to successfully promote and defend service programs in the face of growing Department of Defense (DOD) centralization and the increasing importance assigned to systematic analysis.

During the course of the 1960s, the Army significantly expanded its in-house and contract ORSA capabilities and emulated the OSD in centralizing management of its own ORSA activities at the Secretariat and General Staff level. Accommodation to the new DOD management system embodied in PPBS required immediate response once the decision was made by Secretary McNamara to reorganize the DOD planning, programming, and budgeting system, but the adjustment to the new methods of analysis that supported PPBS—systems analysis and cost-effectiveness analysis—took somewhat longer and involved not only the creation of suitable ORSA organizations but also the training of large numbers of military analysts, the hiring of additional civilian analysts, and increased contracting of ORSA studies to outside agencies. As Dr. Wilbur B. Payne, then special assistant for operations research in the Office of the Assistant Secretary of the Army (Financial Management), told attendees at the third Army Operations Research Symposium at Rock Island Arsenal in May 1964:

> The initial Army response [to PPBS] was very rapid, but was almost entirely to the program system. . . . There was almost no immediate Army response, certainly not at high staff levels of the Army, to the simultaneous existence of the Systems Analysis Office, perhaps in part because they were thinking about the problem and were not causing any great stir.[1]

Although the reaction to McNamara and the Whiz Kids began somewhat slowly, it accelerated significantly with the establishment of the Office of the Assistant Secretary of Defense (Systems Analysis) (ASD [SA]) in September 1965. Gradually, the Army and the other services built the ability to deal with the OSD systems analysts on an equal footing. The Office of the Deputy Under Secretary of the Army (Operations Research) and the Office of the Assistant Vice Chief of Staff were created to coordinate the Army's ORSA efforts, and each of the Army Staff elements expanded and improved their ORSA capabilities.

The Secretary of the Army Responds

Like the other services, the Army was forced to react to Secretary McNamara's centralization of defense

decision making and insistence on quantification and the use of systems analysis. The essence of the problem was clearly stated by Col. Robert Gerard, who served on the Army Staff at the time: "With Robert McNamara in the driver's seat, the services had to do their homework. We had to prove our case."[2]

The Army's response gathered momentum only slowly. Several factors impeded a rapid response to the new management system. First, it took some time before it became obvious to everyone that a new system was in place that required significant changes in the old ways of doing business. Assistant Secretary of Defense (Comptroller) Charles J. Hitch first proposed what became PPBS in the summer of 1961, but it was not until the preparation of the FY 1963 budget that the outlines of the new system and the requirement to support proposals and plans with the new quantitative methods of analysis became apparent.

Another impediment to rapid response was general ignorance of the new analytical concepts and techniques, particularly at lower levels.[3] As Col. James H. Hayes wrote in the April 1965 issue of *Military Review*:

> A new discipline called systems analysis has made a major impact on the type of planning being done at Department of Defense levels. In turn, the Army staff has increasingly attempted to develop its own skills in this field to be able to respond to the questions put to it and the studies asked of it. So little is known of the basic concepts and the techniques and objectives of systems analysis, however, that progress has been slow and faltering in developing a proper understanding of the subject.[4]

There was also initial resistance to the new methods. Some senior Army officers were appalled at the ignorance of military affairs displayed by some of the Whiz Kids and doubted the need for the great volume of data that OSD began to require, seeing it as simply another bureaucratic exercise.[5] However, such resistance was soon overcome. As Brig. Gen. William O. Quirey, director of studies in the Office of the Assistant Vice Chief of Staff, later noted:

> In 1961, we dug in our heels when Mr. McNamara, Mr. Hitch, and Dr. Enthoven started presenting some new techniques and approaches. At first, we remained a little on the conservative side and didn't really want to change, but since then we have jumped on the bandwagon and are coming out ahead very often in the application of these techniques.[6]

Although the Army took several steps beginning in FY 1961 to adjust to the new defense management imperatives, it was not until Cyrus R. Vance took office as secretary of the Army in July 1962 that the Army began to react forcefully.[7] Secretary Vance apparently recognized the intensity of Secretary McNamara's interest in the new DOD management system and the growing importance to the defense decision-making process of the new techniques of systems analysis and cost-effectiveness analysis. Under his direction the Army began to adjust to the new conditions, a process that accelerated after Vance moved up to become the deputy secretary of defense in January 1964 and signed DOD Directive 5141.1 creating the Office of the Assistant Secretary of Defense (Systems Analysis) in September 1965.

The principal problem for the Army Secretariat and the Army Staff was an initial inability to provide the data and studies required by the OSD in a timely and accurate manner. The Army had neither the qualified personnel nor the integrated, computerized data-management system needed to satisfy Secretary McNamara's demands for information and analyses.[8] As late as October 1965, Col. J. T. Newman, then chief of the Systems Analysis Division, had to tell his boss, Brig. Gen. C. A. Corcoran, the director of coordination and evaluation in the Office of the Chief of Staff:

> The General Staff is capable of providing responsive information, but often the time delay is unacceptable to OSD, with the result that important decisions are sometimes made by the OSD staff, with the assistance of the OUS of A [Office of the Under Secretary of the Army] but without participation by the Army Staff.[9]

In fact, no one element of the Army Secretariat or Army Staff was organized and manned in such a way as to be able to provide the detailed information required by the ASD (SA) and other OSD and Joint Chiefs of Staff (JCS) elements regarding Army requirements or justifications for forces, units, space, materiel, personnel, and weapons systems.[10] Army plans, for example, were habitually late in preparation, approval, and distribution and were thus of little value as input to joint plans and the Draft Presidential Memorandums (DPMs), which were an important part of the DOD planning, programming, and budgeting process.[11] William K. Brehm, who served in the Office of the Assistant

Secretary of Defense (Systems Analysis) and later as co-director of the Army's Force Planning and Analysis Office, later wrote:

> The moment of truth came during the buildup of land forces in the Vietnam conflict. Changes in structure and in unit authorization documents occurred so fast that we could not even keep an audit trail. The Army's books lagged the real world by months. Consequently, personnel training plans and materiel procurement plans were not synchronized and did not mesh, a problem further compounded by the one-to-three-year lead time for generating trained people and building new equipment.[12]

The ever-growing demand for information and studies that issued from the OSD was in part initiated by the changes in defense organization required by the DOD Reorganization Act of 1958, which established the unified and specified commands under the direction, authority, and control of the secretary of defense and made the military departments responsible for the administration of their forces assigned to those commands. This change, coupled with the centralization of management and decision making imposed by Secretary McNamara, made it necessary for the services to respond rapidly and in detail to the requirements and demands of the OSD and the JCS.[13] Moreover, the OSD and JCS staffs increased in size, as did the number of routine matters that required OSD decision. To compound the problem, at about the same time the use of high-speed digital computers began to be commonplace, and computers greatly facilitated the transmission, storage, and manipulation of large amounts of data.[14] Thus, the Army and the other services found themselves caught up in a never-ending battle to satisfy the insatiable demands of OSD for detailed information.

Finally, although the Department of the Army had undergone three major reorganizations since 1949, it was still not properly organized to meet the demands of the 1958 defense reorganization act.[15] In February 1961, Secretary McNamara directed that work be done on "A Study of Functions, Organization, and Procedures of the Department of the Army" and placed the effort under the direction of Deputy Comptroller of the Army Leonard W. Hoelscher.[16] The Hoelscher Committee investigated every aspect of Army management, with emphasis on the Office of the Secretary of the Army, the Army Staff, the Continental Army Command (CONARC), and the Technical and Administrative Services. The committee's report and recommendations were submitted in September 1961.[17] Subsequently, another study group was formed under Lt. Gen. David W. Traub to develop recommendations for the Army chief of staff regarding the Hoelscher report. General Traub's committee suggested certain changes to the Hoelscher report, and in December 1961 the Department of the Army published its *Report on the Reorganization of the Army* (the so-called Green Book).[18] The plan was approved and went into effect on 17 February 1962, but the necessary changes were not completed until September 1962. They included the establishment of an Office of Personnel Operations under the Deputy Chief of Staff for Personnel; the abolition of the separate Technical Services and the establishment of the Army Materiel Command; the assumption by CONARC of responsibility for all individual and unit training in the continental United States and surrender of its combat developments responsibilities to a newly formed Combat Developments Command; and the creation of a chief of Reserve components at deputy chief of staff level to coordinate the activities of Army Reserve, Reserve Officers Training Corps (ROTC), and Army National Guard forces.[19]

The 1962 Army reorganization has been called the "most far reaching reorganization since the 1942 Marshall reorganization," and even the oldest and most persistent of the Army's management problems—reducing the authority of the chiefs of the Technical Services—succumbed to the McNamara assault, backed as it was by the irrefutable facts produced by systems and cost-effectiveness analyses.[20] But the 1962 reorganization did not entirely solve the secretary of the Army's problem of responding rapidly and thoroughly to demands for information from OSD. Nor did it provide a focal point for Army management for the use of the new tools of scientific analysis introduced by Secretary McNamara and the Whiz Kids. It was not until 1964 that definite action was taken by the secretary of the Army, then Stephen Ailes, to remedy that defect in the Army Secretariat itself.

Army Policy on the Management of Operations Research

Before 1964, Army management of operations research activities was decentralized.[21] The use of OR methods to address problems throughout the Army was encouraged, and the various Army commands and agencies built up on their own initiatives OR capabilities suitable to their needs. For studies that exceeded their own ability to conduct, commands and agencies were encouraged to sponsor studies by research organizations available to headquarters or the major commands or through contract with suitable civilian organizations. These policies led to the creation of many small OR groups, many of which were also saddled with contract management responsibilities that in larger organizations were often assigned to contract management agencies separate from the OR organization. Decentralization was accompanied by frequent review and central management of the larger study agencies, the Office of the Chief of Research and Development (OCRD) being the principal Army Staff agency involved in such work.[22] Staffing of many small OR organizations was difficult, but on the whole the decentralized arrangement resulted in "a generally adequate, broadly based program with some research in nearly every problem area," although some important areas, such as strategic mobility and tactical air support, were neglected.[23]

The most significant drawback to the decentralized system that existed before 1964 was that the management of the Army OR program seldom involved experienced analysts as members of the management group.[24] This was not a particular problem in smaller OR groups, but there were no such in-house groups in the Army Staff before 1964, and thus the Army Staff generally lacked the participation of experienced OR personnel in positions of authority. The exception, of course, was the OCRD, where the Army Research Office did use officers with OR graduate education to oversee the management of Army OR contracting. As a consequence, the August 1966 Army Study Advisory Committee (ASAC) report recommended "that the highest priority use for military OR professionals should be in small (three- to ten-person) groups with general staff agencies and major commands" and that the functions of such groups should be "study program formulation and management, study review, occasional participation in staff studies."[25] The ASAC also concluded that "such an element would be critically needed to guide, monitor and review any substantial increase or changes in organization of our study-doing agencies."[26]

The Special Assistant for Operations Research

The first step toward creating a centralized office in the Army Secretariat to help cope with the new demands for information and analysis arising from the introduction of PPBS and systems analysis came in early 1964 with the creation in the Office of the Assistant Secretary of the Army (Financial Management) (ASA [FM]) of the position of special assistant for operations research. At the time, the ASA (FM), E. T. Pratt, Jr., was charged with responsibility for, among other matters, "programming concepts and systems; the ADP Equipment Program and ADP policy and administration; operations research; management engineering policy and programs; and progress and statistical reporting."[27] The new special assistant for operations research was thus assigned responsibility for operations research and general management studies.[28]

In general, the special assistant was expected to monitor and guide the overall Army Study Program, review in depth selected studies bearing on program or budget projects of particular interest to the Army's top management, and conduct a limited amount of in-house analysis in support of the Secretariat.[29] Officially, the functions assigned to the special assistant for operations research were to assist the ASA (FM)

> in developing concepts for implementing a comprehensive approach to development of valid units of measure for use of materiel, manpower, and other resources; in the translation of resource requirements into financial or other quantitative or qualitative terms; and in the integration of such measures into a system for use by all functional areas of Army management.[30]

In fact, the new position was created to perform a broader function, which was to provide the secretary of the Army (then Stephen Ailes) with some analytic capability to review major systems and, more important, to provide the missing interface between the Army Secretariat and the OSD systems analysis elements and thus relieve the pressure on the Army Secretariat.[31]

The man chosen in early 1964 to be the special assistant for operations research was Dr. Wilbur B. Payne, who was then an analyst in the Systems Analysis Office in OSD under Alain C. Enthoven.[32] Wilbur B. Payne was born in Pittsburgh, Pennsylvania, on 29 November 1926. He served as an enlisted man in the 88th Infantry Division in Europe during World War II, and following the war he attended Tulane University, from which he received a B.S. in physics in 1951. He was employed for a short time by the Southern Regional Research Laboratory of the United States Department of Agriculture before going on to graduate school in physics at Louisiana State University. There he earned an M.S. in 1953 with a thesis on "The Radioactive Decay of Ba," and a doctorate in physics in 1955 with a dissertation on "Relativistic Radioactive Transitions." In August 1955 Payne joined the staff of the Operations Research Office (ORO), and later briefed the ORO R17 study on air defense at Fort Bliss. He worked at ORO from August 1955 to 1957, and then from 1958 to 1960 he was associate professor of physics at the Virginia Polytechnic Institute. He then returned to the staff of ORO (later Research Analysis Corporation) in June 1960 as an analyst. In the summer of 1961, Dr. Payne became first a consultant and then a full-time analyst in the Systems Analysis Office in OSD under Enthoven. Named special assistant for operations research in the Office of the Assistant Secretary of the Army (Financial Management) in early 1964, he subsequently became the deputy under secretary of the Army for operations research (DUSA [OR]) in 1968, the first of only three men to hold that office. Dr. Payne remained the DUSA (OR) until 1974, when he was lured to White Sands Missile Range in New Mexico by General William E. DePuy to head the new U.S. Army Training and Doctrine Command Systems Analysis Activity (TRASANA). He subsequently consolidated the several Training and Doctrine Command (TRADOC) analysis organizations into the capstone TRADOC Operations Research Agency, the forerunner of the present TRADOC Analysis Command at Fort Leavenworth, Kansas. Wilbur Payne married Mary Farley Wallace of Covington, Virginia, by whom he had two children: Mary Kathryn Ervin and Wilbur B. Payne, Jr. He was a prominent member of both the Military Operations Research Society (in 1990 he was elected the eleventh Lifetime Fellow of the Society) and the Operations Research Society of America and was also a member of Phi Kappa Phi, Sigma Xi, Sigma Pi Sigma, and the American Physical Society. He died in El Paso, Texas, on 17 August 1990.

Wilbur Payne was known as an eccentric and sometimes irascible personality. He was infamous, for example, for his disdain of sartorial conventions. Called to the Pentagon on a Saturday, he is reputed to have appeared in a somewhat bedraggled sweat suit.[33] He was equally well known for his razor-sharp mind and mastery of innumerable subject areas from quantum physics to French wines. He was quick to challenge ill-thought-out positions and poor analyses. He had few peers as an ORSA analyst and became a very powerful advocate for the proper use of ORSA in the Army.[34] In time, Dr. Payne came to be known as one of the giants of the Army operations research community.

Dr. Payne's personal philosophy regarding Army operations research was summarized in an address he delivered to the ORSA Executive Course at the Army Management School on 18 November 1968:

> *Principle No. 1: The Army does not do Operations Research or Systems Analysis because the Office of the Secretary of Defense forces us to. . . .* Since we must rule out most of the available alternatives on the basis of theoretical predictions of performance and cost, it behooves us to consider these alternatives with great care and objectivity, and it is in that area that operations research excels and it is to that problem that operations research is essential.
>
> *Principle No. 2: The Army's community of operations research specialists have very little to learn from any other segment of the research community. . . .* We have within, or in the service of, the Army a complete and competent research community. . . . Our failures of the recent past and near future can, in my opinion, be traced, not to any intrinsic lack of experience or competence, but to the fact that the emphasis OSD gave to these methods forces us to do too many studies with too few resources.
>
> *Principle No. 3: The Army does not do operations research to justify its programs.*
>
> *Principle No. 4: Operations research is not a totally new approach to solving military problems. . . .* A fact is not a fact because someone in authority believes it.[35]

He concluded his address with two suggestions on how to be a good operations research executive:

> Rule 1. Use your influence whenever possible to insure that "unpopular" alternatives are considered in studies.
> Rule 2. In your review of studies be most suspicious of

> those whose conclusions, when you first read them, are exactly what you expected before the study was done.[36]

As special assistant for OR, Dr. Payne was authorized two assistants, both in the civil service grade of GS–16.[37] One, Dr. Daniel Willard, continued to serve in the offices that succeeded the Office of the Special Assistant for OR—the Office of Operations Research and Office of the Deputy Under Secretary of the Army (Operations Research)—for many years until his retirement from government service in 2004. The other, Payne's principal assistant and later assistant DUSA (OR), Abraham Golub, had built his professional reputation at the Weapons Systems Laboratory of the Ballistics Research Laboratories at Aberdeen Proving Ground, where he had pioneered cost-effectiveness studies even before the McNamara era.[38] He served for several years as Payne's deputy before leaving to take up other key ORSA management positions as scientific adviser to the assistant chief of staff for force development (1970–1974) and technical adviser to the deputy chief of staff for military operations (1974–1976). Golub retired from government service in 1976 and subsequently worked as a private consultant for both the government and the private sector. He also served two terms on the Army Science Board before his death in April 2000.

The annual reports of the secretary of the Army during this period reflect the increasing interest in aligning the Army's management policies and procedures with those of OSD, a process in which the special assistant for OR played a key role. In his annual report for FY 1963, Secretary Cyrus Vance noted that during the fiscal year

> [t]he Army increased its use of scientific management tools to carry out its missions and tasks. This use included the application of new management techniques in the decision-making processes which are concerned with insuring the highest operational readiness within available resources. Refinements in the over-all Army organization, employment of revolutionary new computers, improved administration of funds, and planned and systematic management procedures at all levels are indicative of the progress made. Since improved management is a command responsibility, efforts have been made to impress all commanders and supervisors—whether at the staff, tactical, or nontactical command level—that they are directly concerned in the process. Attention has also been devoted to the goal of improved communications to facilitate more rapid decision-making at the top levels of management in the Army.[39]

In his report for FY 1964, Vance's successor, Secretary Stephen Ailes, also addressed the steps taken within the Army to accommodate the emphasis placed on the new management tools by the OSD:

> In fiscal year 1964, increased attention to the use of scientific management tools and new and streamlined reporting systems have been the two principal subjects of the Army's continuing effort to improve the management of its resources. . . . The complex problem of applying limited resources to a variety of competing weapon systems has led to increasing emphasis on "cost effectiveness." The Army has encouraged planners at all levels to consider more carefully the question of costs in relation to results likely to be obtained; in addition, it has set up small groups in the Office of the Chief of Staff and in the Army secretariat manned by experienced military and civilian specialists to concentrate on systems analysis and to apply the broad techniques of operations research to Army problems.[40]

The Office of Operations Research, Office of the Under Secretary of the Army

On 11 July 1965, Secretary of the Army Stanley R. Resor transferred the Office of the Special Assistant for Operations Research from the Office of the Assistant Secretary of the Army (Financial Management) to the Office of the Under Secretary of the Army.[41] Named the Office of Operations Research (OOR), the new office continued to be led by Dr. Payne with Abraham Golub as his deputy.[42] Dr. Payne's principal function continued to be to act as the interface with OSD, but his responsibilities were broadened to include "conducting, sponsoring, monitoring or reviewing studies with more emphasis than the past on the application of modern study techniques to general management problems such as manpower, logistics, readiness and force structure."[43] By September 1965, the official statement of the functions of the Office of Operations Research had been revised and the OOR was charged to:

1. Review, monitor, sponsor selected OR studies; conduct specific analyses as required; assist in development of Army OR capability; primary point of contact with OSD and [sic] OR/SA matters.

2. Analysis of studies in support of Army requirements and programs using a variety of OR and systems analysis techniques.[44]

Initially set at a total of four analysts (including Dr. Payne and Abraham Golub), by December 1965 the personnel authorization of the OOR had been increased to six civilians.[45] The personnel authorization remained the same in January 1967, at which time the functions of the chief of the OOR were revised to read: "Responsible for recommending policy guidance for operations research; generally guides and monitors the Army activities in this field; initiates studies of particular interest to the Secretariat; and serves as primary point of contact with similar activities in OSD."[46]

With the assistance and oversight of Dr. Payne and the Office of Operations Research, the Army continued to make progress during the period 1965–1967 in improving management and meeting the demands of OSD through the use of scientific management techniques. In his annual report of FY 1965, Secretary of the Army Resor was able to report:

> The direction taken, in fiscal year 1965, in the Army's constant search for better management techniques was toward increased use of the tools of scientific management to improve the use of Army resources—money, personnel, materiel, and installations. Much of the effort this year has been devoted to improving cost analysis and accounting, that is, toward identifying the various elements of cost of weapon systems or activities, so as to provide the Army's top managers, those in the Office of the Secretary of Defense, and the Congress, with more precise and comparative data on which decisions can be based.[47]

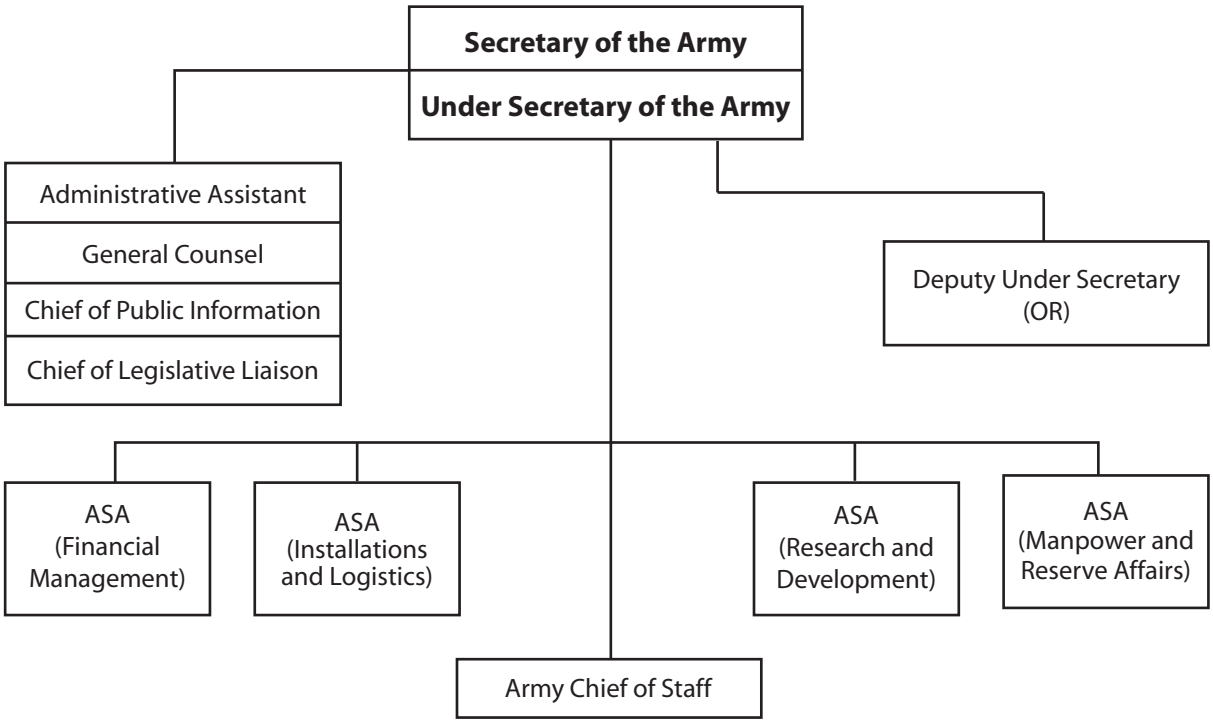
The Office of the Deputy Under Secretary of the Army for Operations Research

By the end of FY 1967, the Army had some 500 management information systems in operation, and the efforts were under way to establish central coordination, guidance, and control of both existing and developing systems.[48] In early 1968, Secretary Resor named Dr. Payne as a deputy under secretary and the Office of Operations Research was redesignated the Office of the Deputy Under Secretary of the Army for Operations Research (ODUSA [OR]). Abraham Golub was also elevated to be assistant DUSA (OR), and the personnel authorization for the ODUSA (OR) was increased to two military and nine civilians.[49] In early 1970, Hunter M. Woodall, Jr., replaced Golub as assistant DUSA (OR), and by July 1971, Robert F. Froehlke had taken office as the secretary of the Army, and the personnel authorization of ODUSA (OR) had been reduced slightly to two military and eight civilian personnel.[50] That level of manning was maintained under Secretary of the Army Howard H. Callaway, and the October 1973 Department of the Army staffing charts defined the responsibilities of the DUSA (OR) as

> establishing policy guidance for operations research and monitors Department of the Army operations research activities; responsible in coordination with ASA (R&D) for operational test and evaluation policies; initiates studies of interest to the Secretariat; and serves as POC for similar activities in OSD; conducts, reviews, and/or monitors studies, experiments, and analytical reports basic to justification of Army requirements and programs.[51]

The elevation of Dr. Payne to deputy under secretary of the Army for operations research in 1968 reflected the growing importance attached to the critical role he and his subordinates performed from 1964 onward. Throughout the mid- to late 1960s, the OOR and then the ODUSA (OR) were highly visible elements of the efforts of the Army Secretariat to cope with the demands for data and analysis issuing from the Office of the Secretary of Defense. Dr. Payne was successful in gaining and maintaining some degree of coordination over certain ORSA matters within the Army, but his efforts fell short of genuine centralization in that most of the Army's ORSA capability, be it in-house or contract, was controlled by other elements of the Army Staff or by the major Army commands. For the most part, however, the ODUSA (OR) served mainly as the secretary of the Army's staff ORSA element. And with the changes in management philosophy and policy introduced after President Nixon and Secretary of Defense Melvin R. Laird took office in January 1969, the trend toward centralization of ORSA management reversed as the new regime emphasized decentralization and management control of programs at much lower levels. The organization of the Army Secretariat as of May 1969 is shown in Figure 3–1.

FIGURE 3–1—ORGANIZATION OF THE ARMY SECRETARIAT, MAY 1969



Source: Change 1 (23 May 1969) to *Army Regulation 10-5* (31 Jul 1968)

The Army Chief of Staff Responds

For the Army chief of staff and his subordinates on the Army Staff, the challenge posed by the introduction of PPBS and the new analytical techniques was even more difficult than for the Army Secretariat. For the chief of staff the problem was the same as that faced by the secretary of the Army: the systems analysts in OSD demanded more and more information more and more quickly, but "there was no central point through which a coordinated Army response to an OSD requirement could be quickly obtained."[52] Not only did the chief of staff and the members of the Army Staff have to respond directly and quickly to the demands of OSD, they also had to respond to the needs of the Army Secretariat for ever-increasing amounts of data and analysis.

The need to respond to the secretary of the Army and his immediate subordinates imposed a particular burden on the Army chief of staff, especially after Secretary Resor took office in July 1965. Secretary Resor liked to delve into each issue in detail and preferred to deal directly with the chief of staff or vice chief of staff rather than with other members of the Army Staff.[53] As a result, considerable time was required for the chief of staff to deal personally with the secretary while continuing to perform his duties in the Joint Chiefs of Staff and overseeing the buildup of forces in Southeast Asia, which by 1965 was a major problem. This left very little time to devote to ensuring "a coordinated and integrated resource management effort from the Army Staff."[54]

As was the case with the Army Secretariat, the response of the chief of staff and of the Army Staff to the McNamara revolution gathered momentum only slowly. The immediate requirement to implement the new programming system was fulfilled rather rapidly, but accommodation to the new emphasis on systems analysis and cost-effectiveness studies took somewhat longer. The proposed solution was the same as it was for the Army Secretariat: greater centralized control over ORSA capabilities and the creation of new organizational elements to handle the new requirements.

The Initial Response, 1961–1966

The chief of staff, vice chief of staff, and the other members of the Army Staff were well aware of the challenges posed by PPBS and the new Systems Analysis Office in the Office of the Assistant Secretary of Defense (Comptroller). The increasing demand for an improved, centralized ORSA capability to meet the demands of the OSD and the Army's own needs for the evaluation of new weapons systems, alternative force structures, and proposed doctrine was keenly felt. As Lt. Gen. Ferdinand J. Chesarek later recalled:

> The kind of detail that the Secretary of Defense was demanding of us . . . we were incapable of providing. . . . Hell, nobody else had anything like this. We were actually capable of producing the complex forms being demanded by Alain Enthoven for materiel, but we couldn't do it for structure, and we couldn't do it for people management.[55]

Writing in *Army* magazine in 1967, General Chesarek, then the assistant vice chief of staff, pointed to the increasing use of programs "such as cost-reduction, cost-effectiveness, systems analysis, force planning analysis, and a host of new tools in the area of management information" that required "masses of data along with techniques of data reduction and analysis, simulation, and gaming" and concluded, "Army management at departmental level cannot afford to be merely reactive to change. It must anticipate change and lead the field. It must be responsive to the demands placed on it by the Executive Office of the President, the Office of the Secretary of Defense and the Congress."[56] The first priority of the chief of staff thus became the establishment of an in-house capability for dealing effectively with the Whiz Kids in the OSD and for competing successfully with the other services. The Army decision-making process was realigned to mesh with that of Secretary McNamara and the OSD systems analysis elements, and the Army's ability to provide necessary data rapidly and accurately was also significantly improved. Operations research techniques, long a part of the Army's weapons analysis, operational test and evaluation, and doctrinal development processes were extended to the newly emphasized task of force development and to the management of the organization and procedures of the Army itself.

The ability to respond rapidly and accurately to demands for information concerning PPBS were especially crucial. Once PPBS went into effect in FY 1963 and the various programs of the Five-Year Defense Program were split out to the several elements of the Army Staff for development and submission, it became essential that the input of the various Army Staff agencies be coordinated.[57] PPBS was driven by the OSD systems analysts, and there were frequent and bitter disputes between OSD analysts and Army Staff officers over such matters as cost estimates, costing factors, the amount of equipment required to sustain a certain force level, and many other factors that went to make up the Army's total budget estimates.[58] As Martin has noted, "in most instances the services lost these battles," but the Army's credibility with the OSD reviewers improved significantly once the Army Staff became more adept at using the new techniques of analysis.[59]

As General Chesarek later told students at the Army Management School: "While our General Staff system is a good one, it lacked one ingredient—a mechanism to integrate the total effort. So we set about to create the machinery to do what was required."[60] The effort began in earnest in 1963 and proceeded in several stages to culminate in the establishment of the Office of the Assistant Vice Chief of Staff in February 1967. The elements in the Office of the Chief of Staff created before 1965 that were involved with analytical functions and were particularly concerned with ensuring the high quality of the analytical backup for Army requirements statements, program documents, and budget presentations included the Directorate of Army Programs, the Directorate of Special Studies, the Office of the Special Assistant for Army Information and Data Systems, and the Directorate of Coordination and Analysis (which included a Systems Analysis Division). Each of these directorates was supported by a number of in-house and contract analysis elements. Their analytical functions were primarily "monitoring and guiding of the overall study program, review in depth of selected studies bearing on program or budget projects of particular interest to top management, and a limited amount of in-house analysis in support of the Secretariat and the Chief of Staff."[61]

The Director of Army Programs

The director of Army Programs was the principal adviser to the chief of staff on all matters related to the DOD/Army programming system and was the principal point of contact with OSD, JCS, and the Army Secretariat on such matters.[62] He chaired the Program Advisory Committee and was a nonvoting member of the Budget Advisory Committee. The Directorate of Army Programs had two divisions: a Coordination and Evaluation Division to handle Program Change Proposals and day-to-day actions and a Plans and Systems Division to handle the overall development, refinement, and procedures of the Army Program System.[63] By September 1965, the seven military and civilian analysts in the Coordination and Evaluation Division of the Office of the Director of Army Programs were responsible for the review and analysis of Army program submissions and some systematic analysis of Program Change Proposals. However, primary responsibility for Army programs remained a function of the comptroller of the Army.

The Director of Special Studies

The Directorate of Special Studies was established in the Office of the Chief of Staff on 15 September 1963, with a senior Army general officer designated by the chief of staff as director, one lieutenant colonel as executive officer, and one civilian secretary with office space and administrative support provided by the secretary of the General Staff.[64] Working under the direction of the vice chief of staff, the director of special studies was responsible for monitoring, reviewing, and advising the chief of staff and the vice chief of staff regarding "such important studies affecting the readiness and capabilities of the Army as may be assigned to him for action."[65] His duties included the coordination and integration of the Army Study Program (TASP) and related systems; acting as chairman of Department of the Army steering groups of senior officers to guide, monitor, develop, and review designated studies; and, as directed, conducting special studies.[66]

Until 1963, various Army Staff agencies prepared studies of important topics independently and without the level of coordination and correlation that would have made them more widely useful.[67] To correct this fault, the chief of staff, on the recommendation of the director of special studies, directed the establishment of the Army Study Advisory Committee (ASAC), the setting up of a documentation and information retrieval system, common standards for the preparation of studies, and publication of an Army Master Study Program that was updated annually. The director of special studies and the three officers in his directorate thus picked up responsibility for chairing the ASAC; general liaison with OSD, JCS, the other services, and the Office of the Secretary of the Army; maintaining information on the status of major studies and on study facilities and resources; conducting some analysis of the need for and priority of proposed studies; and supervising the Army Study Documentation and Information Retrieval System.[68] Under his supervision, a Studies Processing Group maintained liaison with OSD, the JCS, the Army Secretariat, major Army commands, and the other services to identify areas requiring special attention in the Army Study System, and a Special Studies Group provided the capability to conduct short, high-impact studies for the chief of staff.[69]

The Special Assistant for Army Information and Data Systems

By the early 1960s, the automation of Army management information using high-speed digital computers was becoming common, but progress in automation was slow, primarily because the Army Staff "could not decide who would control and develop the headquarters management information system."[70] Each staff section developed its own management information system and the Army that each system described was different. As Lt. Col. Raymond Maladowitz has noted:

> While this was going on, the "Whiz Kids" from OSD were roaming around getting information where they could and using it as they saw fit. The chain of command was by-passed and the contacts made were not always the proper ones. Integrated data being sought by OSD could not be made available by the DA Staff in the response time desired by OSD to support Mr. McNamara's method of management.[71]

In an effort to solve the problem, the position of special assistant to the chief of staff for Army information

and data systems (AIDS) was established in November 1963, and the special assistant was made responsible for the control, review, coordination, and approval of automatic data processing system requirements and equipment acquisitions and for advising the chief of staff and vice chief of staff on "matters pertaining to Army information and data systems."[72] The specific responsibilities of the special assistant for AIDS included the following:

> development and implementation of plans, policies, and guidance for the Army's automatic data processing systems; supervision, coordination, and integration of the overall information and data system effort; and establishment, maintenance, and supervision of a standardized and automated information system for HQDA in coordination with the Army Staff.[73]

The last-named responsibility—to oversee the development of an integrated, automated HQDA Information System (HIS)—was of crucial importance because the HIS was intended to provide a common database for the Army Staff.[74] By September 1965, the special assistant for Army information and data systems and the ten full-time analysts in his office were also responsible for monitoring and coordinating Army projects for information and data systems and for systems analysis of data automation requests and computer system contract proposals.[75]

The Director of Coordination and Analysis

In 1963, Secretary of the Army Cyrus Vance directed that some systems analysis capability be established within the Office of the Chief of Staff, and a small Systems Analysis Division was set up within the Office of the Secretary of the General Staff (SGS).[76] The SGS Systems Analysis Division subsequently formed the cadre for the Directorate of Coordination and Analysis created in 1964. The director of coordination and analysis was intended to be the counterpart of the deputy assistant secretary of defense (systems analysis) and the special assistant for operations research in the Office of the Assistant Secretary of the Army (Financial Management). He was responsible in general for coordinating and reviewing the programming efforts of the Army Staff, and his specific responsibilities included the following:

> analytical review and conduct of independent analysis of military studies, plans, and programs involving major policies, strategy, forces, organizations, tactics, deployments, weapons, logistics, and command-control-communications including cost effectiveness analysis or other operations research techniques where applicable; guidance and support to and coordination and liaison with military and civilian agencies in conducting systems analysis and operations research studies.[77]

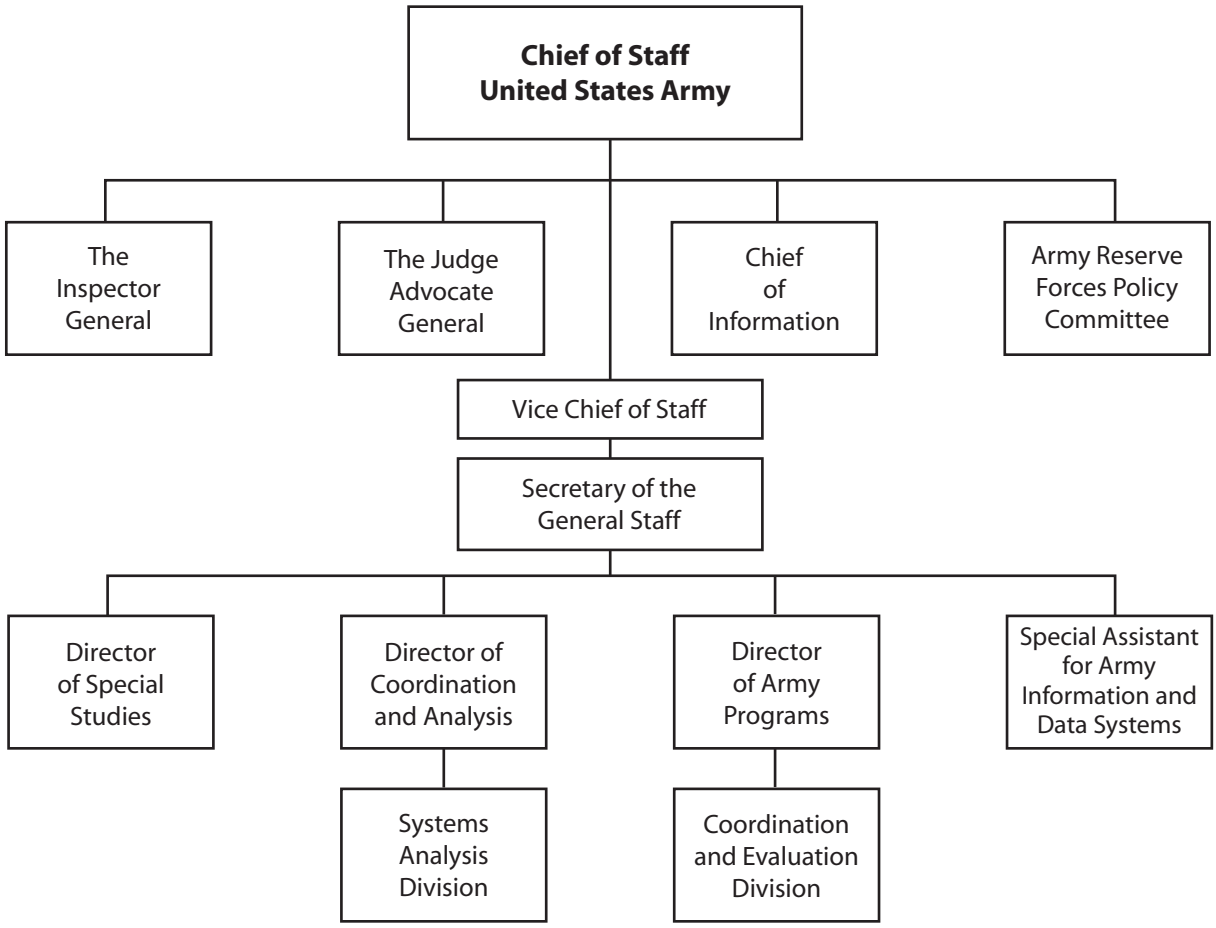
He was also responsible for assisting the chief of staff and vice chief of staff in the preparation of public statements and testimony before Congress and for publication of the *Chief of Staff's Weekly Summary*. By September 1965, the six military analysts in the Systems Analysis Division in the Office of the Director of Coordination and Analysis were deeply involved in monitoring, reviewing, and conducting selected studies for the chief of staff and applying systems analysis and operations research methods to a variety of Army topical problems on a selective basis.[78]

By the beginning of 1965, the several staff directorates established in the Office of the Chief of Staff to meet the demands of OSD and the Army Secretariat for information and analysis had grown substantially and had become essential elements of the Army response to Secretary McNamara's new management system. The resulting organization of the Office of the Chief of Staff, Army, was as shown in Figure 3–2.

Creation of the Force Planning and Analysis Office

Despite the progress made by the fall of 1965 toward creating an integrated, centralized capability to meet the needs of the chief of staff in dealing with OSD and the Army Secretariat, an adequate solution had not been found. In November 1965, General Harold K. Johnson (Army chief of staff, 3 July 1964–2 July 1968) expressed his concern about the Army's ability to meet the demands of the increasingly complex process for producing new weapons, organizations, and doctrine, stating, "The increasing complexity and cost of Army equipment and the expanding reliance by the Army on civilian research and study contractors give rise to the question of whether the Army has the competence, in-house, to make independent assessments and evaluations of the products."[79]

FIGURE 3–2—ORGANIZATION OF THE OFFICE, CHIEF OF STAFF, ARMY, JANUARY 1965



Source: U.S. Department of the Army, Office of the Chief of Staff, Organization and Office Directory (Washington, D.C.: Office of the Chief of Staff, Headquarters, Department of the Army, 1 Jan 1965).

Secretary of the Army Resor was also concerned about the ability of the Army Staff to handle the annual Draft Presidential Memorandums (DPMs) that had become increasingly important as the vehicles for making decisions on weapons systems, force structure, and related doctrinal matters.[80] On 13 January 1966, he wrote to the Army chief of staff, directing the establishment of an agency in the Army Staff to be headed by a general officer to deal with Army issues in the DPMs.[81] Secretary Resor intended that the new agency would be one that "can take the overview which is necessary to the most efficient integration of systems, which can probe, challenge, question, and systematically examine our positions."[82]

Before General Johnson could act on Secretary Resor's directive, a different solution was imposed upon them by OSD. On 15 February 1966, Deputy Secretary of Defense Cyrus Vance directed the Army to establish a Force Planning and Analysis Office (FPAO) to "integrate Army requirements for force structure, manpower, materials, and readiness" and to ensure the ability of the Army Staff to respond in "a timely, accurate, and coordinated manner" to OSD requirements.[83] The FPAO was subsequently established in the Office of the Chief of Staff on 21 February 1966, and Brig. Gen. Paul D. Phillips, who had been the director of plans and programs in the Office of the Assistant Chief of Staff for Force Development, was named as the military co-director of the new office.[84] A number of other general officers subsequently held the position of military co-director/director of FPAO, as shown in Table 3–1.

Table 3–1—Military Co-Directors/Directors of the Force Planning and Analysis Office, 1966–1973

Co-Director/Director	*Dates*
Brig. Gen. Paul D. Phillips	February 1966–August 1966
Brig. Gen. David S. Parker	August 1966–July 1968
Brig./Maj. Gen. J. L. Baldwin	July 1968–July 1970
Brig. Gen. Herbert J. McChrystal, Jr.	July 1970–January 1973
Brig. Gen. John R. Thurman	January 1973–December 1973

Source: Dates of incumbency are approximate and are based on successive issues of Headquarters, U.S. Army, Office of the Adjutant General, *HQDA Chiefs and Executives* (Washington, D.C.: Office of the Adjutant General, HQDA, Feb 1966–Dec 1973).

Note: The position of civilian co-director was discontinued in July 1967, and the Force Planning and Analysis Office was redesignated the Planning and Program Analysis Directorate in April 1970.

Deputy Secretary of Defense Vance apparently did not trust the Army to set up and run the new office properly; therefore, William K. Brehm, then director of the Land Forces Programs Division in the Office of the Assistant Secretary of Defense (Systems Analysis) was placed on loan from OSD to serve as civilian co-director during the start-up period for the new office.[85] Although initially considered an OSD spy, Brehm quickly dispelled any misgivings on the part of the senior Army officers with whom he worked. As Lt. Gen. Ferdinand J. Chesarek later recalled:

> I think Bill was able to do a very good job. He has a very quiet personality, and he quickly sold himself to the key people that he was working for the Army now, and would like to utilize his rather unique talents on behalf of the Army, not as an OSD spy. He was accepted in that light. It was made rather easy, because the Secretary of the Army held him in extremely high regard, and this was well known, but Bill played his cards very beautifully, and in my judgment, made a substantial contribution to the Army.[86]

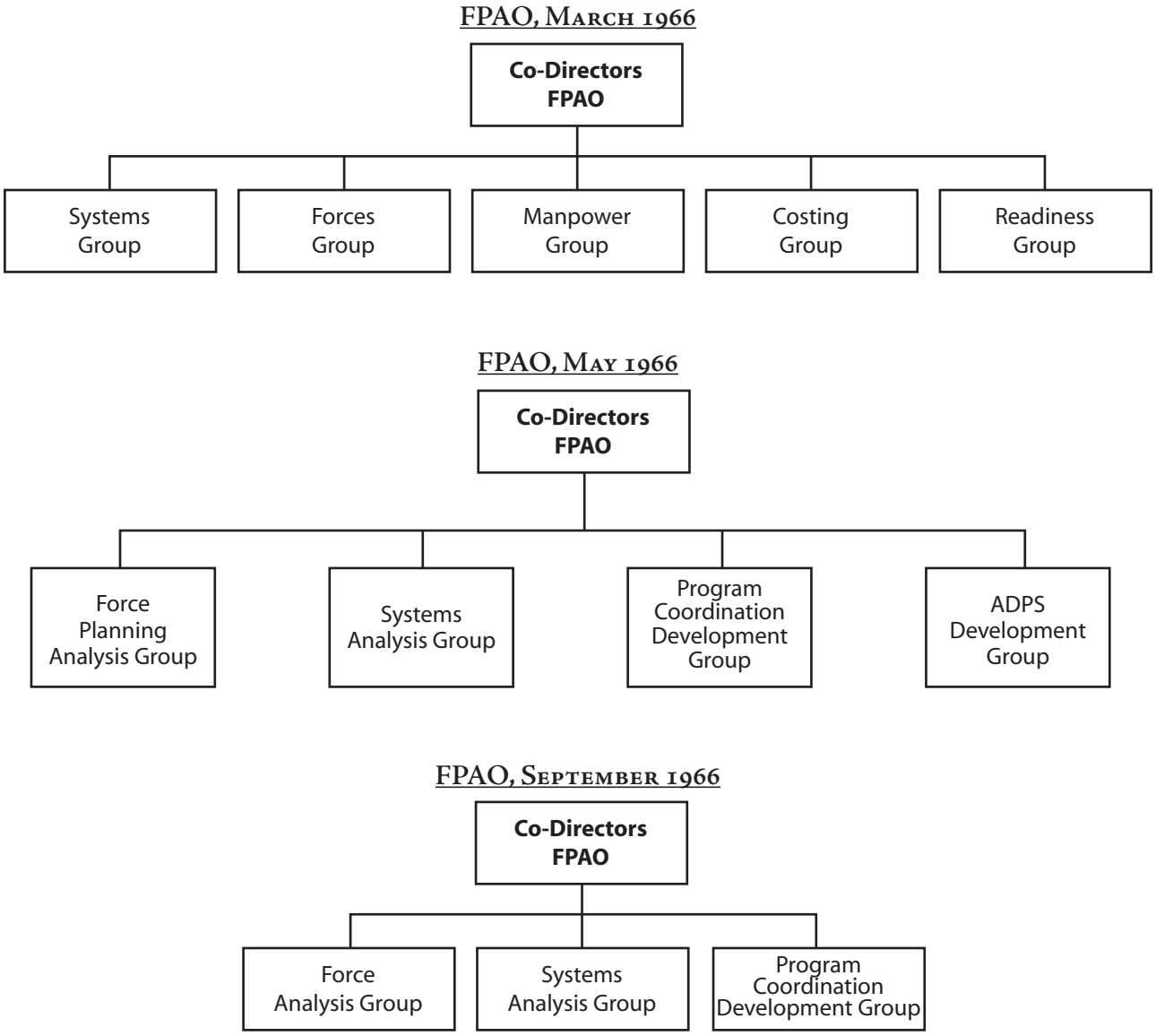
Brehm was replaced by Dr. Jacob A. Stockfisch in the summer of 1966, and Dr. Stockfisch occupied the position of civilian co-director of FPAO until it was abolished with the creation of the Office of the Assistant Vice Chief of Staff in July 1967.[87]

The assigned mission of the new Force Planning and Analysis Office was "to integrate Army requirements, develop and assess alternatives, facilitate dialogues and act as a point of contact with OSD, especially in the SEA [Southeast Asia] programming system, and identify major 'incipient' problems."[88] Another task, assigned by OSD, was the "development of an automatic data processing system to assist in the analysis of alternatives and in the updating of the basic data displays which have come to play such a vital part in the decisionmaking process."[89] The FPAO initially was organized with five subordinate groups but quickly underwent two reorganizations before the end of 1966, as shown in Figure 3–3.

On 14 April 1966, the Army chief of staff again reorganized his office to further reduce overlapping and duplication of functions.[90] The Directorate of Coordination and Analysis was eliminated and its functions were reassigned to other offices.[91] The Directorate of Army Programs was also eliminated, and its functions were reassigned to the FPAO, the deputy secretary of the General Staff for coordination and reports, the DCSOPS, the comptroller of the Army, and the assistant chief of staff for force development (ACSFOR).[92] The FPAO was subsequently reorganized in May 1966 to accommodate the new assignment of functions. The resulting organization of the Office of the Army Chief of Staff was as shown in Figure 3–4.

In August 1966, Brig. Gen. David S. Parker replaced General Phillips as military co-director of FPAO, and on 1 September 1966, FPAO was reorganized with three groups: a Force Analysis Group; a Systems Analysis Group; and a Program Coordination and Development Group. Automatic data processing support and cost analysis support were provided by the Office of the Special Assistant for Army Information and Data

FIGURE 3–3—SUCCESSIVE ORGANIZATION OF THE FORCE PLANNING AND ANALYSIS OFFICE, OCSA, MARCH 1966–SEPTEMBER 1966

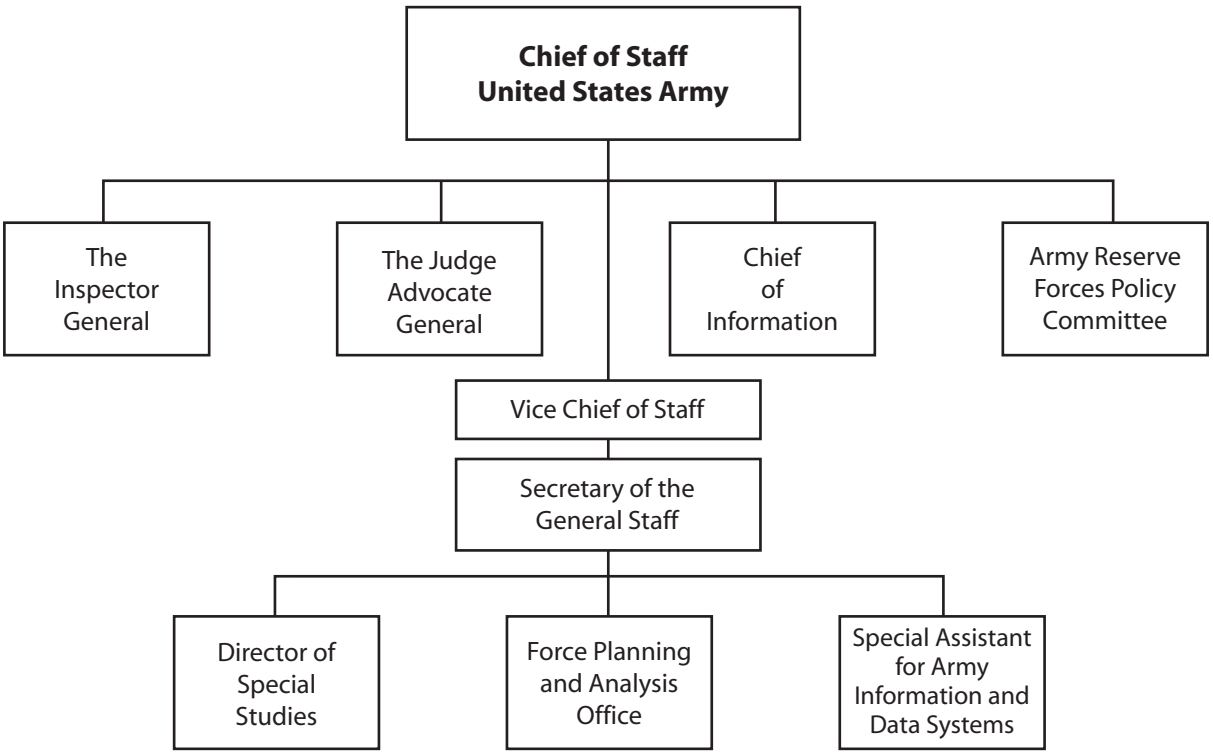


Source: Lt Col Raymond Maladowitz, *Office of the Assistant Vice Chief of Staff—Parkinson's Law or Progress* (Carlisle Barracks, Pa.: U.S. Army War College, 9 Mar 1970), p. 19, Figure 1.

Systems and the comptroller of the Army, respectively.[93] The Forces Analysis Group developed integrated force structure requirements; the Systems Analysis Group conducted independent analyses of major programs of interest to the Army; and the Program Coordination and Development Group developed "procedures and regulations to accomplish DOD instructions concerning major force-oriented issues, DPMs, and other program changes accomplished separately from the Program/Budget."[94] Each group also reviewed "proposed changes in their areas of responsibility and submitting results of their evaluations to SA [secretary of the Army] and CSA [chief of staff of the Army] in format that would facilitate their dialogue with OSD. Each group was also the DA action office on DPM's falling within their area of responsibility."[95]

Despite everyone's good intentions and best efforts, the FPAO had several faults and failed to solve the problems it was created to solve. In a memorandum for General William C. Westmoreland, who became chief

Figure 3–4—Organization of the Office, Chief of Staff, Army, August 1966



Source: U.S. Department of the Army, Office of the Chief of Staff, *Organization and Office Directory* (Washington, D.C.: Office of the Chief of Staff, Headquarters, Department of the Army, 1 Aug 1966).

of staff in 1968, General Chesarek, who had closely observed the creation of FPAO, wrote: "FPAO was not as effective as was hoped. The staff never really accepted the office. . . . While it attempted to provide the depth needed in Army responses and to provide objective analysis of staff output, it was having a hard time of it."[96]

There were several problems. First, the FPAO never had the authority it needed to be effective.[97] Second, the arrangement of having two co-directors, each of whom reported to a different superior, violated basic principles of Army management and confused channels of command and reporting.[98] Third, the FPAO duplicated functions assigned to other elements of the Army Secretariat and the Army Staff.[99] Although theoretically the "functions and responsibilities of existing staff agencies [were to be] in no way diminished by the formation of FPAO," its mission statement overlapped that of the Office of Operations Research in the Office of the Under Secretary of the Army as well as those of the DCSPER, the DCSOPS, and the ACSFOR.[100] It was thus viewed as infringing on the authority of the other principal Department of the Army Staff officers.[101] Fourth, it did not significantly reduce the burden on the chief of staff and the vice chief of staff, who still had to deal with three other important agencies within the Office of the Chief of Staff as well as the Army Staff itself.[102] In view of the many faults of the FPAO, scarcely two months after it was established studies recommending its dissolution were presented to the chief of staff.[103]

The Office of the Assistant Vice Chief of Staff of the Army

Army planning, programming, budgeting, and management relied on three basic systems.[104] Management information systems were used to measure and analyze "requirements and availability of resources in relation to plan or program and provide for

massive data reduction and analysis in order to surface, at the earliest possible time, potential problem areas for management attention"; weapons systems analysis was used to compare "alternative solutions to the mix of personnel, forces, logistical support, and funds"; and force planning analysis was used to compare "alternative forces and their costs against mission capabilities."[105] Over the years, various elements had been created within the Army Staff to deal with these three basic systems, and a variety of studies had been carried out to consider them as a whole. By the mid-1960s it was apparent that none of them would operate effectively unless they were accorded due priority and "placed in a keystone position under the umbrella of the total analysis effort," and that the three systems "must be tied together under central direction and control."[106] The FPAO proved inadequate as the vehicle for coordinating and integrating the necessary systems and thus failed to solve the problems involved in providing the integrated data and detailed analysis required by OSD.[107] What was needed and desired was a centrally managed system to

> better orient our staff operations to attain and maintain that degree of Army readiness required to meet the security interests of the United States . . . to assist the Army in achieving its ultimate objective to field and support fully at any time any reasonable required mix of forces, fully ready, with adequate sustaining power . . . a management system that is auditable, economical, and responsive to change.[108]

Establishment of the Office of the Assistant Vice Chief of Staff

The need to find an effective answer to the problem of centralized direction and integration of the Army's data and analysis systems was urgent in view of the fact that dealing directly with the secretary of the Army took up an inordinate amount of time of the chief of staff, around twenty to thirty hours per week.[109] The Army leadership also feared that if they did not find an adequate solution soon, one would be imposed upon them by OSD, as the Force Planning and Analysis Office had been.[110] In fact, in early 1966 there was already circulating a memorandum prepared by Alain C. Enthoven that was reported to have recommended, in effect, the transfer to OSD of the responsibility for managing the Army.[111] General Chesarek, then the comptroller of the Army, took a copy of the Enthoven memorandum to Army Vice Chief of Staff General Creighton W. Abrams, Jr., along with a proposal to create what would later be called the Office of the Assistant Vice Chief of Staff of the Army (OAVCSA). General Abrams subsequently requested comments on the OSD memorandum from the Army Staff principals and key officers in the Office of the Chief of Staff, Army (OCSA). Lt. Gen. Charles H. Bonesteel III, then the director of special studies, prepared a memorandum for the vice chief of staff on 29 March 1966 that proposed some amalgamation of the Office of the Director of Special Studies, the Force Planning and Analysis Office, and the Office of the Special Assistant for Army Information and Data Systems under a senior officer who would act as chief of staff to the Army chief of staff.[112] A follow-on study by an ad hoc group in the Office of the Chief of Staff reviewed five alternatives and recommended one that would place the Directorate of Special Studies, the Office of the Special Assistant for Army Information and Data Systems, and the Force Planning and Analysis Office under a lieutenant general who would be given the title of "Director of Force Planning, Programming, and Special Studies."[113] Maj. Gen. J. E. Landrum, Jr., then the special assistant for Army information and data systems, suggested that the title should be "Assistant Vice Chief of Staff."[114]

On 16 February 1967, Army Chief of Staff General Harold K. Johnson issued *Chief of Staff Memorandum (CSM) No. 67–64: Reorganization of the Office, Chief of Staff* and appointed General Chesarek, then the comptroller of the Army, as assistant vice chief of staff to develop a modern integrated resource planning and management system.[115] OAVCSA was intended to provide "the priority attention and central control that would insure effective and economical utilization of resources."[116] General Johnson's memorandum creating the OAVCSA prescribed that the process of providing "a modern, updated, integrated Army resource planning and management system using fully modern and scientific advances in resource control and operation with full regard to cost and related effectiveness" should take no longer than two years.[117]

General Chesarek later recalled that General Johnson had given him forty-eight hours to design the

new office and that while the basic concept belonged to General Johnson and Vice Chief of Staff General Abrams, he alone had written the draft memorandum that defined the concept and approach as well as what was to be done and how it was to be done.[118] He did this, he said, without consulting the Bonesteel study, which he did not even have time to read.[119] Chesarek stated:

> I wrote it all. At the end of 24 hours, I had the rough draft. I went in with General Abe [General Creighton W. Abrams, Jr., then the Vice Chief of Staff], and we reviewed it. He made comments as to how he thought the way the Chief wanted to go, and his own views on it. I went back and rewrote it. I tabbed it, and the only person that saw it was my secretary.[120]

Functions of the Assistant Vice Chief of Staff

It was assumed that the assistant vice chief of staff (AVCSA) would be familiar with the language and techniques of OSD and the Army Staff and would thus act as a bridge between the two.[121] As Maladowitz has noted, the new position "also provided a focal point for contacts with OSD and could provide Army interpreted data rather than the raw input data provided previously. It was also in a position to insure that information submitted through Joint channels also was consistent with information provided through the CSA and SA."[122]

The assistant vice chief of staff was assigned the following specific functions for the position:

1. Responsible for an Army-wide study effort for the Chief of Staff aimed at improving performance and effectiveness in all functional areas, with due regard for economy of resources.
2. Responsible for developing and integrating the DA Management Information System to permit commanders at all levels to identify major problem areas at the earliest possible time, and evaluate program alternatives.
3. Responsible for developing, prescribing guidance, and monitoring force planning/costing models and systems designed to assess cost/effectiveness and force alternatives or resource changes.
4. Evaluates force structure alternatives and the resulting integrated resource implications for manpower, materiel, and funds.
5. Responsible for the establishment of thresholds below the level of the Secretary of the Army for the approval of authorization documents.
6. Responsible for developing guidance and processing, with recommendations, DA positions through the Chief of Staff to the Secretary of the Army on force-oriented issues and on Draft Presidential Memoranda that directly involve DA resources.
7. Responsible for prescribing guidance and monitoring analyses which identify weapon systems alternatives, the resources required to implement those alternatives, and actions required to accomplish the preferred alternatives.
8. Acts as a central point of contact for information concerning management information systems, weapon systems analysis and force planning required by outside agencies and maintains close liaison with appropriate staff elements of OSD and the Army Secretariat.
9. Responsible for developing and prescribing the guidance for and integration of Army actions in phase with the timetable for the Planning, Programming, and Budgeting Cycle.
10. Responsible for keeping the Secretary of the Army and the Chief of Staff directly informed with respect to matters within his functional area of responsibility.[123]

These functions were confirmed in essentially the same terms in *Chief of Staff Regulation (CSR) No. 10–25* of 4 March 1968 and in *Change 3* (23 May 1969) to *AR 10–5*.[124] *Change 1* (13 August 1968) to *CSR 10–25* added the responsibility for the AVCSA to act as "the principal assistant to the CofSA and the VCofSA for developing guidance and integrating the efforts of the Army Staff to improve the management and utilization of Army resources, including personnel, materiel, forces, facilities, and funds."[125] In addition, the AVCSA exercised command authority over the United States Army Management Systems Support Agency, a Class II activity of the Office of the Chief of Staff, and the United States Army Computer Systems Support and Evaluation Command, a Class II activity responsible for the development of ADP systems to be used by more than one major Army command.[126] Later, in 1969, the AVCSA was also assigned the responsibility of monitoring "all Army Staff activity relating to the management of prepositioned materiel configured in unit sets."[127] The AVCSA was also charged with playing an important role in the preparation of the Army Force Development Plan and cost estimation.[128]

General Chesarek himself saw his primary duty as AVCSA as being to apply what he called "stretch management" to get "the most benefit from the manpower and funds provided the Army by our government."[129] What was needed, he believed, was:

> a group of highly qualified professionals who are not involved in daily staff actions, who can perform objective analyses, develop the management information systems to provide the decision-makers with better management tools, act as the interface with the Office of the Secretary of Defense and the Army staff, and seek methods and means to integrate the total staff effort.[130]

General Chesarek also believed that the new OAVCSA would have "a far-reaching effect and an impact upon everyone who has any dealings with or is a part of the United States Army."[131] That impact, he wrote:

> will be felt in the application of new management techniques, in the structuring of forces, in the refinement of methods for assessing readiness, and in the types and quantities of weapon systems that are procured. The integration and hardening of the requirements and allocations of manpower, materiel, dollars, and readiness into a total resource management package will result in improved management and, therefore, a better Army.[132]

Nevertheless, he had few illusions about the difficulties of the task before him:

> We have made many mistakes along this road. We have tried to introduce complex systems too fast and have seen them produce chaos rather than improvement. We have learned the hard way that high-speed computer output is no better than the accuracy of manual input. We have seen great emphasis on cost reduction but little objective measurement of effectiveness.[133]

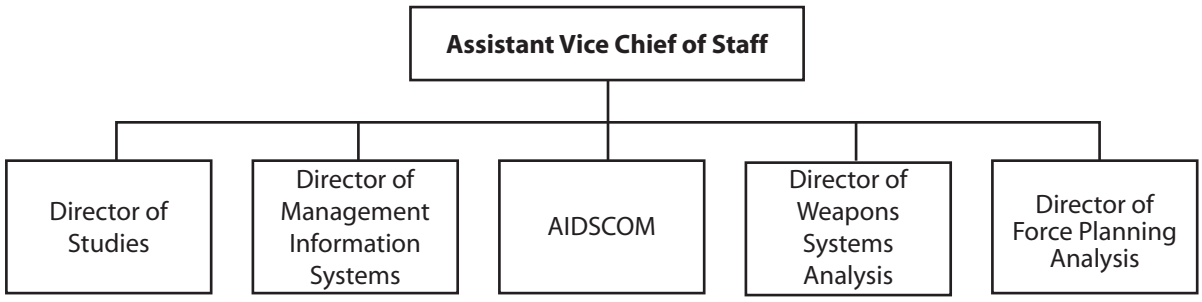
Organization of the Office of the Assistant Vice Chief of Staff

The OAVCSA was initially organized with four directorates plus the United States Army Information and Data Systems Command (AIDSCOM), as shown in Figure 3–5.[134] The personnel and other assets for the four directorates were drawn mainly from the special offices already existing in the Office of the Chief of Staff with additional assets drawn from the Office of the Comptroller of the Army for the Weapons Systems Analysis and Force Planning Analysis Directorates.[135] The new OAVCSA had a staff of 100–150 people, and all four directorates also relied on contract support.[136] As Maladowitz has noted, the responsibilities of the four new directorates "cut across functional lines to provide the basis for developing integrated data upon which meaningful and timely information could be prepared for the CSA and SA."[137]

The Director of Studies

The director of studies was the heir of the former director of special studies in the Office of the Chief of Staff, and his principal function was "to supervise the conduct of longer range studies."[138] In *CSM 67–64* the chief of staff specifically charged the director of studies with organizing and conducting a major study

FIGURE 3–5—ORGANIZATION OF THE OFFICE OF THE ASSISTANT VICE CHIEF OF STAFF, JULY 1967



Source: *CSM 67–64*, Incl 4.

of ways in which to improve Army management.[139] General Chesarek later recalled that the OAVCSA had been created "under the umbrella of this big study program that the Chief wanted," and in preparing the draft memorandum that established the OAVCSA he had included the Directorate of Special Studies as "my principle [*sic*] vehicle to organize and operate this massive managerial improvement program, which the Chief was insistent on, and rightfully so, because what we were faced with was a managerial crisis."[140]

Overall, the efforts of the director of studies were aimed at solving the problem of a "lack of integration among and between various staff agency efforts."[141] Specifically, he was charged with overseeing "the Army Master Study Program; maintaining liaison with OSD, Joint Staff, OSA, Army Staff, major commands, and other military departments regarding the overall study programs; and coordinating the monitoring of studies within the functional responsibilities of other AVCofSA directorates."[142] He also served as the chairman of the Army Study Advisory Committee; supervised both a Special Studies Group that conducted limited, quick-response analyses for the chief of staff and vice chief of staff and a Study Processing Group that directed, monitored, reviewed, and processed special studies for the chief of staff and vice chief of staff; maintained liaison with other agencies regarding ongoing and future studies; and monitored and coordinated the overall Department of the Army study effort. He was aided by a special assistant who tracked trends and developments in the international political and military fields and by the Secretary of the Army Study Advisory Committee, who handled the administration of the committee.

The Directorate of Studies was reorganized in May 1969, and the director of studies became the coordinator of Army studies, chief of the Study Processing Group, and deputy chairman of the Army Study Advisory Committee.[143] The Special Studies Group, special assistant, and Secretary of the Army Study Advisory Committee were eliminated, and the Study Processing Group absorbed most of their functions. The bulk of the functions previously assigned to the director of studies remained the same.

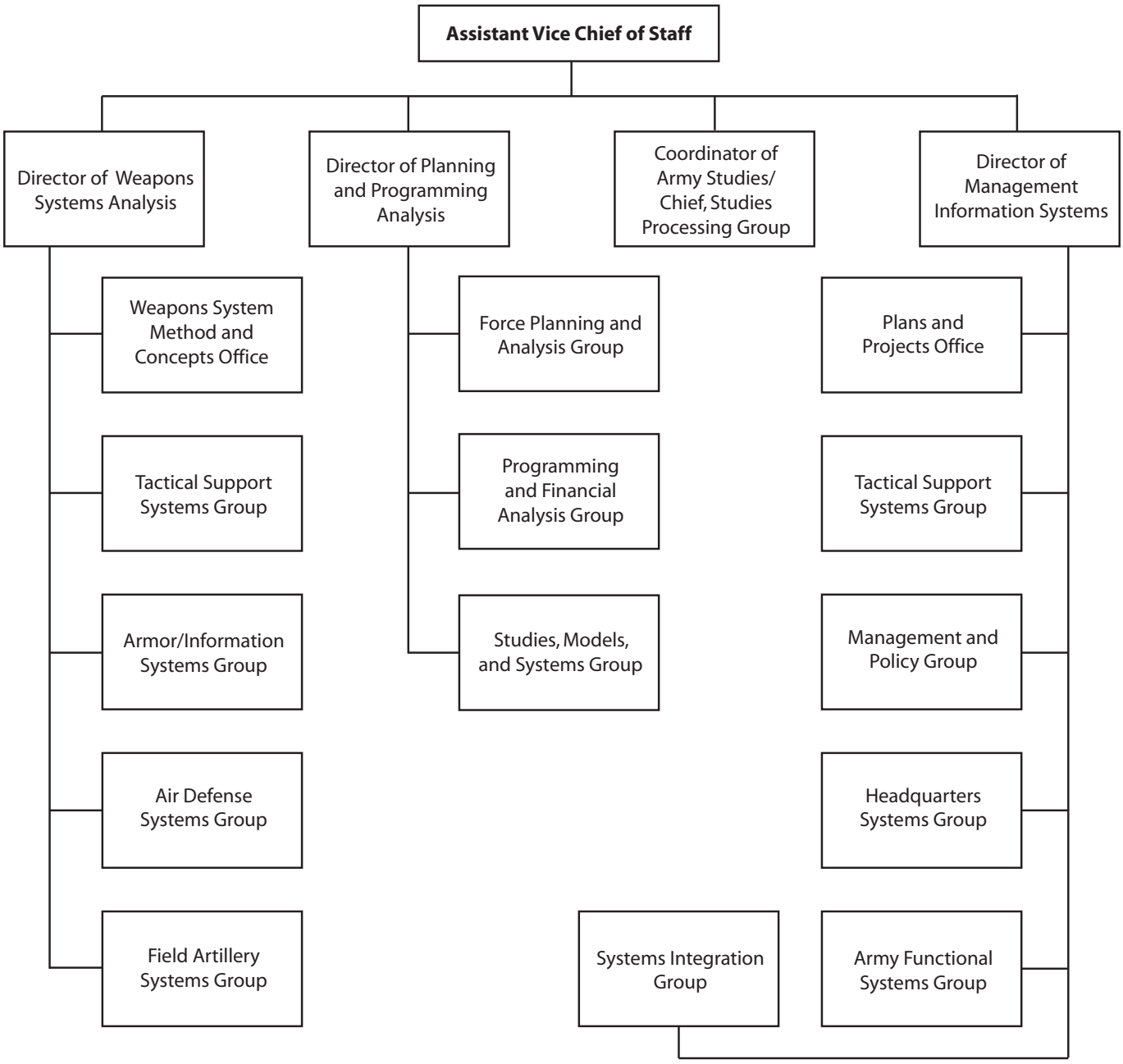
The Director of Management Information Systems

The director of management information systems (DMIS) inherited the functions and responsibilities of the former special assistant for Army information and data systems. He was charged with solving the problem of "fractionalization, diversity, and lack of interface among the information systems upon which managers were required to base resource-oriented decisions" by coordinating, guiding, and controlling "the development of Department of the Army information and data systems to insure the timely receipt of information" and by undertaking "the development of techniques and equipment to correlate and display meaningful data to assist in determining management problem areas."[144] The specific functions assigned to the DMIS by *CSM 67–64* were the following:

1. Develops, designs and controls the DA management information system. Determines in conjunction with the Director of FPA [Force Planning Analysis], the elements of information required by the Secretary of the Army and Chief of Staff for effective management control of DA requirements and resources and supervises the design and monitors these DA data collection and analytical management systems.
2. Provides technical experts to staff agencies in the areas of management information and control systems design, data reduction, verification and analysis techniques and management display concepts.
3. Develops and monitors overall plans, policies, objectives and programs which insure the development of functional DA information and data systems that are cohesive, integrated, non-duplicative and represent maximum utilization of available resources.
4. Develops policies and procedures for standardizing information elements and codes to permit the integration of manpower, materiel and financial data into a cohesive information system for requirements and resource analysis.
5. Monitors and assists in coordinating research and development projects in the automatic data processing and management information and science fields.
6. Reviews and evaluates data automation requirements, including systems development activities. Chairs the Data Automation Panel.
7. Provides guidance to COA [Comptroller of the Army] to insure the integration of ADP hardware and software systems as related to management information needs.[145]

As of March 1968, the Management Information Systems Directorate was organized with four subordinate elements: a Plans and Projects Office, an Information Sciences Group, a Headquarters Systems Group, and an Army Systems Group.[146] An ADP Management Group, an Operations Group, and an Inventory and Contractual Services Group were added by *Change 1* to *CSR 10–25* in August 1968.[147] The directorate was subsequently reorganized with six subordinate elements (Plans and Projects Office, Tactical Support Systems Group, Management and Policy Group, Headquarters Systems Group, Army Functional Systems Group, and Systems Integration Group), as shown in Figure 3–6.

FIGURE 3–6—ORGANIZATION OF THE OFFICE OF THE ASSISTANT VICE CHIEF OF STAFF, AUGUST 1970



Source: U.S. Department of the Army, Office of the Assistant Vice Chief of Staff, *Organization and Office Directory* (Washington, D.C.: Office of the Assistant Vice Chief of Staff, Headquarters, Department of the Army, 1 Aug 1970).

The DMIS also controlled several Class II activities. The United States Army Information and Data Systems Command (AIDSCOM), formerly under the special assistant for AIDS, was transferred to the OAVCSA as a Class II activity in February 1967.[148] Under the supervision of the DMIS, its primary function was to provide management information for the secretary of the Army and the chief of staff and to provide ADP services for the Force Planning and Cost Model (FPCM), the Force Accounting System (FAS), and the Army Authorization Document System (TAADS).[149] The responsibilities for ADP hardware evaluation and selection formerly assigned to AIDSCOM were transferred to the Office of the Comptroller of the Army, where an Office of the Director of Automatic Data Processing was established in April 1967 to evaluate and select computers for all Army elements.

Late in FY 1967, AIDSCOM was disestablished and its functions assumed by the United States Army Management Systems Support Agency (USAMSSA), a new Class II activity under the AVCSA.[150] USAMSSA was responsible for providing ADP support, including computer-oriented systems developed for the FPCM, FAS, TAADS, and an integrated summary level data bank of Army resources.[151] USAMSSA initially was organized with two divisions: the Systems Development Division, which provided computer technical assistance to other OAVCSA directorates, developed computer systems, and maintained an integrated database to support USAMSSA-operated management information systems; and the Operations Division, which maintained, scheduled, and operated the USAMSSA ADP equipment configuration.[152] USAMSSA was subsequently reorganized with three subordinate elements: a Scientific Systems Division, a Systems Development Division, and an Operations Division.[153]

In July 1968, the responsibilities of the director of ADP in the Office of the Comptroller of the Army, including supervision of the United States Army Computer Systems Evaluation Command (USACSEC), were transferred to the DMIS.[154] The USACSEC was redesignated the United States Army Computer Systems Support and Evaluation Command (USACSSEC) and was established as a Class II activity reporting directly to the DMIS and responsible for providing Army computer evaluation functions and ADP technical support, Army-wide.[155]

Considerable progress was made in the difficult area of management information systems during General Chesarek's term as assistant vice chief of staff, and in October 1969, not long after his successor took over, the Army published a comprehensive master plan for the design and development of Army management information systems that established the framework for all Army ADP management systems in the 1970s.[156] Thus, despite difficulties and setbacks, by 1969, the Army had "a computerized force planning system which could in a few weeks analyze in detail a wide variety of 'what ifs' involving some 20,000 separate Army units; as a result the Army could exercise more effective and tighter management controls over its resources."[157]

The Director of Weapons Systems Analysis

The Directorate of Weapons Systems Analysis was a new office intended to address the "lack of review, analysis, and consideration of trade-offs in proposed weapons systems."[158] The directorate had two broad objectives: to seek improvements in the techniques of weapons systems analysis throughout the Army and to consider the cost-effectiveness of alternative weapons systems.[159] The director of weapons systems analysis was assigned responsibility for "assisting organizations performing weapons studies in the development of necessary analytic and emulation models and to closely monitor progress of studies" by prescribing guidance and monitoring analyses "to identify weapon systems alternatives, the resources necessary to carry out the alternatives and what actions are required to achieve the preferred alternatives."[160] Specifically, *CSM 67–64* prescribed the functions of the director of weapons systems analysis as follows:

1. Responsible for prescribing guidance and monitoring analyses which identify weapon systems alternatives, the resources required to carry out those alternatives, and actions required to achieve the preferred alternatives.
2. Advises the Assistant Vice Chief of Staff on matters of weapon systems programming and reprogramming.
3. Responsible for developing guidance and processing recommendations on Draft Presidential Memoranda and Program Change Requests that are weapon systems oriented.[161]

The Directorate of Weapons Systems Analysis was organized with a Weapon Systems Methodology and Concepts Office that focused on reviewing, tracking, and developing criteria and methods for weapons systems analysis and several small groups oriented toward a particular Army mission area: an Armor/Infantry Group, an Air Defense Systems Group, a Field Artillery Systems Group, a Combat Support Systems Group, and, later, a NIKE-X Program Review Group.[162] As of June 1968, the Directorate of Weapons Systems Analysis was authorized with twenty-nine officers and twenty-seven civilian employees.[163]

General Chesarek, the first assistant vice chief of staff, later recalled that

> when we set up the AVICE's office, my original intent was to merge into Weapons Systems Analysis Directorate, Wilbur's people [i.e., the Office of Operations Research in the Office of the Under Secretary of the Army] and the staff people, so we didn't have two echelons of review. . . . I even asked Wilbur [i.e., Dr. Wilbur B. Payne] if he would head that outfit, but Wilbur preferred to stay where he was. The Secretariat [sic] wasn't about to give up his own analytic capability until he saw what the Weapons Systems Analysis Directorate might turn into.[164]

General Chesarek subsequently brought in Richard J. Trainor from the Office of the Comptroller of the Army to serve as chief cost analyst and director of weapons systems analysis.[165] The Weapons Systems Analysis Directorate supported the vice chief of staff in his role as chairman of the Army's System Acquisition Review Council (ASARC) and was thoroughly disliked by the Army Staff because it provided the vice chief of staff with an independent view.[166]

The Director of Force Planning Analysis

The Directorate of Force Planning Analysis was the lineal successor of the former Force Planning and Analysis Office. The director of force planning analysis (DFPA) was assigned responsibility for two major functions:

a. The translation of OSD decisions into specific program direction in terms of forces and resources.
b. The use of automated analytical models for the rapid assessment of alternative force structures and their associated costs.[167]

The task of the DFPA was thus to address the "lack of review, analysis, and consideration of trade-offs in force programs."[168] The specific functions assigned to the DFPA by *CSM 67–64* were:

1. Responsible for developing, providing guidance, and monitoring force planning/cost models and systems utilized to assess rapidly the cost/effectiveness and possible trade-offs and/or alternatives to proposed force concepts or changes.
2. Plans and conducts studies to apply systems analysis, gaming and simulation techniques, cost/effectiveness and other methodologies to the analysis of force structure and associated resource implications and balances.
3. Designs and monitors systems and automated models which are capable of developing alternative force analyses to variable inputs of scenarios, military responses, force compositions, deployments and other elements.
4. Interprets OSD guidance on force structure and prescribes boundaries within which the Army force structure will be prepared.
5. Reviews and analyzes DA authorization documents within thresholds to be prescribed.
6. In conjunction with the Director of Management Information Systems, prescribes the design and monitors the DA Management Information System, including the FAS, NAADS, and the asset information system.
7. Responsible for developing guidance for the Army Staff and reviews recommended DA positions for presentation to the Secretary of the Army through the Chief of Staff on force-oriented issues and on Draft Presidential Memoranda that involve DA resources.[169]

The Directorate of Force Planning Analysis eventually became the "master program office for the Department of the Army" and used computers, systems analysis, gaming, simulation techniques, and cost-effectiveness models to compare alternative force structures.[170] Initially, most of the analytical skills required were supplied by OR contractor personnel.[171] The directorate was organized initially with a Force Planning and Analysis Group, a Management Systems Group, a Programs Group, and a Studies and Models Group.[172] As of June 1968, the Directorate of Force Planning Analysis was authorized with forty-two officers and eighteen civilian employees.[173] It was subsequently reorganized into a Force Planning and Analysis Group; a Programming and Financial Analysis Group; and a Studies, Models, and Systems Group, as shown in Figure 3–6.

The Program To Improve the Management of Army Resources

Between 1967 and 1973, the assistant vice chief of staff and his subordinate directors were responsible for the design, conduct, and implementation of a number of complex studies of Army management, management information systems, force structuring, and the study process itself. Many of these studies involved the use of ORSA analysts, both in-house and contract, and had important implications for the use of ORSA by both the Army Staff and the Army in the field. Among the many projects undertaken, the Program to Improve the Management of Army Resources (PRIMAR) was one of the more important. In *CSM 67–64*, which established the Office of the Assistant Vice Chief of Staff, Army Chief of Staff General Harold K. Johnson specifically charged the new director of studies, under the supervision of the assistant vice chief of staff, to organize and conduct a major study of ways in which to improve Army management, the objective being to provide within two years "a modern, updated, integrated Army resource planning and management system utilizing fully modern and scientific advances in resource control and operation with full regard to cost and related effectiveness."[174] The resulting management system was to be "auditable, economic, and responsive to change" and was to improve "performance and effectiveness in all functional areas, with due regard for economy of resources."[175] The PRIMAR study itself was to "survey the entire spectrum of Army activities with the assistance of management consultants" as part of the two-year effort to establish "an integrated resource management system that would improve the Army Staff's ability to plan, program, and manage its resources."[176]

The PRIMAR study was conducted between February 1967 and February 1969 at a total cost of some $2.7 million, of which $705,724 went to contractor payments; more than one hundred man-years of professional Army Staff effort; and the efforts of a major part of the Army Staff for more than two years.[177] PRIMAR involved the participation of McKinsey and Company, a consulting firm that provided contract consultant services throughout the study and attempted to "integrate the separate study products into an overall Army resources management system."[178]

Army Chief of Staff General Johnson approved the concept for the PRIMAR study and issued the directive that announced its purpose and assigned responsibilities on 4 April 1967.[179] The consulting firm of McKinsey and Company was selected to assist the Special Studies Group in the Directorate of Studies to conduct the first phase of the study, "a survey of Army management systems and on-going improvement efforts" in order to develop a plan for the second phase of PRIMAR.[180] As Lt. Col. John R. Martin later recalled:

> Those of us involved in the PRIMAR effort soon began to compare our task to that of digging the Panama Canal with a teaspoon. When one considers the size of the Army staff, its varied functions, the diversity of expertise and experience among its members, and the fact that the major focus at that time was on the war in SEA [Southeast Asia], the scope of the PRIMAR effort truly becomes appalling.[181]

The PRIMAR study was designed to proceed in three phases. Phase I, which was completed in September 1967, defined the problem and identified more than 250 management processes and 100 ongoing management improvement programs that were laid out in a matrix called the Landscape of Army Resources Management, which enabled the study participants to identify major linkages among Army management systems as well as the major shortfalls. Eventually, twenty-three projects (later reduced to twenty) were identified for study by elements of the Army Staff during Phase II.

The complex plan for PRIMAR Phase II envisioned the completion over a period of one year of detailed studies of each of the twenty project areas identified in Phase I. To integrate the study effort, it was decided that "the primary effort during PRIMAR II would be the development of a measure of force readiness which would allow decision makers to evaluate the impact of their decisions on the readiness of the force as a whole or subelements of the force structure if they so desired."[182] Each of the twenty study projects identified in Phase I was assigned to one or another element of the Army Staff or of the Office of the Chief of Staff and was carried out by a study team composed of representatives from each of the principal Army Staff sections while the OAVCSA monitored, coordinated, and expedited the overall study process. Eleven of the twenty projects

"assisted in defining the component systems which support the total resource management system," and the remaining nine contributed directly to the goals of PRIMAR.[183] PRIMAR II was completed in February 1969, and the twenty PRIMAR II studies produced some 231 recommendations for improvements in the Army resource management system, of which 206 were approved by the vice chief of staff and ordered implemented.

The responsibility of the director of studies for PRIMAR ended with Phase II, and the director of force planning analysis, OAVCSA, was charged with overseeing Phase III, the implementation phase. The responsibility of implementing the approved recommendations was assigned to the Army Staff element having primary interest in a particular improvement recommendation. It was originally intended that Phase III would overlap Phase II by six months, but inasmuch as Phase II failed to define "an integrated resource management system which could be implemented immediately," some recommendations had already been carried out, and others were too difficult to implement immediately, PRIMAR was canceled in February 1969 without a formal implementation phase.[184]

Although there was no formal implementation phase, many of the 206 approved PRIMAR II recommendations were adopted piecemeal. By March 1970, 132 of them had been implemented.[185] Some, such as the publication of a revised *Army Regulation No. 1–1: The Army Planning System*, on 4 November 1970, represented significant progress, but other approved recommendations, such as the proposed integrated readiness measurement system, proved to be too difficult to implement immediately. Responsibility for monitoring the implementation by the Army Staff of the remaining approved recommendations was subsequently transferred to the KEYSTONE Management System Committee.

PRIMAR has been called "the most comprehensive analysis of Army management ever undertaken," but in the end it failed to achieve the objective of "a modern, updated, integrated Army resource planning and management system."[186] General Chesarek later stated:

> I don't believe we got out of it what we should have. Again, we had the great reluctance on the part of the staff to (a) admit error; or (b) to change. And unless you are mentally equipped to do both, no study effort was really going to go very far. . . . As I say, I was disappointed in many of the reported studies. Instead of jumping forward a year, we inched ahead a little bit.[187]

The principal factor in the failure of PRIMAR to achieve its goal was resistance and a lack of understanding on the part of the Army Staff. As stated in the *After-Action Report of PRIMAR*: "The Staff did not understand fully the reasons for PRIMAR and did not agree with many of the [Phase I] report's conclusions; thus, the detailed study phase was conducted without the full support and in some cases with active hostility from the Staff."[188]

Moreover, the efforts of the Special Studies Division and the contractor, McKinsey and Company, in Phase I "failed to examine the resource management problem in sufficient depth and detail to isolate all critical problems."[189] Colonel Martin, who was a participant in the PRIMAR study, drew a number of lessons learned from the experience:

> First, the two-year time constraint was unrealistic.
> Second, the Army Staff never really supported the PRIMAR effort.
> Third, the assignment of proponency for the individual PRIMAR II studies to individual Staff agencies affected the objectivity with which any study should be conducted.
> Fourth, contractor personnel should be used in such an effort only to address specific problems and then, a specific product required of them.
> Last, an overall Director for an effort of this magnitude should be provided.[190]

Lt. Gen. William E. DePuy as Assistant Vice Chief of Staff

The interest in providing the Army with an effective ORSA capability was shared by General Johnson's successors as Army chief of staff. General Wiliam C. Westmoreland (Army chief of staff, 3 July 1968–30 June 1972) stated to the members of the ORSA Executive Course at the Army Management School:

> I want to emphasize the importance that I attach to analytical techniques in managing the Army today. The art is wide and varied. As far as I am concerned, even though we in the Army have made great strides in the application of OR/SA techniques, we have only begun to touch the surface. You ladies and gentlemen are, therefore, in a fast moving, important field. My challenge to you today is to

> take the techniques you have learned and apply them in your jobs where these kinds of analyses and data have not been available. There is a continuous need to increase the skills of our managers.[191]

On 10 March 1969, General DePuy replaced General Chesarek, who was promoted and reassigned to command the Army Materiel Command.[192] As AVCSA, General DePuy immediately focused on his responsibilities for ensuring the effective participation of the Army in the DOD Planning, Programming, and Budgeting System. In a February 1971 interview with Colonel Martin, General DePuy stated: "The single most important function of my office is that of master programming."[193] Accordingly, during his time as assistant vice chief of staff, General DePuy instituted a number of efforts to coordinate and improve the Army's programming efforts, and by the time he left the AVCSA position in March 1973, he had successfully centralized control of the Army programming process in the OAVCSA.[194]

Changes to Army Planning, Programming, and Budgeting

When Melvin Laird took office as secretary of defense in January 1969, he modified the existing PPBS to give the services more power to allocate resources.[195] To ensure Army compliance with Secretary Laird's changes in PPBS, Vice Chief of Staff General Bruce Palmer, Jr., directed the comptroller of the Army, Lt. Gen. Frank J. Sackton, to head a committee composed of representatives of the AVCSA, the DCSPER, the ACSFOR, and the deputy chief of staff for logistics to examine the Army's organization and procedures for programming and budgeting and to make recommendations for their improvement. General Sackton's committee recognized the need for strong central management of the Army Programming System and recommended that the assistant vice chief of staff be given the responsibility for management of the system. This was done in *Chief of Staff Regulation No. 5–10*, which directed that the responsibilities of the AVCSA would include "the discipline, guidance, and management of the Army Programming System" and assigned to the AVCSA primary Army Staff responsibility for:

> (1) Developing and supervising the Army Programming System.
> (2) Developing program guidance and coordinating program guidance with the appropriate elements of the Army Secretariat.
> (3) Guiding the Army Staff in actions relevant to the development of the Army Program and reviewing, monitoring, and coordinating the Army Staff responses to program guidance.[196]

The recommendations of the Sackton Committee led to changes in the Army programming and budgeting system, including the formation of a senior-level committee known as the Select Committee (SELCOM) composed of all the principal Army Staff officers and chaired by the AVCSA.[197] The SELCOM, assisted by two subcommittees, the Budget Review Committee and the Program Guidance Review Committee, was responsible for interpreting the guidance received from higher headquarters, evaluating the analyses and recommendations of Army Staff elements, and making "program, budget, and funding decisions within the bounds of established policy and guidance."[198]

General DePuy used his position as chairman of the SELCOM and the authority granted to the AVCSA by *CSR 5–10* to implement a number of improvements to the Army programming system. For example, Secretary Laird's changes to PPBS called for the services to prepare justifications in the form of Program Objective Memorandums (POMs). To ensure that the Army response was well-coordinated, General DePuy instituted the so-called *Army Guidance*, which prescribed in detail what each Army Staff element was to prepare for the POM so that a single coordinated submission was sent up to the OSD comptroller. The Army Staff complied but were unhappy with the centralization and detailed review of their efforts by the OAVCSA.[199] General DePuy also initiated several attempts to automate the PPBS decision-making process, one being the so-called Dean machine—named for its creator, Lt. Col. Robert Dean—which failed because it required a general officer (General DePuy) to sit down for a long time to make changes.[200]

General DePuy also had many successes in other areas as assistant vice chief of staff. He was a promoter of the "big five" weapons systems that still form the core of the Army's fighting systems three decades later: the Apache helicopter, the Abrams

tank, the Bradley infantry fighting vehicle, the Patriot air defense missile, and the Black Hawk helicopter.[201] One of the major activities undertaken during his tenure was the management, through the program system, of a reduction of the size of the Army from 1.6 million personnel to 800,000 in a period of only four years.[202] General DePuy also headed the unpopular WHEELS study, which recommended a significant decrease in the number of wheeled vehicles in the Army inventory—from some 400,000 to fewer than 300,000—and saved some $1.1 billion in procurement costs and some $4.5 billion in life-cycle costs during the period FY 1973–FY 1978.[203]

General DePuy later assessed the success he achieved as assistant vice chief of staff by noting that when he became the AVCSA he worked 80 percent of the time for the secretary of the Army and 20 percent of the time for the chief of staff and the vice chief of staff, but after four years in the job the ratio had been reversed, a reflection, in his opinion, of the increased confidence of the secretary of the Army in the AVCSA and in the Army Staff to perform satisfactorily.[204] In broader perspective General DePuy noted:

> I think that's a very important period in the history of the Army General Staff. The Secretary was making the program decisions for the Army, and was using the A/VICE as his instrument and channel into the Army. I came out of that assignment fairly well educated in the techniques of program management, and to this day I am an ardent and enthusiastic believer in program management as the way to go for any large organization. I won't bore you with all of what that means, but it's the antithesis of budget management, and it's the opposite of General Staff Management of the old kind.[205]

The Office of the Assistant Vice Chief of Staff in 1970

By 1970, the Office of the Assistant Vice Chief of Staff had grown to some 200 ORSA analysts on hand against a total authorization of some 320 and was organized as shown in Figure 3–6. In March 1973, General DePuy was replaced by Lt. Gen. James G. Kalergis, who served as assistant vice chief of staff until the position was abolished in the STEADFAST reorganization later that year.

Criticism of the Office of the Assistant Vice Chief of Staff

The establishment and subsequent operations of the Office of the Assistant Vice Chief of Staff solved many of the problems faced by the secretary of the Army, the chief of staff, and the Army Staff in dealing with the Office of the Secretary of Defense. It also met the desire of the secretary of the Army to deal with only one or two key Army Staff officers and freed the chief of staff to devote more time to duties in the Joint Chiefs of Staff and overseeing the Army as a whole.[206] In the "Conclusions" to his 1971 study of the Office of the Assistant Vice Chief of Staff, Colonel Martin stated:

> f. The Office, Assistant Vice Chief of Staff, Army, has been effective in resolving many of the resource management problems and in directing efforts toward the solution of others. This is evidenced by the increasing credibility of the Army position on resource-related matters shown at the higher levels of review.
> g. In response to the dynamic nature of the field of resource management, a requirement for the Office, Assistant Vice Chief of Staff, Army or some other office performing essentially the same functions, will continue to exist for the foreseeable future.[207]

However, the OAVCSA was not universally acclaimed by the other principal Army Staff officers, many of whom saw it as a "super-staff" or "palace guard."[208] In establishing the OAVCSA, Army Chief of Staff General Johnson prescribed that the new establishment should "not change in any way the existing channels of communication between the Army Staff and the field commands."[209] On the day after he established the OAVCSA, General Johnson told the Army Staff: "Now what we are doing here I want to stress is not a criticism of the way that agencies that we have now are performing; it is not critical of the work that individuals have done in any way. It is basically a recognition at long last of what we need to get our job done, and I think that we see this."[210] General Johnson was also adamant that the new office should not impede his access to the Army Staff or their access to him.[211]

However, it is obvious that the OAVCSA both interfered with the access of the other Army Staff principals to the chief of staff and vice chief of staff and

infringed in many ways their assigned responsibilities. The OAVCSA double-checked the work of the Army Staff and had the authority to overrule the Army Staff on key issues. General Chesarek later recalled:

> This was not something that was accepted wholeheartedly by the senior people in the Army Staff, who viewed this as an encroachment on many of their assignments and their missions. Nevertheless, they took it in good grace when the Chief told them that he was going to proceed along this line. The early months were quite anxious. We battled out the problems and the way we wanted to go. The technique of proceeding. Again, this was not done in a victorious manner at all. It was honest differences between honest people.[212]

Among the many criticisms of the OAVCSA voiced by senior Army Staff officers were:

1. The power and position of the OAVCofSA tend to disrupt and distort the normal operations of the staff.
2. The size of the OAVCofSA generates a high demand for quality personnel at the expense of the rest of the staff.
3. The size of the OAVCofSA results in its getting into primary staff activity—tends to develop parallel staff actions which have been assigned to staff agencies and then to be the proponent for these uncoordinated solutions.
4. The existence of the OAVCofSA tends to insulate the staff from interaction with the Secretariat.
5. The development of a strong inter-disciplinary capability in the OAVCofSA reinforces the tendency to handle quick-response actions in-house rather than requiring and assisting the appropriate staff agencies to become more responsive.
6. The size of the OAVCofSA results in an increased requirement for more detailed information to support the monitoring and review role—duplication of data available from the staff results.
7. The principle of management by exception is violated by the monitoring role.
8. Its existence has an adverse impact on staff morale since the OAVCofSA projects a "palace-guard" image.
9. The OAVCofSA constitutes one more agency in the coordination exercise. Virtually every action must touch base with the AVCofSA due to his broad-based charter.
10. The OAVCofSA is OSD oriented and does not understand or support the Army position.[213]

The widespread and often bitter opposition to the OAVCSA on the part of many senior Army Staff officers still rankled years later. General James K. Woolnough, who served as the DCSPER from October 1965 to July 1967, later recalled:

> The AVCS was set up over the objections of the Army staff. I remember General Johnson calling me in and saying, "I am going to do this." (I was the senior deputy, so I was sort of an acting vice most of the time). He said, "I know we are going to get lots of objections, but Abe and I are spending so much time with the Secretary answering his questions that we have to have someone who can just go down and give him figures. So, this is why I am doing it.". . . I am completely out of sympathy with the expansion of the AVCS's office . . . the AVCS had complete control on certain occasions of what DCSPER was doing. . . . I think the concept has gone too far. . . . I know it has gone far beyond what General Johnson and General Abrams had meant for it.[214]

Lt. Gen. Austin W. Betts, the chief of research and development from May 1966 to January 1971, had an equally negative view of the OAVCSA and offered the opinion that "It would have been more effective for the long pull if he [General Johnson, the chief of staff] had pulled in the staff principals and said, 'If you two guys can't get together and work this out, I'll get new staff principals.'"[215] General Betts went on to say:

> Well, I was there and involved when General Johnson asked the Staff for comments on his concept of an Office of Assistant Vice Chief of Staff, and I confess that at that stage that I had some misgivings but they weren't strong enough, and as it happened, I did not actively oppose it. . . . I don't fault General Chesarek and General DePuy in any way for moving out to take authority and to do the things for the Army that they thought were right. Nevertheless, if you carry this to the extreme, it is simply another layer of General Staff above the General Staff, in effect. This small, though not too small element, (I guess a couple of hundred people in the A-Vice's Office) was in effect a kind of super-staff, wheeling and dealing across all spheres of activity of the Army General Staff. Now, I know that ACSFOR, General Collins went on record to the Chief of Staff urging that the duplication of his force posture planning and system analysis activities should be discontinued. As a matter of fact, he recommended wiping out the A-Vice's Office completely. I didn't recommend quite that much, but when the Parker Board gave us a vehicle for selectively recommending changes in duties of the A-Vice's Office, I agreed with that. I thought that the A-Vice ought to go back to the kind of function that was available in the coordination office we used to have before the A-Vice's Office was set up. It's so tempting for a major commander when he has terrible complex problems to want to have a little super group right near him that wheels and deals and helps him with his problems. But, I think that everything that was accomplished by the A-Vice Office could have been accomplished by making the

> staff do its job, and I think it should have been. What I'm saying, in substance, is that creating that office was a mistake.[216]

Even General Johnson, the creator of the OAVCSA, later seemed to regret his decision to establish the office. He told his oral history interviewers that, at the time, he viewed the OAVCSA as "a very dangerous office…because there is a tendency to usurp the functions of the deputies," and that he wrote for his successor, General Westmoreland "a two or three-page handwritten letter pointing out the dangers of that position [i.e., the OAVCSA]."[217] General Johnson went on to say, "I think that many of those dangers eventuated in subsequent years and I was delighted when General Abrams wiped out the position."[218]

As Colonel Martin pointed out, some of these criticisms may have been valid from the point of view of "the harassed, already over supervised action officer on the Army General Staff," but from the point of view of the secretary of the Army and the chief of staff, the disruption of "normal operations" of the Army Staff were just what was needed to improve the Army's response to OSD.[219] The OAVCSA did in fact skim the "cream" of the extraordinarily bright staff officers, as the large number of OAVCSA staff officers who went on to high rank attests, and the OAVCSA did "insulate" the Army Secretariat from the Army Staff, just as the secretary of the Army expressly desired.[220] On the whole, however, the OAVCSA performed the important function of monitoring and coordinating the flow of information to the Army Secretariat and OSD and corrected many of the problems of delayed, incomplete, or inadequate responses that it was created to correct. Colonel Martin concluded:

> History will judge the effectiveness of this attempt to solve the problems of resource management. When viewed in the light of its apparent results, one can only deduce that it is a vast improvement over the efforts which had previously sought to solve the ever-changing resource management equation. The initial objections to the new organization by some members of the Army Staff are certainly valid from the viewpoint of the agencies and individuals concerned. However, analysis indicates that most of the objections were based on wounds which were essentially self-inflicted. Until the Army Staff is able to solve the problems of resource management by normal staff procedures, then an agency such as the Office of the Assistant Vice Chief of Staff is required.[221]

ORSA and the Army Staff

The deputy under secretary of the Army (operations research), the assistant vice chief of staff, and the ORSA specialists under their direction focused for the most part on meeting the requirements for integrated data and analyses imposed on the Army Secretariat and the Army Staff by the Office of the Secretary of Defense. They thus concentrated on studies conducted within the Army Staff, and their concern with the management of Army-wide ORSA programs was marginal. However, other elements of the Army Staff also employed large numbers of ORSA analysts, conducted numerous studies, and played an important role in managing ORSA resources and activities Army-wide.

The traditional focal points for ORSA activities on the Army Staff were the deputy chief of staff for military operations (DCSOPS), who oversaw the Strategy and Tactics Analysis Group (STAG), and, in particular, the chief of research and development (CRD), who was responsible for overseeing the Army Research Office (ARO) and contracts with Army ORSA contractors such as the Research Analysis Corporation (RAC). Despite increased centralization of Army ORSA management in the Secretariat and the Office of the Chief of Staff during the 1960s, the DCSOPS, the CRD, and other Army Staff elements continued to play a prominent role in the overall management of Army ORSA activities. Moreover, they all increased their internal use of ORSA to define and defend their assigned programs and thus saw a significant growth in the number of ORSA specialists and managers, both military and civilian, that they employed.

An accurate assessment of the degree to which Army Staff elements were engaged in ORSA activity is complicated by the fact that organizational charts and Tables of Distribution and Allowances often failed to identify officers engaged in staff work having a high analytical content as being involved in such work, and many of the civilian positions identified as "analyst" did not in fact devote significant time and effort to analytical activities.[222] The criteria used by Dr. Wilbur B. Payne for identifying analytical elements of the Army Staff is perhaps more useful:

1. Primary mission is study and analysis in support of Army programs and requirements.

2. Use such analytical techniques as: operations research, systems analysis, cost effectiveness analysis, war gaming, simulation, field experiment, troop test, test and evaluation, maneuvers, field exercises, and actual operational experience.
3. Manned by a number of professional military or civilian analysts who habitually use the techniques of 2. above.
4. Monitor or execute preplanned programs of study and analysis.
5. Carry out some contract study and analysis under the provisions of AR 1-110, "Contracting for Management Advisory Services and Operations Research Studies and Projects" and AR 70–8, "Human Factors and Non-Materiel Special Operations Research".
6. Maintain lists of studies and analyses underway or planned.
7. Contribute to one or more of the established documentation and information retrieval systems (Defense Documentation Center, Army Study Documentation and Information Retrieval System, Defense Logistics Studies Information Exchange).
8. Monitor and review the work of elements characterized per 1.-7. above.[223]

The identification of Army Staff elements having an ORSA capability and conducting ORSA studies should thus be extended to include those involved in a wide variety of analytical activities, such as strategic studies, threat analysis, and technological forecasting, that did not directly involve the use of ORSA methods.[224] Although every element of the Army General Staff and many elements of the Army Special Staff had at least one small element engaged in analytical work, the bulk of Army Staff ORSA activities took place in six principal staff elements: the offices of the Comptroller of the Army, the DCSPER, the DCSLOG, the ACSFOR, the DCSOPS, and the CRD.[225]

Many of the Army Staff elements and the Class II activities reporting directly to them had substantial requirements for trained ORSA personnel. Table 3–2 shows the ORSA personnel requirements for the Army Staff from the summer of 1970 onward as estimated in the 1966 ASAC study of ORSA personnel requirements. There were no requirements for ORSA personnel in the Office of the Chief of Chaplains, Office of the Adjutant General, Center of Military History, Army Audit Agency, Office of the Chief of the National Guard Bureau, Office of the Chief of the Army Reserve, Office of the Judge Advocate General, Office of the Inspector General, or Office of the Chief of Information. For reasons that are unclear, the ORSA personnel requirements for the Army Secretariat were not included in the 1966 ASAC study.

The Office of the Comptroller of the Army

In addition to his direct fiscal and budget responsibilities, the comptroller of the Army (COA) was responsible for the review and analysis of Army programs; the management systems of the Army, to include development of Army-wide systems not falling within functional areas of any single staff agency; and the coordination and integration of the Army staff functional management systems to assure an integrated management system for the Army.[226] The COA was also responsible for overseeing the Army Cost Analysis Program created in 1966 by Secretary of Defense McNamara to extend to the Army the techniques employed by the Systems Analysis Group in OSD.[227]

There were three main elements within the Office of the Comptroller of the Army that were substantially involved in analytical work, including ORSA and cost analysis.[228] The director of cost analysis planned and monitored a uniform system of costing activities, prepared cost estimates in support of Army studies, conducted research on costing methods and techniques, and operated a cost information center. The director of review and analysis exercised staff supervision over review, analysis, progress reporting, and statistical reporting systems and performed independent reviews and analyses of Army programs and Army command operations. The chief of the Organization and Systems Analysis Division in the Office of the Director of Management developed Department of the Army-administered organizational principles, policies, concepts, and techniques and analyzed current and designed improved future organizational management structures. Overall, the ORSA personnel requirements of the OCOA in the summer of 1970 were estimated at four military and five civilian ORSA "specialists" and eight military and six civilian ORSA "executives" for a total complement of twenty-three ORSA-trained personnel.[229] In addition, the OCOA had a large share of the overall Department of the Army requirement for 118 cost analysts.

Table 3–2—Army Staff ORSA Personnel Requirements, Summer 1970

	"Specialist"		*"Executive"*		*Total*	
Army Staff Element/Class II Installation	*Mil*	*Civ*	*Mil*	*Civ*	*Spec*	*Exec*
Office of the Chief of Staff, Army (including OAVCSA)	23	15	30	6	38	36
U.S. Army Information and Data Systems Command	0	1	13	9	1	22
Deputy Chief of Staff for Personnel	3	6	4	0	9	4
Chief of the Office of Personnel Operations	3	1	21	3	4	24
Enlisted Evaluation Center	0	9	0	4	9	4
Reserve Components Personnel Center	0	0	2	1	0	3
Comptroller of the Army	4	5	8	6	9	14
Chief of Finance	0	1	1	0	1	1
Assistant Chief of Staff for Intelligence	9	1	5	5	10	10
Special Research Detachment	0	0	1	0	0	1
Intelligence Threat and Forecast Group	2	6	11	3	8	14
Deputy Chief of Staff for Military Operations	9	6	13	0	15	13
Strategy and Tactics Analysis Group	6	35	3	0	41	3
Deputy Chief of Staff for Logistics	9	12	7	2	21	9
Logistics Doctrine and Systems Agency	12	37	5	3	49	10
Chief of R&D (including ARO)	11	3	39	9	14	48
Operations Research Advisory Group	0	0	3	0	0	3
Assistant Chief of Staff for Force Development	10	0	9	1	10	10
The Surgeon General (include Medical Field Service School)	7	1	8	0	8	8
The Provost Marshal General	1	0	0	0	1	0
Chief of Communications-Electronics	3	3	4	2	6	6
Chief of Reserve Components	0	0	1	0	0	1
Chief of Engineers	1	5	10	7	6	17
Engineer Strategic Studies Group	5	3	0	0	8	0
Army Map Service	0	3	2	0	3	2
Geodesy, Intelligence, Mapping R&D Agency	0	3	2	0	3	2
Army Data Support Command	2	0	0	0	2	0
Army Administration Center	0	0	3	0	0	3
Department of the Army Cost Analysts	14	104	0	0	118	0
ARMY STAFF TOTAL	134	260	205	61	394	266

Source: *ASAC Main Report*, an. C (Requirements for OR/SA Personnel), Table C–1 (Consolidated OR/SA Personnel Requirements).

Note: Estimates are as of 29 August 1966 and reflect the expected state at the end of the planned Phase III expansion of Army ORSA requirements. The categories "Specialist" and "Executive" refer to the level of ORSA training required and not to position in the hierarchy. "Executives" required substantially less formal, detailed training in ORSA techniques. Detailed breakouts of Army Staff ORSA personnel requirements by staff element, phase, and grade can be found in apps. 5–16 of the *ASAC Main Report*. The Army Data Support Command and the Army Administration Center were Class II activities under the adjutant general. DA cost analysts were integrated with ORSA personnel in various Army Staff elements.

The Office of the Deputy Chief of Staff for Personnel

The deputy chief of staff for personnel (DCSPER) was responsible for developing and administering the Army's military and civilian personnel systems to include policies for the procurement and utilization of manpower, career development, the distribution of personnel to major commands, and the separation of personnel from active duty.[230] The chief of the Personnel Research Branch in ODCSPER was responsible for monitoring personnel research programs, maintaining a file of personnel studies, and participating in the Army Study Advisory Committee as a study coordinator.[231] The chief of the Requirements Division determined requirements for manning the Army force structure and analyzed requirements against availability as to numbers, skills, and grades. As of the summer of 1970, the ODCSPER had requirements for three military and six civilian ORSA "specialists" and four military ORSA "executives" for a total complement of twenty-three ORSA-trained personnel.[232]

The DCSPER also supervised the Office of Personnel Operations (OPO) created on 1 July 1962 for the purpose of integrating and centralizing the career management of officers and enlisted personnel of both the active Army and the Reserve components.[233] Using both in-house and contract analysts, OPO worked closely with DCSPER on the preparation of personnel management studies and policies aimed at more effective control and utilization of Army personnel resources and improved career planning. The chief of the Office of Personnel Operations supervised both the Army's Enlisted Evaluation Center and the Reserve Components Personnel Center. The ORSA personnel requirements for OPO and its two subordinate agencies totaled some forty-four ORSA-trained personnel in the summer of 1970: three military and one civilian ORSA "specialists" and twenty-one military and three civilian ORSA "executives" in OPO itself; nine civilian ORSA "specialists" and four civilian ORSA "executives" in the Enlisted Evaluation Center; and two military and one civilian ORSA "executives" in the Reserve Components Personnel Center.[234]

The DCSPER was also responsible for overseeing the activities of the United States Army Data Support Command (USADSC) within which was an Operations Research Group that developed computer-assisted systems for force, structure, and cost analyses and conducted statistical analyses, mathematical programming, and simulations.[235] The USADSC had requirements in the summer of 1970 for two military ORSA "specialists."[236]

The Office of the Deputy Chief of Staff for Logistics

The deputy chief of staff for logistics (DCSLOG) was responsible for the development and supervision of the Army's logistics organizations and systems, including supply, maintenance, and transportation elements; the management of materiel and supplies, to include requirements, production, supply and materiel maintenance; and the formulation, justification, and supervision of Army programs and budgets pertaining to logistics areas.[237] The DCSLOG employed both in-house and contract analysts to conduct studies of the varied logistical activities that fell under his or her purview. The DCSLOG in-house analytical elements were concentrated in two offices. The director of the Office of Management Analysis advised the DCSLOG on the performance of the worldwide Army logistics system; evaluated the effectiveness and efficiency of logistical operations; conducted or supervised studies of logistic functions and organization; and developed and analyzed the Department of the Army Cost Reduction Program.[238] The chief of the Combat Service Support Division in the Directorate of Plans was responsible for administering DCSLOG ORSA studies and projects; monitoring study contracts; representing the DCSLOG on the Army Operations Research Steering Committee, the Army Study Advisory Committee, and the DOD Committee on Advanced Logistical Planning Studies; and acting as the point of contact on all logistical analytical matters. The Office of the Deputy Chief of Staff for Logistics (ODCSLOG) also worked closely with the Army Materiel Command on studies of all kinds.

In all, the ODCSLOG had requirements in the summer of 1970 for some thirty ORSA-trained personnel: nine military and twelve civilian ORSA "specialists" and seven military and two civilian ORSA "executives."[239] In addition, the DCSLOG supervised the operations of the Logistics Doctrine and Systems Agency, which had requirements for fifty-nine ORSA-

trained personnel: twelve military and thirty-seven civilian ORSA "specialists" and five military and three civilian ORSA "executives."[240]

The Office of the Assistant Chief of Staff for Force Development

The Office of the Assistant Chief of Staff for Force Development (OACSFOR) was established on 4 February 1963.[241] The assistant chief of staff for force development (ACSFOR), a lieutenant general with a relationship to the chief of staff corresponding to that of a deputy chief of staff, was responsible for a wide range of functions related to the development of the Army's force structure, including the preparation and supervision of active Army force development plans and requirements; the establishment of readiness capabilities in coordination with DCSOPS and other Army General Staff agencies; overall mobilization and demobilization planning; the formulation, justification, and supervision of portions of the Operations and Maintenance, Army, budget; and programs and budgets for operating forces and training activities of the Army.[242] More concisely, the ACSFOR's mission was "to provide the trained, equipped, and supported units that are required in our force structure to accomplish the world-wide missions of the Army."[243]

To assist the ACSFOR in managing the ORSA activities that were a part of the duties, the Office of the Scientific Advisor to the ACSFOR was established in 1969. Abraham Golub moved from the ODUSA (OR) to become the scientific adviser to the ACSFOR, and a small staff was set up to assist him in overseeing the analytical activities in OACSFOR.[244] Although the position of scientific adviser to the ACSFOR existed for only a short time (1969–1974), it was one of the more active and important of the senior ORSA positions in the Army during that period.

As Dr. Payne told attendees in his keynote address at the third Army Operations Research Symposium, ". . . probably the most pressing area in which the Army . . . could use some assistance from the operations research community has to do with the design of force structures."[245] In fact, the ACSFOR worked closely with both the United States Army Combat Developments Command and the Force Planning Analysis Directorate of the Office of the Assistant Vice Chief of Staff and employed both in-house and contract analysts to conduct studies on all phases of force development. The Force Development Analysis Office in the ACSFOR Directorate of Plans and Programs was directly responsible for planning, developing, and supervising procedures and systems for the analysis of Army force development plans and programs and for planning and conducting studies using ORSA, war-gaming, simulations, cost-effectiveness analyses, ADPS, and information systems.[246] As of the summer of 1970, the OACSFOR had requirements for twenty ORSA-trained personnel: ten military ORSA "specialists" and nine military and one civilian ORSA "executives."[247]

The Office of the Deputy Chief of Staff for Military Operations

The deputy chief of staff for military operations (DCSOPS) was responsible for establishing requirements for and utilization of Army forces; establishing requirements for operational readiness of those forces; and reviewing unit readiness reports to monitor and determine the capability of the Army to accomplish assigned missions.[248] Responsibilities also included training, military assistance programs, civil defense, civil affairs, and special warfare. In particular, the DCSOPS was charged with "coordination of the Department of the Army strategic studies and related war games and analyses to evaluate U.S. and Allied strategic force requirements."[249] Consequently, the DCSOPS was heavily involved in ORSA activities, and as of the summer of 1970 the DCSOPS had requirements for twenty-eight ORSA-trained personnel: nine military and six civilian ORSA "specialists" and thirteen military ORSA "executives."[250]

The chief of the Readiness Division in the Directorate of Operations was responsible for supervising and coordinating a system for measuring the readiness of Army units and for analyzing and preparing reports of the operational readiness of Army forces worldwide.[251] The chief of the Strategic Studies and War Games Division of the Directorate of Strategic Plans and Policy was responsible for the development and coordination of an Army program of strategic studies and war games; maintenance of

data on in-house and contractual studies; supervision of the Strategy and Tactics Analysis Group; and the review and analysis of selected studies and war games. Although many of the studies conducted under its aegis did not use ORSA techniques specifically, the Strategic Studies Program conducted by the DCSOPS should be included among the analytical activities conducted by the Army Staff inasmuch as most of the studies conducted under the Strategic Studies Program were done by research groups that also did ORSA studies, and the results often became direct inputs to ORSA studies.[252]

The Strategy and Tactics Analysis Group (STAG) was established in August 1960 as a Class II activity under the supervision of the DCSOPS for the purpose of supporting "Department of the Army operational planning and evaluation activities by war gaming and allied techniques" and providing "the military, scientific, and computer integration necessary for the solving of complex problems through gaming and other techniques."[253] By the summer of 1970, STAG had requirements for forty-four ORSA-trained personnel: six military and thirty-five civilian ORSA "specialists" and three military ORSA "executives."[254]

The Chief of Research and Development

After 1955, the Office of the Chief of Research and Development (OCRD) was the focal point on the Army Staff for the management of Army-wide ORSA programs. *AR 10–5* assigned to the chief of research and development (CRD) responsibility for "planning, coordinating, and supervising all Army research, development, test, and evaluation including review and analysis, research and development objectives, policies, and funds essential to the discharge of this responsibility" as well as responsibility for directing the activities of the Army Research Office (ARO).[255] In accordance with *AR 1–110*, the CRD was also responsible for monitoring all Army activities with research, development, test, and evaluation (RDTE) implications and for reviewing and recommending for approval to the assistant secretary of the Army (research and development) all requests for ORSA studies of more than $100,000 regardless of the source of funding.[256] The CRD had authority to approve requests for studies costing less than $100,000, and he also coordinated Operations and Maintenance, Army (OMA)–funded projects if they had RDTE implications. Although the CRD was charged by *AR 1–110* with staff oversight of all Army contracts for ORSA services and studies, he did not in fact exercise direct supervision of all Army ORSA activities. The deputy under secretary of the Army (OR), other Army Staff agencies (including the Office of the Assistant Vice Chief of Staff), and the major Army commands retained authority over a significant portion of the overall Army ORSA program.

The CRD was deeply involved in the management of Army ORSA programs and as of the summer of 1970, the OCRD had a total of sixty-five requirements for ORSA-trained personnel: eleven military and three civilian ORSA "specialists" and thirty-nine military and nine ORSA "executives."[257] This total included another three military ORSA "executives" required for the Operations Research Advisory Group that supervised the work of the Research Analysis Corporation for the CRD, assured compliance with *AR 70–20*, provided military advice to RAC, and made recommendations to the CRD regarding the RAC program.[258]

The successive chiefs of research and development, directors of Army research, and chiefs of the Research Programs Division of ARO during the 1960s and early 1970s are listed in Table 3–3.

The Army-wide ORSA management responsibilities of the CRD were handled by the Army Research Office located in Arlington, Virginia.[259] Created on 16 January 1961, ARO was headed by the director of Army research, who discharged the responsibilities of the CRD for supervising and coordinating the Army's research program. In the course of the 1960s, ARO became the Army's official sponsor of in-house ORSA research and provided a centralized agency to coordinate and contract out ORSA studies and to oversee ORSA contractors as well as serve as the principal publisher of Army ORSA publications.[260] ARO efforts to monitor and coordinate Army ORSA studies contracts—including the operation of the Operations Research Steering Committee and the Project Advisory Groups established for each project or study contract—were governed by *AR 1–110*, which established overall policy guidance, procedures, responsibilities, and evaluation criteria concerning both management advisory services and ORSA studies or projects performed under contract.[261]

Table 3–3—Army Chiefs of Research and Development, Directors of Army Research, and Chiefs, Research Programs Division, ARO, April 1961–December 1973

Incumbent	*Dates*	
	Chief of Research and Development	
Lt. Gen. A. G. Trudeau	April 1961	August 1962
Lt. Gen. D. E. Beach	August 1962	July 1963
Maj. Gen. G. W. Power	July 1963	November 1963
Lt. Gen. W. W. Dick, Jr.	November 1963	May 1966
Lt. Gen. A. W. Betts	May 1966	January 1971
Lt. Gen. W. C. Gribble, Jr.	January 1971	August 1973
Lt. Gen. J. R. Deane, Jr.	August 1973	December 1973
	Director of Army Research	
Maj. Gen. W. J. Ely	April 1961	August 1962
Maj. Gen. C. W. Clark	August 1962	July 1963
Dr. R. A. Weiss (Acting)	July 1963	October 1963
Brig. Gen. W. E. Lotz, Jr.	October 1963	October 1965
Dr. R. A. Weiss (Acting)	October 1965	February 1966
Col. R. E. Kimball	February 1966	February 1967
Col./Brig. Gen. C. D. Y. Ostrom, Jr.	February 1967	February 1969
Col./Brig. Gen. G. M. Snead, Jr.	February 1969	October 1971
Col. N. R. Rosen (Acting)	October 1971	April 1972
Brig. Gen./Maj. Gen. C. D. Daniel	April 1972	December 1973
	Chief, Research Programs Division, ARO[a]	
Col. R. H. Oliver	October 1961	October 1962
Maj. W. R. Rosen	October 1962	July 1963
Lt. Col. W. G. Langley	July 1963	January 1964
Lt. Col. F. L. Taylor	January 1964	October 1965
Lt. Col. W. G. Van Auten	October 1965	February 1966
R. D. Greene	February 1966	August 1966
Lt. Col. A. E. Joy	August 1966	September 1968
Lt. Col. D. J. Walsh	September 1968	July 1969
Lt. Col. D. W. Pulsifer	July 1969	July 1971
Col. R. E. Ingalls	July 1971	December 1973

Source: Based on quarterly organizational charts (HQDA Chiefs and Executives) prepared by the Adjutant General's Office, Headquarters, Department of the Army, Apr 1961–Dec 1973. All assignment dates are approximate.

[a] Redesignated the Research Programs Office as of October 1962.

Within the Army Research Office, three divisions played particularly important roles with respect to ORSA programs. The Studies and Analyses Division monitored all studies performed using RDTE funds and those conducted by the Research Analysis Corporation for the Army, regardless of source of funding. The Studies and Analyses Division also provided military advisers and coordinated study sponsors and contractors, and the division chief also acted as the contracting officer's representative for ORSA studies contracts issued by the CRD.[262] The Human Factors and Operations Research Division in ARO was responsible for supervising human factors and ORSA programs on behalf of the CRD and assisted in the development and control of those programs in accordance with *AR 1–110*.[263] Meanwhile, the Research Programs Division of ARO managed the day-to-day oversight and coordination of Army OR programs.

ARO exercised staff supervision on behalf of the chief of research and development over a wide variety of analytical agencies, including Class II activities, contractors, and in-house elements, most notably the Research Analysis Corporation, a Federal Contract Research Center located in McLean, Virginia, that provided the Army with ORSA research and analysis on a wide variety of topics. The director of Army research was also responsible for overseeing the Army-related activities of the Stanford Research Institute (SRI) located in Menlo Park, California. SRI provided contract research studies and analysis pertinent to several areas of Army interest, particularly missiles, air defense, and command, control, and communications (C^3).[264] ARO also oversaw the activities of the Special Operations Research Office at American University and the Human Resources Research Office (HumRRO) at George Washington University, both in Washington, D.C., as well as the operations of the United States Army Personnel Research Office (USAPRO), also located in Washington, D.C. USAPRO used a variety of mathematical, statistical, psychometric, and other analytical techniques to conduct studies of personnel utilization and measurement. The United States Army Limited Warfare Laboratory in Aberdeen, Maryland, conducted studies and analyses in support of the development of new ideas and equipment for use in limited war operations and also fell under the purview of the director of Army research. Among the other activities for which ARO provided oversight was the Behavioral Sciences Research Laboratory (BSRL), which in late 1968 was authorized with four officers and sixty-two civilians.[265] The BSRL focused on behavioral science research but also had an ORSA element that conducted studies on behalf of the Office of Personnel Operations and other agencies.

ARO also supervised the operations of the Army Research Office-Durham (ARO-D) at Duke University in Durham, North Carolina. ARO-D was responsible for coordinating and supporting basic research in the physical sciences and mathematics and administered contracts with, and grants to, educational, research, and industrial agencies on behalf of the Army.[266] ARO-D also supervised the activities of the Operations Research Technical Assistance Group (ORTAG) formed in September 1962 to provide ORSA-related assistance to various Army commands. ORTAG also planned and conducted the annual Army Operations Research Symposia (AORS) that began in 1962. During the course of the 1960s, the AORS steadily grew in size and importance as the principal venue for Army ORSA managers and analysts to meet their colleagues in the other services, foreign military establishments, and the civilian analytical community and to present their work for public review and comment. [267]

Other Elements of the Army Staff

Other elements of the Army Staff that had significant numbers of ORSA personnel, conducted ORSA-type studies, or supervised Class II activities that conducted ORSA-type studies included the assistant chief of staff for intelligence, the chief of engineers, the surgeon general, the chief of communications-electronics, the chief of finance, the provost marshal general, the chief of Reserve components, and the Army Administration Center under the adjutant general. Several Army boards, committees, and advisory groups were also involved in ORSA matters. They included the Army Mathematics Steering Committee, the Program Advisory Committee, the Army Operations Research Steering Committee, and the Project Advisory Groups assigned for each ORSA study.[268]

As of September 1965, the Office of the Assistant Chief of Staff for Intelligence (OACSI) had two subordinate elements that were directly involved in the

conduct and review of ORSA-type studies. The chief of the Plans Office in the Office of the Deputy Assistant Chief of Staff for Foreign Intelligence and Security prepared intelligence plans and studies and provided the assistant chief of staff for intelligence (ACSI) liaison to the Army Study Advisory Committee.[269] The chief of the Systems Development Division in the Directorate of Surveillance and Reconnaissance monitored, evaluated, and coordinated research, development, test, and evaluation of surveillance and reconnaissance systems and monitored studies of such systems. By 1968, there was also a Threat Analysis Group that had an authorized strength of sixteen officers and ten civilians and conducted, monitored, and coordinated studies regarding threats to the United States and monitored threat aspects of studies conducted by other Army agencies.[270] The Threat Analysis Group also provided an interface with the Army Materiel Command and the Combat Developments Command to coordinate studies in support of interagency programs. The assistant chief of staff for intelligence also supervised a Special Research Detachment and an Intelligence and Threat Forecast Group, both of which employed ORSA-trained personnel. As of the summer of 1970, the OACSI and its subordinate agencies had requirements for forty-three ORSA-trained personnel: nine military and one civilian "specialists" and five military and five civilian ORSA "executives" in the OACSI itself; one military ORSA "executive" in the Special Research Detachment; and two military and six civilian ORSA "specialists" and eleven military and three civilian ORSA "executives" in the Intelligence Threat and Forecast Group.[271]

The chief of engineers conducted ORSA analyses and supervised the operations of three other agencies that were involved in ORSA-type studies: the Engineer Strategic Study Group, the Army Map Service, and the United States Army Engineer Geodesy, Intelligence and Mapping Research and Development Agency (GIMRADA). The Engineer Strategic Study Group (ESSG) consisted of twelve officers and thirty civilians and was co-located with the Army Map Service.[272] Operating under the direction of the chief of engineers, the ESSG conducted analyses of weapons and supporting systems, some strategic and some tactical, and also did some war-gaming.[273] As of the summer of 1970, the Office of the Chief of Engineers (OCOE) and its three subordinate agencies had requirements for some forty-one ORSA-trained personnel: one military and five ORSA "specialists" and ten military and seven ORSA "executives" in the OCOE itself; five military and three civilian ORSA "specialists" in the ESSG; three civilian ORSA "specialists" and two military ORSA "executives" in the Army Map Service; and three civilian ORSA "specialists" and two military ORSA "executives" in GIMRADA.[274]

The Office of the Surgeon General (OSG) also had significant ORSA personnel requirements and activity. The surgeon general's special assistant for research and development commanded the United States Army Medical Research and Development Command and coordinated a broad program of analyses and research into improved medical practices and operations in both peace and war.[275] Overall, in the summer of 1970, the OSG had requirements for seven military and one civilian ORSA "specialists" and eight military ORSA "executives," of which four military "specialists" and four military "executives" were assigned to the Medical Field Service School.[276]

In the summer of 1970, the Office of the Chief of Communications-Electronics had requirements for three military and three civilian ORSA "specialists" and four military and two civilian "executives"; the Office of the Chief of Finance, for one civilian ORSA "specialist" and one military ORSA "executive"; the Office of the Provost Marshal General, for one military ORSA "specialist"; the Office of the Chief of Reserve Components, for one military ORSA "executive"; and the Army Administration Center under the adjutant general for three military ORSA "executives."[277]

Conclusion

The magnitude of the management problems facing the secretary of the Army and the chief of staff during the 1960s was enormous. By 1969, with a full-scale war raging in Southeast Asia, the Army was authorized with nearly 1.9 million men and women in more than 10,000 units stationed in some 900 major installations in more than fifty countries; there were more than 15,000 different major items of equipment in its inventory; it ran the largest school system in the world; it hired and managed more people than any other organization in the world; and it managed an annual budget of more than

$25 billion, all in an environment of constantly changing external requirements.[278] Under such circumstances, the wisdom of employing the most advanced techniques of scientific management and decision making was manifest. The use of such techniques became an absolute necessity after the administration of President John F. Kennedy took office in January 1961 and his secretary of defense, Robert S. McNamara, embarked on a transformation of defense planning, programming, budgeting, and decision making embodied in a new planning, programming, and budgeting system and the mandatory use of new quantitative methods of analysis, such as systems analysis and cost-effectiveness analysis.

Faced with the need to provide the secretary of defense and his subordinates with accurate, timely, and detailed information and analyses, the secretary of the Army and the Army chief of staff responded by creating the mechanisms needed to expand and integrate the Army's analytical capabilities and exercise centralized control over the flow of data both upward to the Office of the Secretary of Defense and internally within the Army. The new agencies established to accomplish those ends were focused in the Army Secretariat in what became in 1968 the Office of the Deputy Under Secretary of the Army for Operations Research and in the Office of the Chief of Staff in the Office of the Assistant Vice Chief of Staff, established in 1967. At the same time, the analytical capabilities of other Army Staff elements were reorganized and expanded, and Army Staff supervision of Army-wide ORSA programs was strengthened.

The changes in Army management in general, and the management of Army ORSA activities and personnel in particular, engendered by the response to the McNamara revolution were both profound and lasting. The sharp edges of Secretary McNamara's management style were rounded off during subsequent administrations, but the essence remained. The elevation of scientific decision-making techniques to positions of prominence, their application to an ever-widening array of Army problems, a substantial increase in the number of Army ORSA elements and personnel at all levels, and the beginnings of systematic management of Army ORSA resources, particularly the education and utilization of uniformed analysts and managers, represented permanent changes that affected every aspect of Army management and operations.

The period of accelerated growth in ORSA capabilities in the Army and other services ushered in by the McNamara revolution in 1961 came to an end in January 1969, when the administration of President Richard M. Nixon took office. The new administration emphasized effective management and reductions in defense manpower and budgets, but President Nixon and his secretary of defense, Melvin Laird (secretary of defense, 22 January 1969–29 January 1973), were far less enamored of centralized management of the DOD than had been Secretary McNamara and his immediate successors. President Nixon and Secretary Laird preferred what was called "participatory management" and returned to the services much of the decision-making power lost during the McNamara era.[279] President Nixon and Secretary Laird were also far more interested in extricating the United States from the morass of the war in Vietnam and reducing defense expenditures across the board than in promoting detailed analysis of every proposal. PPBS and the use of quantitative methods of analysis remained in place, but there was no longer the intense interest in their promotion by the DOD leadership.[280] Consequently, the services, never entirely convinced of the efficacy of centralized management and the use of quantitative analytical methods introduced by Secretary McNamara, reduced the creation of additional ORSA organizations and staffing. However, the emphasis on methods of scientific analysis that dominated the 1960s produced in all of the services a dependence on such methods that ensured the continued survival of the ORSA organizations created after 1961. Perhaps more important, by 1973 there were few in the armed services who questioned either the need for scientific analysis in such critical areas as weapons analysis, operational testing and evaluation, doctrinal development, force structuring, and general management or the need to exercise centralized control and direction of analytical capabilities.

CHAPTER THREE NOTES

[1] Wilbur B. Payne, "Operations Research—A View from the Pentagon," in *Proceedings of the [Third] United States Army Operations Research Symposium, 25, 26, 27 May 1964, Rock Island, Illinois, Part I—Unclassified Papers* (Rock Island, Ill.: Operations Research Technical Assistance Group, U.S. Army Research Office-Durham, 1964), p. 6.

[2] Col Robert Gerard (USA Ret.), personal communication with the author, 15 Jun 2004.

[3] Craig Powell, "Have the Services Learned to Live with the Office of Systems Analysis?" *Armed Forces Management* 12, no. 1 (October 1965), p. 73.

[4] Col James H. Hayes, "Basic Concepts of Systems Analysis," *Military Review 45*, no. 4 (April 1965), p. 5.

[5] See, for example, the remarks of General James K. Woolnough in his oral history, *Conversations with General James K. Woolnough by Colonel Macmillan and Lieutenant Colonel Stevenson*, USAWC/USAMHRC Senior Officer Oral History Program (Carlisle Barracks, Pa.: U.S. Army War College/U.S. Army Military History Research Collection, 1971), vol. I, Interv no. 2 (25 February 1971), p. 16.

[6] Brig Gen William O. Quirey, "Does Systems Analysis Have All the Answers?" *Army Management Views XIV*, no. 1 (July 1969), p. 116.

[7] In FY 1961, the Army adopted the "program package" system, began a comprehensive study of HQDA functions, organization, and procedures, expanded the use of automatic data processing, and introduced a number of improvements in organization, procedures, operations, cost reductions, and work simplification (see U.S. Department of the Army, Office of the Secretary of the Army, "Annual Report of the Secretary of the Army for Fiscal Year 1961," in U.S. Department of Defense, *Annual Report of the Secretary of Defense and the Annual Reports of the Secretary of the Army, Secretary of the Navy, Secretary of the Air Force, for Fiscal Year 1961* [Washington, D.C.: Government Printing Office, 1962], pp. 63–64).

[8] Lorna Jaffe, *Quantitative Analysis and Army Decision Making* (Washington, D.C.: U.S. Army Materiel Development and Readiness Command Historical Office, Dec 1984), p. 19.

[9] Col J. T. Newman, Memo for Brig Gen C. A. Corcoran, Washington, D.C., 6 Oct 1965, sub: Impact of Establishment of OASD (SA) (quoted in Lt. Col. Raymond Maladowitz, *Office of the Assistant Vice Chief of Staff—Parkinson's Law or Progress* [Carlisle Barracks, Pa.: U.S. Army War College, 9 Mar 1970], p. 14).

[10] Maladowitz, *Office of the Assistant Vice Chief of Staff—Parkinson's Law or Progress*, p. 15.

[11] Ibid., p. 22.

[12] William K. Brehm, "The Role of Systems Analysis in Defense Management," *Army Management Views XIV*, no. 1 (Jul 1969), p. 105.

[13] Maladowitz, *Office of the Assistant Vice Chief of Staff—Parkinson's Law or Progress*, pp. 4–5.

[14] Ibid., p. 5; Lt. Col. John R. Martin, *The Role and Progress of the Office, Assistant Vice Chief of Staff in the Management of Army Resources*, case study (Carlisle Barracks, Pa.: U.S. Army War College, 8 Mar 1971), p. 9. Lt. Col. Martin was assigned to the Office of the Director of Studies in the Office of the Assistant Vice Chief of Staff from April 1967 to June 1968 and was thus intimately involved in the early work of that office.

[15] Martin, *The Role and Progress of the Office, Assistant Vice Chief of Staff*, p. 8.

[16] On the Hoelscher Committee and OSD Project 80, see James E. Hewes, *From Root to McNamara: Army Organization and Administration, 1900–1963* (Washington, D.C.: U.S. Army Center of Military History, 1975), ch. IX; and Maj Francis T. Julia, Jr., *Army Staff Reorganization, 1903–1985*, CMH Publication 93–6 (Washington, D.C.: Government Printing Office for Analysis Branch, U.S. Army Center of Military History, 1987), pp. 29–31.

[17] U.S. Department of the Army, *Study of the Functions, Organization and Procedures of the Department of the Army, OSD Project 80 (Army)* (Washington, D.C.: Headquarters, Department of the Army, Oct 1961).

[18] Julia, *Army Staff Reorganization*, 1903–1985, pp. 29–31.

[19] Ibid., pp. 30–31; U.S. Department of Defense, Office of the Secretary of Defense, "Annual Report of the Secretary of Defense for Fiscal Year 1962," in U.S. Department of Defense, *Annual Report of the Secretary of Defense and the Annual Reports of the Secretary of the Army, Secretary of the Navy, Secretary of the Air Force, for Fiscal Year 1962* (Washington, D.C.: Government Printing Office, 1963), pp. 28–29. See also U.S. Department of the Army, Office of the Secretary of the Army, "Annual Report of the Secretary of the Army for Fiscal Year 1962," in U.S. Department of Defense, *Annual Report of the Secretary of Defense and the Annual Reports of the Secretary of the Army, Secretary of the Navy, Secretary of the Air Force, for Fiscal Year 1962*, pp. 189–93; and U.S. Department of the Army, Office of the Secretary of the Army, "Annual Report of the Secretary of the Army for Fiscal Year 1963," in U.S. Department of Defense, *Annual Report of the Secretary of Defense and the Annual Reports of the Secretary of the Army, Secretary of the Navy, Secretary of the Air Force, for Fiscal Year 1963* (Washington, D.C.: Government Printing Office, 1964), pp. 119–24.

[20] Julia, *Army Staff Reorganization*, 1903–1985, p. 31.

[21] U.S. Department of the Army, Army Study Advisory Committee (ASAC), *Main Report: Army Study Advisory Committee Examination of the Army's Operations Research/Systems Analysis Personnel Requirements* (Washington, D.C.: Office of the Director of Special Studies, Office of the Chief of Staff, Headquarters, Department of the Army, 30 Aug 1966), an. B (Operations Research in and for the Army), p. 12 (cited hereafter as ASAC *Main Report*).

[22] The Chief of Research and Development (CRD) was responsible, for example, for overseeing the Army Research Office-Durham (ARO-D) and the Army's contract with the Research Analysis Corporation (RAC). However, the direct responsibility of the CRD extended only to those OR studies funded by research, development, test, and evaluation (RDTE) funds.

[23] ASAC *Main Report*, an. B, p. 12.

[24] Ibid., p. 13.

[25] Ibid., p. 14.

[26] Ibid.

[27] U.S. Department of the Army, *Army Regulation No. 10–5: ORGANIZATION AND FUNCTIONS—Department of the Army* (Washington, D.C.: Headquarters, Department of the Army, Aug 1964), par. 9.

[28] Martin, *The Role and Progress of the Office, Assistant Vice Chief of Staff*, pp. 10–11.

[29] ASAC *Main Report*, an. B, an. 4 (The Army Analytical Community), p. 5.

[30] U.S. Department of the Army, Office of the Secretary of the Army, Management Office, Management Systems Branch, *Organization and Staffing Charts of the Office, Secretary of the Army and Activities Serviced Thereby* (Washington, D.C.: Management Systems Branch, Management Office, Office of the Secretary of the Army, U.S. Department of the Army, Jan 1965), Chart 5 (Organization of the Office of the Assistant Secretary of the Army for Financial Management).

[31] Gen Ferdinand J. Chesarek (USA Ret.), *Oral History Interviews*

with General Ferdinand J. Chesarek by Lieutenant Colonel Richard Lawrence and Lieutenant Colonel James Agnew, USAWCUSAMHI Senior Officer Oral History Program (Carlisle Barracks, Pa.: U.S. Army War College/ U.S. Army Military History Institute, 1971), vol. II, Interv no. 1 (25 February 1971), p. 13: "It [the position of Special Assistant for Operations Research] was set up because the Secretary felt that he had to have some kind of analytic capability to review major systems, and he hadn't had it before, and so he brought Wilbur [Payne] in from OSD."

[32] There is no formal published biography of Dr. Payne, and to date I have not found either an official Department of the Army biography or the location of his papers. The following brief biographical sketch is based on a number of sources, none of which is comprehensive in scope or specific in details. The best of these sources is Eugene P. Visco, "Ellis A. Johnson and Wilbur B. Payne, FS: Two Unsung (Relatively) Pioneers," *Military Operations Research 9*, no. 4 (2004), pp. 67–72. See also the introductory remarks of Brig. Gen. Walter E. Lotz, Jr., to Dr. Payne's keynote address at the third Army Operations Research Symposium (in Proceedings of the *[Third] United States Army Operations Research Symposium*, 25, 26, 27 May 1964, *Rock Island, Illinois, Part I—Unclassified Papers*, p. 5) and the note accompanying Wilbur B. Payne, "Some Principles Relating to Operations Research in the Army," *Army Management Views XIV*, no. 1 (July 1969), p. 132.

[33] Visco, "Ellis A. Johnson and Wilbur B. Payne, FS: Two Unsung (Relatively) Pioneers," p. 7.

[34] Chesarek oral history, vol. II, Interv no. 1 (25 February 1971), pp. 13–14: "He is highly knowledgeable, and in general, he has a reasonably fair attitude, but his job, however, is to challenge, and challenge he does . . . if Wilbur would take a strong negative approach to anything, it wouldn't fly."

[35] Payne, "Some Principles Relating to Operations Research in the Army," pp. 133–36.

[36] Ibid., p. 136.

[37] U.S. Department of the Army, *Organization and Staffing Charts of the Office, Secretary of the Army* (Washington, D.C.: HQDA, Jan 1965), Chart 5.

[38] Abraham Golub was well known and highly respected in the Army OR community. In a 1992 interview he told Eugene P. Visco that when offered the position of special assistant for operations research by Secretary of the Army Cyrus Vance, Dr. Payne made his acceptance contingent on the hiring of him [Golub] as his assistant (Eugene P. Visco, communication to the author, 3 May 2005). Abraham Golub was born on 16 May 1921 and earned a B.A. in mathematics from Brooklyn College in 1941, shortly before he began work for the Army Ordnance Corps in Washington, D.C. He served on active duty in the Army from 1943 to 1946, primarily at Aberdeen Proving Ground, Maryland. After the war, he worked at Aberdeen Proving Ground from 1946 until he became Payne's assistant in the Office of the Assistant Secretary of the Army (Financial Management) in 1964. During that time he earned a master's degree in mathematics at the University of Delaware and rose steadily in the Weapon Systems Laboratory of the Ballistics Research Laboratories (BRL). In November 1962, he was appointed an assistant director of BRL for weapon systems analysis. Abraham Golub died on 25 April 2000. See *Phalanx Online 33*, no. 3 (September 2000), www.mors.org/publications/phalanx/ sep00/sep00.htm, downloaded 6 May 2005; copy in possession of the author.

[39] "Annual Report of the Secretary of the Army for Fiscal Year 1963," p. 141.

[40] U.S. Department of the Army, Office of the Secretary of the Army, "Annual Report of the Secretary of the Army for Fiscal Year 1964," in U.S. Department of Defense, *Department of Defense Annual Report for Fiscal Year 1964 Including the Annual Reports of the Secretary of Defense, Secretary of the Army, Secretary of the Navy, and Secretary of the Air Force* (Washington, D.C.: Government Printing Office, 1966), p. 158.

[41] U.S. Department of the Army, Office of the Secretary of the Army, Memo for the Chief of Staff, Washington, D.C., 11 Jul 1965, sub: Transfer of Responsibility for Operations Research. Par. 8 of Change 1 (14 Jan 1966) to U.S. Department of the Army, *Army Regulation No. 10–5: ORGANIZATION AND FUNCTIONS—Department of the Army* (Washington, D.C.: HQDA, 19 May 1965) formally reassigned responsibility for OR matters from the ASA (FM) to the Under Secretary of the Army.

[42] ASAC *Main Report*, an. B, an. 4, app. 4. Dr. Payne was employed under the provisions of Public Law 313 and Abraham Golub was a civil service GS–16. Dr. Payne apparently chose the name of the new office as a gibe at the Army for its treatment of Ellis Johnson and the old Operations Research Office (ORO).

[43] Memo for the Chief of Staff, Washington, D.C., 11 Jul 1965, sub: Transfer of Responsibility for Operations Research, p. 1.

[44] ASAC *Main Report*, an. B, an. 4, app. 4.

[45] U.S. Department of the Army, *Organization and Staffing Charts of the Office, Secretary of the Army* (Washington, D.C.: HQDA, December 1965), Chart 4 (Office of the Under Secretary of the Army).

[46] U.S. Department of the Army, *Organization and Staffing Charts of the Office, Secretary of the Army* (Washington, D.C.: HQDA, Jan 1967), Chart 4 (Office of the Under Secretary of the Army).

[47] U.S. Department of the Army, Office of the Secretary of the Army, "Annual Report of the Secretary of the Army for Fiscal Year 1965," in U.S. Department of Defense, *Department of Defense Annual Report for Fiscal Year 1965 Including the Annual Reports of the Secretary of Defense, Secretary of the Army, Secretary of the Navy, and Secretary of the Air Force* (Washington, D.C.: Government Printing Office, 1967), p. 166.

[48] U.S. Department of the Army, Office of the Secretary of the Army, "Annual Report of the Secretary of the Army for Fiscal Year 1967," in U.S. Department of Defense, *Department of Defense Annual Report for Fiscal Year 1967 Including the Annual Reports of the Secretary of Defense, Secretary of the Army, Secretary of the Navy, and Secretary of the Air Force* (Washington, D.C.: Government Printing Office, 1969), p. 196.

[49] U.S. Department of the Army, *Organization and Staffing Charts of the Office, Secretary of the Army* (Washington, D.C.: HQDA, Apr 1968), Chart 4 (Office of the Under Secretary of the Army).

[50] U.S. Department of the Army, *Organization and Staffing Charts of the Office, Secretary of the Army* (Washington, D.C.: HQDA, Jul 1971), Chart 4 (Office of the Under Secretary of the Army).

[51] U.S. Department of the Army, *Organization and Staffing Charts of the Office, Secretary of the Army* (Washington, D.C.: HQDA, Oct 1973), Chart 4 (Office of the Under Secretary of the Army).

[52] Martin, *The Role and Progress of the Office, Assistant Vice Chief of Staff*, p. 14.

[53] Ibid., p. 18.

[54] Ibid.

[55] Chesarek oral history, vol. II, Interv no. 2 (23 April 1971), pp. 48–49.

[56] Lt. Gen. Ferdinand J. Chesarek, "New Techniques for Managing Men and Materiel," Army 17, no. 6 (October 1967), pp. 51–52.

[57] Martin, *The Role and Progress of the Office, Assistant Vice Chief of Staff*, p. 50.

[58] Ibid., pp. 48–49.

[59] Ibid., p. 49.

[60] Ferdinand J. Chesarek, "Limited War 'Stretch Management,'" *Army Management Views XIII*, no. 2 (December 1968), p. 19.

[61] ASAC *Main Report*, an. B, an. 4, Incl 1 (The Army Analytical Community), p. 5.

[62] AR 10–5 (August 1964), par. 28.

[63] Leonard C. Shea, "Planning, Programming, and Budgeting at

Department of the Army Headquarters," *Army Management Views* IX, pt. 1 (1963–1964), p. 65.

[64] U.S. Department of the Army, *Office of the Chief of Staff, Chief of Staff Memorandum No. 63–105*, Washington, D.C., 15 Aug 1963, sub: Terms of Reference for Director of Special Studies, Office of the Chief of Staff, U.S. Army. The annual report of the Secretary of the Army for FY 1965 indicates that the Office of the Director of Special Studies was established earlier, in April 1963 (see "Annual Report of the Secretary of the Army for Fiscal Year 1965," p. 178). The first director of special studies was Lt. Gen. Charles H. Bonesteel III. In part, the new position was created to provide General Bonesteel a place to recover from serious eye problems (see General Harold K. Johnson, *Conversations between General Harold K. Johnson and LTC Rupert F. Glover and Col. James B. Agnew*, USAWC/USAMHI Senior Officers Debriefing Program [Carlisle Barracks, Pa.: U.S. Army War College/U.S. Army Military History Institute, 1973–1974], vol. II, Interv no. 10 [22 January 1973], pp. 2–3).

[65] Ibid., par. 2.

[66] AR 10–5 (Aug 1964), par. 27. The Army Study Program is discussed in greater detail below in ch. 5.

[67] U.S. Department of the Army, Office of the Secretary of the Army, "Annual Report of the Secretary of the Army for Fiscal Year 1967," in U.S. Department of Defense, *Department of Defense Annual Report for Fiscal Year 1967 Including the Annual Reports of the Secretary of Defense, Secretary of the Army, Secretary of the Navy, and Secretary of the Air Force* (Washington, D.C.: Government Printing Office, 1969), p. 201.

[68] AR 10–5 (May 1965), par. 26; ASAC *Main Report*, an. B, an. 4, app. 4. The Army Study Advisory Committee and the ASDIRS are discussed in greater detail below in chs. 4 and 5.

[69] Martin, *The Role and Progress of the Office, Assistant Vice Chief of Staff*, p. 14.

[70] Maladowitz, *Office of the Assistant Vice Chief of Staff—Parkinson's Law or Progress*, p. 59.

[71] Ibid.

[72] Ibid., p. 10; AR 10–5, Aug 1964, par. 26.

[73] AR 10–5 (Aug 1964), par. 26.

[74] Maladowitz, *Office of the Assistant Vice Chief of Staff—Parkinson's Law or Progress*, p. 10.

[75] ASAC *Main Report*, an. B, an. 4, app. 4.

[76] Martin, *The Role and Progress of the Office, Assistant Vice Chief of Staff*, p. 14.

[77] AR 10–5 (Aug 1964), par. 29.

[78] ASAC *Main Report*, an. B, an. 4, app. 4.

[79] Gen Harold K. Johnson, comments in ASAC *Main Report*, pp. 2–3.

[80] Maladowitz, *Office of the Assistant Vice Chief of Staff—Parkinson's Law or Progress*, p. 16.

[81] U.S. Department of the Army, Office of the Secretary of the Army, Memo for the Chief of Staff, U.S. Army, Washington, D.C., 13 Jan 1966, sub: Army Organization for Participating in the Annual Series of Memoranda for the President, p. 1 (cited in Maladowitz, *Office of the Assistant Vice Chief of Staff—Parkinson's Law or Progress*, p. 16).

[82] Ibid., p. 2 (quoted in Maladowitz, *Office of the Assistant Vice Chief of Staff—Parkinson's Law or Progress*, p. 16).

[83] U.S. Department of Defense, Office of the Deputy Secretary of Defense, Memo for the Secretary of the Army, Washington, D.C., 15 Feb 1966, sub: Establishment of a Force Planning and Analysis Office within the Department of the Army. See also U.S. Department of the Army, Office of the Secretary of the Army, "Annual Report of the Secretary of the Army for FY 1966," in U.S. Department of Defense, *Department of Defense Annual Report for Fiscal Year 1966 Including the Annual Reports of the Secretary of Defense, Secretary of the Army, Secretary of the Navy, and Secretary of the Air Force* (Washington, D.C.: Government Printing Office, 1967), p. 189; Martin, *The Role and Progress of the Office, Assistant Vice Chief of Staff*, p. 15; Maladowitz, *Office of the Assistant Vice Chief of Staff—Parkinson's Law or Progress*, p. 16. The Force Planning and Analysis Office within the Office of the Chief of Staff should not be confused with the Force Planning Analysis Office (FPAO) established by the Deputy Chief of Staff for Military Operations (DCSOPS) in July 1983 to function as a separate, off-line "think tank" to examine alternative force structures in the light of resources limitations placed on the Army (see Terrence J. Gough, James E. Hewes Jr., and Edgar F. Raines Jr., *Office of the Deputy Chief of Staff for Operations and Plans, 1903–1983: Establishment—Evolution* [Washington, D.C.: U.S. Army Center of Military History, 1983], p. 36).

[84] Brig. Gen. Paul D. Phillips was a 1940 graduate of the U.S. Military Academy and of various Army schools, including the National War College. He held a master's degree from George Washington University. He retired from active duty in June 1966 and was subsequently employed by the Research Analysis Corporation from July 1966 with a brief leave of absence to serve as deputy assistant secretary of the Army for manpower and Reserve affairs from April 1968 to February 1969 (see the brief biographical sketch that accompanies his article, "OR/SA and Defense Management," *Army Management Views XVI* [1971], p. 153).

[85] Chesarek oral history, vol. II, Interv no. 2 (23 April 1971), p. 36. William K. Brehm held degrees from the University of Michigan and had been associated with the General Dynamics Corporation and North American Aviation, Incorporated, before joining OSD. He was the director of the Land Forces Programs Division in the Office of the Assistant Secretary of Defense (Systems Analysis) from October 1964 to October 1967, when he became the deputy assistant secretary for land forces programs, OASD (SA), in which position he served until April 1968. He was appointed assistant secretary of the Army for manpower and Reserve affairs in April 1968 and again in March 1969 (see the brief biographical sketch that accompanies his article, "The Role of Systems Analysis in Defense Management," *Army Management Views XIV*, no. 1 [July 1969], p. 100).

[86] Ibid., p. 38.

[87] Before taking up the position of co-director of FPAO, Dr. Jacob A. Stockfisch was a professor of economics at Occidental College in Los Angeles, at the University of Wisconsin, and at the University of California (Los Angeles). In 1965–1966, he was director of the Research Office of the Stanford Research Institute for the U.S. Army Combat Developments Experimentation Command at Fort Ord, Calif. He subsequently served as a senior research analyst with the Institute for Defense Analyses in Arlington, Va. (see the brief biographical sketch that accompanies his article, "The Structuring of General-Purpose Forces," *Army Management Views XIII*, no. 2 [December 1968], p. 74). Dr. Stockfisch later joined the staff of the RAND Corporation in Santa Monica, Calif.

[88] U.S. Department of the Army, Office of the Chief of Staff, Chief of Staff Memorandum No. 66–141, Washington, D.C., 21 Mar 1966, sub: Force Planning and Analysis Office, p. 1. See also Martin, *The Role and Progress of the Office, Assistant Vice Chief of Staff*, p. 15; Maladowitz, *Office of the Assistant Vice Chief of Staff—Parkinson's Law or Progress*, p. 17.

[89] Deputy Secretary of Defense, Memo for the Secretary of the Army, 15 Feb 1966, sub: Establishment of a Force Planning and Analysis Office within the Department of the Army, p. 1.

[90] U.S. Army, Office of the Chief of Staff, *Chief of Staff Memorandum No. 66–178*, Washington, D.C., 14 Apr 1966, sub: Reorganization of the Office of the Chief of Staff, Army; "Annual Report of the Secretary of the Army for FY 1966," p. 190.

[91] Martin, *The Role and Progress of the Office, Assistant Vice Chief of Staff*, pp. 15–16. Most of the functions of the director of coordination

and analysis were transferred to the deputy secretary of the General Staff for coordination and reports. Other functions went to the director of Army studies and to the director of the new Force Planning and Analysis Office that received the Office of the Director of Coordination and Analysis (ODC&A) systems analysis functions (see "Annual Report of the Secretary of the Army for FY 1966," p. 190).

[92] "Annual Report of the Secretary of the Army for FY 1966," p. 190. For example, the compilation of program and budget guidance was reassigned to the comptroller of the Army and the monitoring of Department of the Army Systems Staff Officers (DASSO) to the ACSFOR (see Martin, *The Role and Progress of the Office, Assistant Vice Chief of Staff*, p. 16).

[93] Maladowitz, *Office of the Assistant Vice Chief of Staff—Parkinson's Law or Progress*, p. 18.

[94] Ibid., pp. 18, 20.

[95] Ibid., p. 20.

[96] U.S. Department of the Army, Office of the Assistant Vice Chief of Staff, Briefing for General Westmoreland, 13 Jun 1968 (cited by Maladowitz, *Office of the Assistant Vice Chief of Staff—Parkinson's Law or Progress*, p. 23).

[97] Maladowitz, *Office of the Assistant Vice Chief of Staff—Parkinson's Law or Progress*, p. 61.

[98] Ibid., p. 20; Martin, *The Role and Progress of the Office, Assistant Vice Chief of Staff*, p. 16.

[99] Ibid.

[100] Maladowitz, *Office of the Assistant Vice Chief of Staff—Parkinson's Law or Progress*, p. 21. See also U.S. Department of the Army, Office of the Under Secretary of the Army, Office of Operations Research, Memo for the Secretary of the Army, Washington, D.C., 19 Feb 1966, sub: Review and Comment on FPAO, p. 7; and Martin, *The Role and Progress of the Office, Assistant Vice Chief of Staff*, p. 16.

[101] Lt. Gen. Ferdinand J. Chesarek later commented (Chesarek oral history, vol. II, Interv no. 2 [23 April 1971], pp. 36–37) on the infringement of the FPAO on the authority of the other principal Army Staff agencies:

> . . . all of the functions . . . [of the] Force Planning [and] Analysis Office, were the legitimate functions of some element of the Army Staff. After all, Force Planning was a function as a part of DCSOPS and part of ACSFOR as they existed. The big problem was the work they [i.e., DCSOPS and ACSFOR] were doing was deemed insufficient from the point of view of excellence, and OSD was, in fact, stipulating the structure of the Army through the draft Presidential Memoranda Technique that McNamara had set up. So, it was a duplication on paper, but not in fact. Now, one other factor you have to recognize, and that is that the Secretary of the Army, Mr. Vance, was loathe to accept Army Staff positions and recommendations. He found much fault with them. He became Deputy Secretary of Defense. He carried this uneasiness with him. And Mr. Resor became Secretary of the Army. He too found information he was receiving from his staff was inadequate and he built up his own office. He brought in people and built up his Assistant Secretaries with a much greater capability to review and analyze and to suggest other alternatives, and so forth, from the papers that were being flowed through the summary sheets, coming through the Chief's channel.

[102] Ibid.; Martin, *The Role and Progress of the Office, Assistant Vice Chief of Staff*, p. 18.

[103] Maladowitz, *Office of the Assistant Vice Chief of Staff—Parkinson's Law or Progress*, p. 61.

[104] U.S. Department of the Army, Office of the Chief of Staff, Chief of Staff Memorandum No. 67–64, Washington, D.C., 16 Feb 1967, sub: Reorganization of the Office, Chief of Staff, pp. 1–3. See also Maj F. L. Smith, A History of the U. S. Army in Operations Research, MMAS thesis (Fort Leavenworth, Kans.: U.S. Army Command and General Staff College, 22 May 1967), pp. 98–99; "Annual Report of the Secretary of the Army for Fiscal Year 1967," p. 193.

[105] Ibid., p. 2; "Annual Report of the Secretary of the Army for Fiscal Year 1967," p. 193.

[106] *CSM 67–64*, pp. 2–3; "Annual Report of the Secretary of the Army for Fiscal Year 1967," p. 193.

[107] Jaffe, *Quantitative Analysis and Army Decision Making*, pp. 19–20.

[108] *CSM 67–64*, p. 2.

[109] Maladowitz, *Office of the Assistant Vice Chief of Staff—Parkinson's Law or Progress*, p. 23.

[110] Ibid., pp. 23–24. Moreover, the Navy and Air Force had already adopted solutions that involved a vice admiral as director of program planning in the Office of the Vice Chief of Naval Operations and a lieutenant general as assistant vice chief of staff of the Air Force, thereby presumably giving the Navy and Air Force an edge on the Army.

[111] Chesarek oral history, vol. II, Interv no. 2 (23 April 1971), p. 39.

[112] Lt. Gen. Charles H. Bonesteel III, Memo for General Abrams, Washington, D.C., 29 Mar 1966, sub: Functions, Systems, and Command and Control (cited by Maladowitz, *Office of the Assistant Vice Chief of Staff—Parkinson's Law or Progress*, p. 21). See also Chesarek oral history, vol. II, Interv no. 2 (23 April 1971), p. 38. The idea was not entirely new. In 1961, the Hoelscher Committee had recommended the establishment of a director of the Army Staff to coordinate the efforts of the Army Staff (see Martin, *The Role and Progress of the Office, Assistant Vice Chief of Staff*, p. 19).

[113] U.S. Department of the Army, Memo for General Johnson, Washington, D.C., 29 Apr 1966, sub: Command and Management at the Department of the Army Level (cited by Maladowitz, *Office of the Assistant Vice Chief of Staff—Parkinson's Law or Progress*, 22). In his oral history (vol. II, Interv no. 2 [23 April 1971], p. 39) General Chesarek later claimed that he and General Abrams discussed just three alternatives. The first was to build up the Office of the Assistant Chief of Staff for Force Development (OACSFOR) and make the ACSFOR the first among equals on the staff; the second was to create a vice chief of staff for management; and the third was to create the position of assistant vice chief of staff, the alternative eventually selected. Elsewhere (Chesarek oral history, vol. II, Interv no. 2 [23 April 1971], p. 40) General Chesarek claimed that only four persons were involved in the discussions that led to the establishment of the OAVCSA: Secretary of the Army Stanley R. Resor, Chief of Staff General Harold K. Johnson, Vice Chief of Staff General Creighton W. Abrams Jr., and himself. As is generally the case with oral histories and interviews conducted some time after the event, General Chesarek no doubt inflated his own role in the process while conveniently forgetting some of the more pertinent details that did not involve him directly.

[114] Ibid. (cited in Maladowitz, *Office of the Assistant Vice Chief of Staff—Parkinson's Law or Progress*, p. 23).

[115] Lt. Gen. Ferdinand J. Chesarek was born in Calumet, Michigan, on 18 February 1914 and graduated from the U.S. Military Academy in 1938. He later (1950) earned a master's degree in business administration from Stanford University. He was also a graduate of the Armed Forces Staff College (1953) and the National War College (1956) and attended the Advanced Management Program at Harvard University (1959). During World War II, he served as a field artillery battalion commander in the European Theater of Operations. After the war, he served in the Logistics Division of the Army General Staff and as assistant to the chairman of the Munitions Board before serving in Eighth Army headquarters and as commander of the 5th Artillery Group in Korea. He returned to the United States to serve in the Office of the Deputy Chief

of Staff for Logistics (DCSLOG) and as military assistant and executive officer to the assistant secretary of defense for international security affairs. He then served in Europe as chief of staff, U.S. Army Communications Zone, Europe; chief of staff, U.S. Army Southern European Task Force; and commanding general, 4th Logistical Command. In October 1962, he returned to the Army Staff as an assistant deputy chief of staff in the Office of the DCSLOG. He was appointed comptroller of the Army on 1 August 1966 and became the first assistant vice chief of staff on 16 February 1967. In July 1968, he was appointed to the additional duty of senior U.S. member to the Military Staff Committee of the United Nations. On 10 March 1969, he was promoted to general and was reassigned to command the U.S. Army Materiel Command. He retired from active duty in October 1970 and died in Nashville, Tennessee, on 20 November 1993 (see Headquarters, U.S. Department of the Army, General Orders No. 2, Washington, D.C., 10 Jan 1994, and the Army Materiel Command biographical sketch, "General Ferdinand J. Chesarek," www.amc.army.mil/amc/ho/amc_cg/chesarek.html; copy in possession of the author).

[116] "Annual Report of the Secretary of the Army for Fiscal Year 1967," p. 193.

[117] *CSM 67–64*, p. 2.

[118] Chesarek oral history, vol. II, Interv no. 2 (23 April 1971), pp. 41–42. General Johnson later confirmed General Chesarek's claim that he was given only forty-eight hours to write the terms of reference for the new position (see Johnson oral history, vol. III, Interv no. 10 [30 October 1974], p. 19).

[119] Ibid., p. 58.

[120] Ibid., pp. 41–42.

[121] Herman R. Staudt, *The D.O.D. Decision Making Process*, M.S. thesis (Cambridge, Mass.: Sloan School of Management, Massachusetts Institute of Technology, 1 May 1968), p. 108 (Interv no. 24).

[122] Maladowitz, *Office of the Assistant Vice Chief of Staff—Parkinson's Law or Progress*, p. 28.

[123] *CSM 67–64*, Incl 1 (Functions of the Assistant Vice Chief of Staff).

[124] U.S. Department of the Army, Office of the Chief of Staff, Chief of Staff Regulation No. 10–25: ORGANIZATION AND FUNCTIONS—Office of the Chief of Staff (Washington, D.C.: Office of the Chief of Staff, Headquarters, Department of the Army, 4 Mar 1968), par. 4; Change 3 (23 May 1969) to U.S. Department of the Army, *Army Regulation No. 10–5: ORGANIZATION AND FUNCTIONS—Department of the Army* (Washington, D.C.: Headquarters, Department of the Army, 31 Jul 1968), pars. 2–20.

[125] *Change 1* (13 Aug 1968) to *CSR 10–25*, par. 3.

[126] Martin, *The Role and Progress of the Office, Assistant Vice Chief of Staff*, p. 132.

[127] U.S. Department of the Army, Office of the Chief of Staff, Chief of Staff Regulation No. 71–4: FORCE DEVELOPMENT—Prepositioned Materiel Configured to Unit Sets (Washington, D.C.: Office of the Chief of Staff, Headquarters, Department of the Army, 28 Nov 1969) (cited in Martin, *The Role and Progress of the Office, Assistant Vice Chief of Staff*, p. 57).

[128] Martin, *The Role and Progress of the Office, Assistant Vice Chief of Staff*, pp. 57–58.

[129] Chesarek, "Limited War 'Stretch Management,'" p. 18.

[130] Chesarek, "New Techniques for Managing Men and Materials," p. 51.

[131] Ibid., p. 52.

[132] Ibid.

[133] Chesarek, "Limited War 'Stretch Management,'" p. 20.

[134] "Annual Report of the Secretary of the Army for Fiscal Year 1967," pp. 193–94.

[135] *CSM 67–64*, p. 4.

[136] Staudt, *The D.O.D. Decision Making Process* 108 (Interv no. 24); *CSM 67–64*, p. 4.

[137] Maladowitz, *Office of the Assistant Vice Chief of Staff—Parkinson's Law or Progress*, p. 28.

[138] *CSM 67–64*, p. 3. The Army Study Program is discussed below in ch. 5.

[139] Ibid. See the discussion of the Program to Improve the Management of Army Resources (PRIMAR), below.

[140] Chesarek oral history, vol. II, Interv no. 2 (23 April 1971), pp. 40 and 42.

[141] Martin, *The Role and Progress of the Office, Assistant Vice Chief of Staff*, p. 24.

[142] *CSR 10–25*, 4 Mar 1968, par. 4.

[143] *Change 3* (2 May 1969) to *CSR 10–25*, par. 3.

[144] Martin, *The Role and Progress of the Office, Assistant Vice Chief of Staff*, p. 25; Smith, A History of the U. S. Army in Operations Research, p. 99.

[145] *CSM 67–64*, Incl 1 (Functions of the Director, Management Information Systems) to Incl 1.

[146] *CSR 10–25*, 4 Mar 1968, pp. 5–6.

[147] *Change 1* (13 Aug 1968) to *CSR 10–25*, pp. 3–4.

[148] *CSM 67–64*, p. 4.

[149] TAADS was completed in the fall of 1968 and provided a data bank of equipment and personnel requirements for each of some 20,000 units identified in the FAS (see William Gardner Bell, ed., *Department of the Army Historical Summary, Fiscal Year 1969* [Washington, D.C.: Office of the Chief of Military History, Department of the Army, 1973], p. 4).

[150] "Annual Report of the Secretary of the Army for Fiscal Year 1967," p. 194.

[151] *CSR 10–25*, 4 Mar 1968, p. 8.

[152] Ibid., p. 9.

[153] Martin, *The Role and Progress of the Office, Assistant Vice Chief of Staff*, app. V, p. 143.

[154] *Department of the Army Historical Summary, Fiscal Year 1969*, p. 59.

[155] *Change 1* (13 Aug 1968) to *CSR 10–25*, p. 4.

[156] William Gardner Bell, ed., *Department of the Army Historical Summary, Fiscal Year 1970* (Washington, D.C.: Office of the Chief of Military History, Department of the Army, 1973), p. 90.

[157] Jaffe, *Quantitative Analysis and Army Decision Making*, p. 21.

[158] Martin, *The Role and Progress of the Office, Assistant Vice Chief of Staff*, p. 25.

[159] Chesarek, "New Techniques for Managing Men and Materiel," p. 52.

[160] Maladowitz, *Office of the Assistant Vice Chief of Staff—Parkinson's Law or Progress*, p. 28; Smith, A History of the U.S. Army in Operations Research, p. 99.

[161] *CSM 67–64*, Incl 3 (Functions of the Director, Weapon Systems Analysis) to Incl 1.

[162] Ibid., Incl 1 (Weapon Systems Analysis Directorate Concept of Operations) to Incl 2; *CSR 10–25*, 4 Mar 1968, pp. 7–8. For the organization of the Weapon Systems Analysis Directorate in 1970, see Figure 3–6.

[163] Russell D. McGovern, "Management of Operations Research and Systems Analysis Studies," *Army Management Views XIII*, no. 2 (December 1968), p. 29.

[164] Chesarek oral history, vol. II, Interv no. 1 (25 February 1971), p. 14.

[165] Ibid.

[166] Romie L. Brownlee and William J. Mullen III, *Changing An Army: An Oral History of General William E. DePuy*, USA Retired (Carlisle

Barracks, Pa.: U.S. Army Military History Institute, n.d. [1984]), p. 173. The DePuy oral history was conducted in 1979 as part of the U.S. Army War College/U.S. Army Military History Institute Senior Officer Oral History Program and is cited hereafter as "DePuy oral history." General DePuy also gave an "end-of-tour" oral history interview in March 1973 to then Lt. Col. (later Lt. Gen.) David K. Doyle, chief of the Staff Management Division, OAVCSA (not seen).

[167] *CSM 67–64*, Incl 2 (Director of Force Planning Analysis Concept of Operations) to Incl 2.

[168] Martin, *The Role and Progress of the Office, Assistant Vice Chief of Staff*, p. 24.

[169] *CSM 67–64*, Incl 2 (Functions of the Director, Force Planning Analysis) to Incl 1.

[170] DePuy oral history, p. 172; Jaffe, *Quantitative Analysis and Army Decision Making*, p. 20.

[171] Maladowitz, *Office of the Assistant Vice Chief of Staff—Parkinson's Law or Progress*, p. 27.

[172] *CSR 10–25*, 4 Mar 1968, pp. 6–7.

[173] McGovern, "Management of Operations Research and Systems Analysis Studies," p. 29.

[174] *CSM 67–64*, p. 2. See also Chesarek oral history, vol. II, Interv no. 2 (23 April 1971), pp. 40 and 42.

[175] Ibid., p. 2, and Incl 1, p. 1.

[176] Ibid.; Department of the Army, Office of the Assistant Vice Chief of Staff, Director of Studies, *After-Action Report of PRIMAR—Program to Improve Management of Army Resources: A Case Study* (Washington, D.C.: Director of Studies, Office of the Assistant Vice Chief of Staff, Headquarters, Department of the Army, May 1969), p. 1.

[177] Brig Gen William O. Quirey (Director of Studies, OAVCSA), Memo for Heads of Army Staff Agencies, Washington, D.C., 13 May 1969, sub: Critique of the PRIMAR Study Effort, 1 (reproduced in *After-Action Report of PRIMAR*). In addition to the *After-Action Report of PRIMAR*, which deals primarily with the conduct of the study itself, see also U.S. Department of the Army, Office of the Assistant Vice Chief of Staff, Director of Studies, *Program to Improve the Management of Army Resources (PRIMAR): Final Summary Report* (Washington, D.C.: Director of Studies, Office of the Assistant Vice Chief of Staff, Headquarters, Department of the Army, May 1969); Department of the Army Historical Summary, Fiscal Year 1969, p. 61; Maladowitz, *Office of the Assistant Vice Chief of Staff—Parkinson's Law or Progress*, ch. 3; and Martin, *The Role and Progress of the Office, Assistant Vice Chief of Staff*, pp. 32–46. The Martin study is particularly useful because Lt. Col. John R. Martin was assigned to the Office of the Director of Studies from April 1967 to June 1968 and was intimately involved in the PRIMAR project.

[178] Maladowitz, *Office of the Assistant Vice Chief of Staff—Parkinson's Law or Progress*, p. 31. Contract proposals were also received from Planning Research Corporation, Philco-Ford, Stanford Research Institute, Operations Research, Inc., and Booz-Allen Associates. Booz-Allen Associates provided a preliminary approach for the study (see *After-Action Report of PRIMAR*, p. 10).

[179] Martin, *The Role and Progress of the Office, Assistant Vice Chief of Staff*, p. 34. See U.S. Department of the Army, Office of the Chief of Staff, Chief of Staff Memorandum No. 67–142, Washington, D.C., 4 Apr 1967, sub: Program to Improve the Management of Army Resources.

[180] Ibid., pp. 34–35.

[181] Ibid., p. 35.

[182] Ibid., p. 39.

[183] Maladowitz, *Office of the Assistant Vice Chief of Staff—Parkinson's Law or Progress*, p. 32.

[184] *After-Action Report of PRIMAR*, p. 3.

[185] Martin, *The Role and Progress of the Office, Assistant Vice Chief of Staff*, p. 40.

[186] The assessment of PRIMAR was offered by Lt. Col. Richard Lawrence in an interview with General Ferdinand J. Chesarek (see Chesarek oral history, vol. II, Interv no. 2 [23 April 1971], p. 50).

[187] Chesarek oral history, vol. II, Interv no. 2 (23 April 1971), pp. 51–52.

[188] *After-Action Report of PRIMAR*, p. 2.

[189] Ibid.

[190] Martin, *The Role and Progress of the Office, Assistant Vice Chief of Staff*, pp. 42–44. The formal lessons learned from PRIMAR can be found in *After-Action Report of PRIMAR*, pp. 4–7.

[191] Gen William C. Westmoreland, "The Army's Challenge in Management," *Army Management Views* XVI (1971), p. 2.

[192] General William E. DePuy is widely considered one of the outstanding Army leaders of the second half of the twentieth century. He was born in Jamestown, North Dakota, on 1 October 1919, and graduated from South Dakota State University with a B.S. in economics in 1941. He subsequently graduated from the Army Command and General Staff College (1946), the Army Language School (1948), the Strategic Intelligence School (1949), the Armed Forces Staff College (1953), and the British Imperial Defence College (1960). William E. DePuy was commissioned as an infantry second lieutenant in 1941 and served with distinction in infantry combat units in the European Theater, ending the war in the rank of lieutenant colonel as G–3 of the 90th Infantry Division. Following World War II, he served in various intelligence and Army attaché positions, in infantry command and staff assignments in Germany, and for four years in the Office of the Chief of Staff in Washington, D.C., working on force structure, doctrine, and training issues. Following assignment as an infantry battle group commander in Germany, he returned to Washington, D.C., to serve as the director of special warfare in the Office of the DCSOPS and as director of plans and programs in the Office of the ACSFOR before going to Vietnam in May 1964 to become the assistant chief of staff for operations of the U.S. Military Assistance Command, Vietnam. From March 1966 to March 1967, he commanded the 1st Infantry Division in Vietnam. He then returned to the Pentagon to serve in the Office of the Joint Chiefs of Staff as the special assistant for counterinsurgency and special activities. On 10 March 1969, he was promoted to lieutenant general and became the assistant vice chief of staff. In March 1973, General DePuy was assigned briefly as deputy commanding general of the U.S. Continental Army Command before becoming the first commanding general of the new U.S. Army Training and Doctrine Command (TRADOC) created as part of the 1973 STEADFAST reorganization of the Army. As the TRADOC commander, General DePuy played a central role in the recovery of the Army from Vietnam and its reformation during the 1970s and 1980s that led to the rapid victories in the first Gulf War (Operation Desert Storm). General DePuy retired from active duty in July 1977. He died at Arlington, Va., on 9 September 1992 (see Headquarters, Department of the Army General Orders No. 24, Washington, D.C., 23 Oct 1992, sub: General William E. DePuy, and the brief biography at www3.sdstate.edu/Academics/CollegeOfArtsAndScience/MilitaryScience/Alumni/DistinguisheAlumni/DePuy/Index.cfm; copy in possession of the author). There is no comprehensive biography of General DePuy, but one is now in preparation and should appear in 2008.

[193] Martin, *The Role and Progress of the Office, Assistant Vice Chief of Staff*, p. 55; Jaffe, *Quantitative Analysis and Army Decision Making*, p. 22.

[194] Jaffe, *Quantitative Analysis and Army Decision Making*, p. 22.

[195] Ibid., p. 21.

[196] U.S. Department of the Army, Office of the Chief of Staff, *Chief of Staff Regulation No. 5–10: MANAGEMENT—Management of the Army Programming System* (Washington, D.C.: Office of the Chief of Staff, Headquarters, Department of the Army, 6 Mar 1970), par. 4 (cited in Martin, *The Role and Progress of the Office, Assistant Vice Chief of Staff*, pp. 52–53).

[197] Martin, *The Role and Progress of the Office, Assistant Vice Chief of Staff*, p. 53.

[198] U.S. Department of the Army, *Office of the Chief of Staff, Chief of Staff Regulation No. 15–17: BOARDS, COMMISSION, AND COMMITTEES—Select Committee* (Washington, D.C.: Office of the Chief of Staff, Headquarters, Department of the Army, 6 Mar 1970), p. 2.

[199] Col Brian R. McEnany (USA Ret.), personal communication to the author, 22 Feb 2005.

[200] Ibid.

[201] See the remarks of General Maxwell R. Thurman at the memorial service for General DePuy at Fort McNair, D.C., on 16 September 1992, reproduced in U.S. Army Combat Studies Institute, *In Tribute to General William E. DePuy: Remarks by General Maxwell R. Thurman, Lieutenant General Orwin C. Talbott, and General Paul F. Gorman* (Fort Leavenworth, Kans.: U.S. Army Combat Studies Institute, May 2004), p. 2.

[202] DePuy oral history, p. 174.

[203] William Gardner Bell and Karl E. Cocke, eds., *Department of the Army Historical Summary, Fiscal Year 1973* (Washington, D.C.: U.S. Army Center of Military History, 1973), p. 105. When the WHEELS study began, there was about one wheeled vehicle for every two soldiers in the Army.

[204] DePuy oral history, p. 173.

[205] Ibid.

[206] Maladowitz, *Office of the Assistant Vice Chief of Staff—Parkinson's Law or Progress*, p. 62.

[207] Martin, *The Role and Progress of the Office, Assistant Vice Chief of Staff*, p. 64.

[208] Ibid., p. 1.

[209] *CSM 67–64*, p. 5.

[210] Gen Harold K. Johnson, "Reorganization of the Office, Chief of Staff," address to selected members of the Army Staff, Washington, D.C., 16 Feb 1967, p. 7 (quoted in Martin, *The Role and Progress of the Office, Assistant Vice Chief of Staff*, p. 23).

[211] Martin, *The Role and Progress of the Office, Assistant Vice Chief of Staff*, p. 23.

[212] Chesarek oral history, vol. II, Interv no. 2 (23 April 1971), p. 58.

[213] U.S. Department of the Army, Special Review Panel on Department of the Army Organization, *Report of the Special Review Panel on Department of the Army Organization, vol. II: Detailed Organizational Discussion* (Washington, D.C., 1 Feb 1971), pp. 28–29 (quoted in Martin, *The Role and Progress of the Office, Assistant Vice Chief of Staff*, pp. 27–28).

[214] Gen James K. Woolnough, *Conversations Between General James K. Woolnough [and] Colonel Macmillan and Lieutenant Colonel Stevenson*, USAWC/USAMHRC Senior Officer Oral History Program (Carlisle Barracks, Pa.: U.S. Army War College/U.S. Army Military History Research Collection, 1971), vol. I, Interv no. 2 (25 February 1971), pp. 14–15.

[215] Lt. Gen. Austin W. Betts, *Conversations between Lieutenant General Austin W. Betts and Colonel Henk and Colonel Wahle*, USAWC/USAMHI Senior Officer Oral History Program (Carlisle Barracks, Pa.: U.S. Army War College/U.S. Army Military History Institute, 1971), Interv no. 2, p. 31.

[216] Ibid., Interv no. 4, pp. 4–5.

[217] Johnson oral history, vol. II, Interv no. 10 (22 January 1973), p. 4, and vol. III, Interv no. 6 (30 October 1974), p. 20. General Johnson noted that the subject of the OAVCSA was the only topic about which he wrote to General Westmoreland.

[218] Ibid., vol. III, Interv no. 6 (30 October 1974), p. 20.

[219] Martin, *The Role and Progress of the Office, Assistant Vice Chief of Staff*, pp. 28–29 and 32.

[220] Ibid., pp. 29–30.

[221] Ibid., pp. 59–60.

[222] ASAC *Main Report*, an. B (Operations Research In and For the Army), an. 4 (The Army Analytical Community), Incl 1 (Characteristics of Analytically Oriented Offices and Agencies of Interest to Office of Operations Research, OUSA), p. 6.

[223] Ibid., p. 7.

[224] Ibid., pp. 5–6.

[225] Maladowitz, *Office of the Assistant Vice Chief of Staff—Parkinson's Law or Progress*, p. 11.

[226] *AR 10–5* (May 1965) (cited in Maladowitz, *Office of the Assistant Vice Chief of Staff—Parkinson's Law or Progress*, p. 12); ASAC *Main Report*, an. B, Incl 1, p. 8; McGovern, "Management of Operations Research and Systems Analysis Studies," p. 29.

[227] T. Arthur Smith, "Overview of the Role of Cost Analysis (for an Economically Constrained Army)," in Proceedings of the [Tenth] United States Army Operations Research Symposium: "The Next Decade," 26–28 May 1971, Durham, North Carolina (Durham, N.C.: U.S. Army Research Office-Durham, 1971), p. 100.

[228] ASAC *Main Report*, an. B, an. 4, app. 5, atch 1.

[229] Ibid., an. C, Table C–1.

[230] *AR 10–5* (May 1965) (cited in Maladowitz, *Office of the Assistant Vice Chief of Staff—Parkinson's Law or Progress*, p. 12).

[231] ASAC *Main Report*, an. B, an. 4, app. 5, atch 2; McGovern, "Management of Operations Research and Systems Analysis Studies," pp. 29–30.

[232] Ibid., an. C, Table C–1.

[233] "Annual Report of the Secretary of the Army for Fiscal Year 1962," pp. 192–93; "Annual Report of the Secretary of the Army for Fiscal Year 1963," p. 120.

[234] ASAC *Main Report*, an. C, Table C–1.

[235] Ibid., an. B, an. 4, app. 5, atch 2.

[236] Ibid., an. C, Table C–1.

[237] AR 10–5 (May 1965) (cited in Maladowitz, *Office of the Assistant Vice Chief of Staff—Parkinson's Law or Progress*, p. 12).

[238] ASAC *Main Report*, an. B, an. 4, app. 5, atch 4.

[239] Ibid., an. C, Table C–1.

[240] Ibid.

[241] "Annual Report of the Secretary of the Army for Fiscal Year 1963," p. 119. See *Department of the Army General Order No. 6*, Washington, D.C., 7 Feb 1963. The OACSFOR was abolished, effective 20 May 1974, by Department of the Army General Order No. 10, Washington, D.C., 8 May 1974, and its functions dispersed to other staff elements.

[242] *AR 10–5* (May 1965), par. 37.

[243] Abraham Golub, "Risk Analysis and Planning for Tomorrow's Army," in *Proceedings of the [Eleventh] United States Army Operations Research Symposium, 15–18 May 1972, Durham, North Carolina* (Durham, N.C.: U.S. Army Research Office-Durham, 1972), p. 13, Figure 3.

[244] Personal communication, E. B. Vandiver III to the author, 29 Aug 2005.

[245] Payne, "Operations Research—A View from the Pentagon," p. 6.

[246] ASAC *Main Report*, an. B, an. 4, app. 5, atch 3.

[247] Ibid., an. C, Table C–1.

[248] For the specific responsibilities of the DCSOPS, see *AR 10–5* (May 1965), par. 31, and subsequent changes and editions.

[249] *Change 1* (14 Jan 1966) to *AR 10–5* (May 1965), p. 13, par. 31b.

[250] ASAC *Main Report*, an. C, Table C–1.

[251] Ibid., an. B, an. 4, app. 5, atch 3.

[252] Ibid., an. B, Incl 1, p. 6.

[253] U.S. Department of the Army, *Army Regulations No. 15–14: BOARDS, COMMISSIONS, AND COMMITTEES—United States Army Strategy and Tactics Analysis Group* (Washington, D.C.: Headquarters, Department of the Army, 11 Sep 1961), par. 2; U.S. Army Strategy and Tactics Analysis Group, *Fact Sheet—U. S. Army Strategy and Tactics Analysis Group*, Bethesda, Md., n.d. [c. 1962], pp. 1–2. For the establishment and early history of STAG, see vol. I, ch. 3, of this history. The development and operation of STAG during the 1960s and early 1970s is discussed in greater detail below in ch. 5.

[254] ASAC *Main Report*, an. C, Table C–1.

[255] The specific responsibilities of the CRD are prescribed in *AR 10–5* (May 1965), par. 35, and subsequent changes and editions.

[256] U.S. Department of the Army, *Army Regulations No. 1–110: ADMINISTRATION—Contracting for Management Advisory Services and Operations Research Studies and Projects* (Washington, D.C.: Headquarters, Department of the Army, 28 Jun 1961, and subsequent issues), par. 9.

[257] ASAC *Main Report*, an. C, Table C–1.

[258] Ibid., an. C, Table C–1, and an. B, an. 4, app. 5, atch 5.

[259] The pre-1963 histories of ARO and the ORSA-related activities that it supervised, including RAC, SRI, SORO, HumRRO, ARO-D, ORTAG, the annual Army Operations Research symposia, et al., are outlined in vol. I, ch. 4, of this history. The post-1963 histories of the organizations and activities supervised by ARO are discussed in greater detail below in ch. 5.

[260] Smith, *A History of the U. S. Army in Operations Research*, p. 75.

[261] U.S. Department of the Army, *Army Regulations No. 1–110: ADMINISTRATION—Contracting for Management Advisory Services and Operations Research Studies and Projects* (Washington, D.C.: Headquarters, Department of the Army, 28 Jun 1961, with subsequent changes and revisions). The Army Operations Research Steering Committee (AORSC), chaired by the director of Army research, met semiannually to oversee requirements and allocation of resources for ORSA activities and to advise the CRD on the Army's overall ORSA program. The permanent Army Study Advisory Committee (ASAC), created in 1963 under the director of special studies in the Office of the Chief of Staff, absorbed the functions of the Operations Research Steering Committee, which was then discontinued (see ASAC *Main Report*, an. B, p. 11).

[262] McGovern, "Management of Operations Research and Systems Analysis Studies," p. 32.

[263] ASAC *Main Report*, an. B, an. 4, app. 5, atch 5.

[264] Ibid.

[265] McGovern, "Management of Operations Research and Systems Analysis Studies," p. 30.

[266] ASAC *Main Report*, an. B, an. 4, app. 5, atch 5.

[267] The successive published reports of the AORS are also a very important source for the historian interested in the development of ORSA in the U.S. military services.

[268] Ibid., an. B, an. 4, Incl 1, p. 9. The Army Mathematics Steering Committee was organized under *CSR 15–4*, the Program Advisory Committee under *CSR 15–10*, and both the Army Operations Research Steering Committee and the Project Advisory Groups under *AR 1–110*.

[269] Ibid., an. B, an. 4, app. 5, atch 4.

[270] McGovern, "Management of Operations Research and Systems Analysis Studies," p. 30.

[271] ASAC *Main Report*, an. C, Table C–1.

[272] McGovern, "Management of Operations Research and Systems Analysis Studies," p. 30.

[273] ASAC *Main Report*, an. B, an. 4, app. 5, atch 2.

[274] Ibid., an. C, Table C–1.

[275] Ibid., an. B, an. 4, app. 5, atch 2.

[276] Ibid., ann. C, Table C–1.

[277] Ibid.

[278] Brig Gen William O. Quirey, address on PRIMAR to the U.S. Army War College, Carlisle Barracks, Pa., 9 Apr 1969, pp. 2–3 (cited in Maladowitz, *Office of the Assistant Vice Chief of Staff—Parkinson's Law or Progress*, p. 56).

[279] Martin, *The Role and Progress of the Office, Assistant Vice Chief of Staff*, pp. 49–50.

[280] In his FY 1971 DOD posture statement, Secretary Laird reinforced the importance of systems analysis when he wrote: "Systems analysis, when properly used, is an essential management tool. There are no absolute answers to the type of questions we face in Department of Defense decision-making. Systems analysis, properly used, elevates the level of judgment and helps decision-makers to sort out fact and opinion" (quoted in Eckhard Bennewitz, "The Need for OR/SA Is Greater Than Ever," *Army Management Views XV*, no. 2 [1970], p. 110).

CHAPTER FOUR

Army ORSA Personnel Management, 1961–1973

Secretary of Defense Robert S. McNamara's revolution in defense management and decision making significantly increased the demands on the services for integrated data reporting and scientific analyses of weapons systems, force structure, tactical doctrine, strategy, and management. The increased demand produced in turn, in the Army and in the other services, a substantial increase in the organizational elements, both staff and field, dedicated to providing the required data and analyses. For the Army, this increase in ORSA organizations was accompanied by centralization of control of higher-level ORSA activities in the Army Secretariat and in the Office of the Chief of Staff. The increased demand carried with it, of course, an increased demand for ORSA specialists, both civilian and military, to perform the necessary analyses and manage the overall ORSA program. Army ORSA assets, although substantial, were inadequate to meet the increased demand, and neither the expansion of contractual arrangements for ORSA support nor the increases in the Army's civilian ORSA workforce were desirable or practical alternatives. Army officers were becoming more directly involved in ORSA work at every level, and the Army therefore initiated a sustained effort to build up its supply of adequately trained uniformed ORSA specialists and managers. ORSA requirements and assets were surveyed, efforts to provide formal education and systematic on-the-job training were increased, and informal programs for the management of ORSA-qualified military personnel were transformed into formal career management programs. Similar efforts were directed at improving the recruitment and training of Department of the Army civilian ORSA personnel. Strenuous efforts in the early and mid-1960s produced a substantial increase in the Army's cadre of trained ORSA specialists and executives and established permanent mechanisms for ensuring the continued supply of military ORSA personnel.

The Increasing Requirement for ORSA Personnel

The increasing need for ORSA specialists in the Army was not just a function of OSD demands; it was also a reflection of rapidly changing technology and the increasingly complex systems comprising military power. As Dr. Wilbur B. Payne, the chief of the Office of Operations Research in the Office of Under Secretary of the Army, wrote in 1965:

> There seems an inevitable growing need for operations research within the Army. This has its roots in what I call the Proliferation of Technical Alternatives and the Proliferation of Specialization, two phenomena associated with the growth of modern science. The first of these has reference to the fact that the number of technical alternatives to solve military problems is rapidly increasing. Even now it is not possible to reduce a significant fraction of them to practice and make choices on an empirical basis. The second refers to the fact that as science and scientists become more specialized, there is an increasing gulf to be bridged with communications. We simply must create a larger pool of people with the understanding that comes only through study and research of both military and scientific aspects of our problems.[1]

The increasing requirement for ORSA specialists and the consequent need to increase the Army's ORSA

capabilities was also widely recognized by Army leaders. General Ralph E. Haines, Jr. (Army vice chief of staff, July 1967–August 1968) wrote that

> the Army today has a sharply increasing requirement for an improved OR/SA capability . . . the number of complex military problems is rapidly increasing. But analytical techniques as those associated with OR/SA can directly contribute to the solution of these problems. . . . The present Army OR/SA community must be expanded to meet these and projected needs.[2]

In the early 1960s, the United States Department of Defense became the world's largest employer of ORSA personnel as well as the largest consumer of ORSA products.[3] The staff of the OSD Office of Systems Analysis under Dr. Alain C. Enthoven alone grew from thirteen members in March 1961 to 203 in April 1966.[4] The rapidly growing level of technical expertise in OSD and a comparative lack of such expertise at Army level had become, in the word of Gerald Wetzel, "unnerving."[5] As the 23 April 1964 Department of the Army letter on systems analysis and cost-effectiveness noted, "OR methods are becoming more and more evident in everyday Army activity," as evidenced by an annual $24 million OR "program" and "the almost daily insistence, by DOD in particular, that Army recommendations be supported by quantitative, as well as qualitative analysis."[6]

To compete successfully in the new environment of scientific analysis, the Army and the other services had to develop a greatly increased analytical capability of their own, a capability that would allow staff officers to communicate with the Whiz Kids in their own language and to match them in both quality and quantity of analytical output. At the beginning of the McNamara era, the Army relied principally on contractors for its analytical needs and had only a limited in-house capability, mostly composed of civilian analysts.[7] Given the increasing complexity and cost of Army equipment and operations and the demands imposed on the Army by OSD, Army Chief of Staff General Harold K. Johnson questioned whether the Army had the capacity in-house even to make "independent assessments and evaluations" of the ORSA products being supplied by contractors.[8]

Under such circumstances, an increase in the amount of ORSA work done for the Army by independent civilian contractors, such as the Research Analysis Corporation (RAC) and the Stanford Research Institute (SRI), did not seem to offer an adequate solution to the problem of the Army's rapidly increasing ORSA workload. There was already a good deal of dissatisfaction with the contracting option, as was demonstrated by the failure of the Army and Johns Hopkins University to come to an agreement on the renewal of the contract for the Operations Research Office (ORO) in the summer of 1961.[9] The use of contractors posed problems of continuous funding, study definition, timeliness, quality, and control. Moreover, most ORSA contractors relied on the Army to provide the data essential to their studies, and thus, as General Haines noted:

> This means that we are sometimes buying back our own files, reordered and dressed up in new covers. Therefore, we are resolved to increase our in-house capability. In addition to cutting down the cost of contractual studies, we believe we can improve the overall quality of special studies and OR/SA products and more effectively integrate advancing technology with future Army doctrine and concepts.[10]

Although not an ideal, or even a preferred, solution, the use of ORSA contractors remained an important part of the overall Army ORSA program, and the amount spent annually on ORSA contractor support continued to rise sharply. In FY 1964, the Army spent some $17 million on contract ORSA studies; by FY 1968 that amount had risen to $25.7 million.[11]

Any attempt to increase the Army's civilian ORSA workforce was deemed equally unattractive, principally because the shortage of civilian ORSA analysts willing to work for the Army was even greater than the shortage of ORSA-trained officers.[12] In the early to mid-1960s American business and industry were also experiencing rapid growth in the use of advanced analytical techniques, and attempts to recruit additional civilian ORSA analysts for government service, where the pay and benefits were substantially less attractive, thus met with little success.[13] Also, given the United States Civil Service Commission rules then in effect, the recruitment, assignment, transfer, and, if necessary, separation of civilian ORSA employees was difficult at best. Thus, the preferred solution came to be a significant expansion of the

numbers of ORSA-trained Army officers in order to create the independent Army ORSA capability essential to the Army's ability to compete successfully in the new management environment. As Lt. Col. Allen W. Wiegand wrote in the December 1966 issue of *Signal*:

> The pattern emerging now seems quite clear—the military services must use systems analysis to survive in the present environment of the Department of Defense. Although analyses can and will be performed externally, each service must possess a capability to perform the analyses itself. Furthermore, a large segment of both the military and civilian personnel of the services must be made fully aware of the advantages and limitations of analysis techniques, and be able to communicate with those specialists who prepare the studies. They also must have an ability to employ the studies to assist themselves in the making of decisions, and be able to provide assistance to their superiors for like efforts.[14]

In any event, by the mid-1960s Army commanders and staff officers at all levels were finding that knowledge of ORSA was an indispensable tool of their trade, something that every Army officer needed to some degree.[15] In 1969, Col. John G. Waggener wrote in *Military Review*:

> While there is no requirement for every career officer to become fully qualified to perform operations research, cost effectiveness analysis, and systems analysis, there does exist an implied requirement for every career officer to be fully qualified to employ these techniques in improving those military operations and supporting operations for which he may be responsible.[16]

The requirement for two levels of ORSA acumen had also been addressed earlier by Col. Oliver R. Dinsmore, who opined:

> Two levels of training are necessary to provide a proper balance of operations research knowledge within the Army. First, the orientation of all career officers, and second, to provide formally trained analysts to participate in and/or supervise operations research studies within the Army, with Army contract organizations, such as RAC and SRI, and those conducted by colleges and universities for the Army.[17]

The increasing involvement of Army officers in ORSA matters was also recognized officially in the 23 April 1964 Department of the Army letter in which a section titled "Qualitative Needs for Capability in or Understanding of OR Methods by Military Personnel" noted:

> Four "needs" were brought out: formulation of problems, managing OR efforts, reviewing and using OR reports and doing OR-type studies.
>
> Military personnel normally pose problems for examination by OR or participate in the formulation of the problem. If would appear desirable that they do so in recognition of the techniques of OR.
>
> Military personnel are frequently responsible for guiding OR efforts of others, approving OR contracts, reviewing proposed OR work programs and assigning priorities to available effort. While the pressing need for the study of a particular area is often the major consideration, knowledge of the possible limitations of OR methods could assist in doing a more optimum OR management job.
>
> Military personnel are the main users and reviewers of OR reports. The utility of each report is a function of *both* the manner in which it is presented by the OR specialist and the capability of the military reviewer and user to assess and understand all of the report.
>
> Military personnel are frequently finding themselves in the role of a team leader or participant in OR- (cost effectiveness, operational evaluation) type studies. To function effectively in this role, they need both understanding of and capability in OR methods.[18]

The expectation that almost every Army officer might at some time serve as either a proposer, a guider, a consumer, a critic, a supervisor, or a preparer of ORSA products was the foundation for the subsequent drive to increase the numbers of Army officers conversant with the techniques and limitations of ORSA.

Army Education and Training in ORSA up to 1966

Although the problem (the need to expand the Army's ORSA capabilities) was soon recognized and a preferred solution (to increase the number of Army officers trained in ORSA) quickly determined, the design and implementation of the preferred solution took longer to work out. For some time the Army had been sending a limited number of officers to civilian universities for graduate-level education in business management and comptrollership, fields closely related to ORSA; and from early 1964 there was an informal program for the identification, assignment, and management of ORSA-qualified officers. However, it was not until 6 March 1967 that the Army established

a formal program for the development and management of ORSA officer specialists.

In its report on 15 June 1949, the Department of the Army Board on the Educational System for Officers, headed by Lt. Gen. Manton S. Eddy, then the commandant of the Army Command and General Staff College, recommended that business management be added to the curricula of all schools in the Army educational system, and in June 1951 the Management Division of the Office of the Comptroller of the Army developed a two-hour program of instruction for use in all Army branch advanced courses.[19] Selected officers were also sent to a number of universities for graduate education in comptrollership and related fields.[20] It was only in 1951, however, that the first graduate programs in OR were offered in American universities. The first doctorates in OR were granted by the Massachusetts Institute of Technology and Johns Hopkins University in 1955, and by 1959 some nineteen schools had doctoral programs in OR.[21]

Following the second Army Operations Research Symposium in 1962, the Army's Chief of Research and Development (CRD) requested that the Operations Research Technical Assistance Group (ORTAG), an element of the Army Research Office-Durham (ARO-D), make a study and submit recommendations regarding the Army ORSA education program.[22] After studying the problem for several months, the ORTAG recommend the establishment of a program to:

1. Acquaint officer personnel with this new and powerful tool useful in problem solving and decision making.
2. Improve the quality of Army decision making instruments such as the Commander's Estimate of the Situation, Operations and Logistical Plans, Staff Studies, and Budget and Programming papers by increasing their quantitative aspects.
3. Better equip personnel for the preparation and defense of the Army's Budget, plans, programs and projects. These are evaluated at an ever increasing extent at DA, DOD and Congressional levels using operations research methodology.
4. Facilitate identification of problems that can be solved by the professional application of operations research technology.
5. Insure more effective Army operations research by clearer statements of problems and more knowledgeable supervision of work.
6. Insure quicker and better application of the results of operations research.
7. Assist in developing logical and more quantitative thought processes.[23]

At its meeting on 1–2 August 1963, the Army Operations Research Steering Committee endorsed the recommendations of the ORTAG committee and devoted considerable time to a discussion of the trend toward greater use of advanced analytical techniques in the Army and DOD.[24]

The first major step toward firmly identifying the Army's requirements for trained ORSA officers came on 20 December 1963, when the Army Educational Requirements Board (AERB) validated thirty-five positions as requiring officers with advanced-degree training in ORSA.[25] By 1969, the number of validated positions had grown to 550.[26] In his keynote address to the attendees at the third Army Operations Research Symposium in March 1964, Dr. Wilbur B. Payne incongruously expressed the view that the education of Army OR personnel had been "completely satisfactory," with only eight to ten Army officers educated at the graduate level versus formal requirements for about thirteen to fourteen professionally trained OR officer analysts.[27] He did go on to state, however, "We are going to expand our education program in the area very rapidly," and he noted that the Office of Personnel Operations had forty trained OR officers on hand and planned to triple the number over the next five years with fifteen officers entering graduate school in the fall of 1964.[28]

DOD Initiatives and the Bonesteel Study

In March 1964, Dr. Alain C. Enthoven, then the deputy assistant secretary of defense for systems analysis, expressed to Maj. Gen. Arthur S. Collins, Jr., the Army's director of officer personnel, the need for the development of Army officers as qualified systems analysts.[29] The following September, Charles J. Hitch, then the DOD comptroller, announced the creation of a graduate-level training program to be established at a "leading educational institution" to produce qualified systems analysts for utilization within the Department of Defense.[30] Hitch proposed that the program of instruction should include the following:

- Strategic studies and analysis of defense policy decisions.
- Economics—price and allocation theory and national income analysis.
- Probability statistics and inference from uncertain data.
- Mathematical operations research and computers.[31]

The reaction of the services was favorable, and in November 1964 Deputy Secretary of Defense Cyrus R. Vance issued another memorandum to the service secretaries that formally established a defense systems analysis educational program to begin in the fall of 1965.[32] The Army was to have a quota of eight spaces in the initial course.

In May 1964, Lt. Gen. Charles H. Bonesteel III, the Army's director of special studies, issued a report of his study of the Army Study System that also addressed the problem of training and education of officers in ORSA.[33] The Bonesteel study recognized that the Army lagged behind the other services in the training of ORSA officers and recommended that training and education in ORSA be increased, both to provide "a hard core of expertise" and to familiarize senior commanders and staff officers as well as intermediate-level staff officers with "the modern techniques and uses of studies," including ORSA studies.[34] The Bonesteel study report also indicated that as of 1964 there were only twelve officers on active duty with advanced degrees in ORSA, and that the ORTAG, a subordinate element of the Army Research Office-Durham, was studying the problem. General Bonesteel also noted that although the Office of Personnel Operations (OPO) and the deputy chief of staff for personnel (DCSPER) were giving greater attention to the problem, "an adequately energetic approach to the problem" had been inhibited by the lack of validated position requirements for ORSA-trained officers.[35] However, the DCSPER had recently established a requirement for the education and training of some seventeen officers at a time in order to provide eighty-four additional ORSA officer specialists over a period of five or six years. Although the OPO was able to identify officers with ORSA skills, there was as yet no specific Military Occupational Specialty (MOS) code or prefix to identify such officers. A survey in April 1964 showed that there were in fact thirteen Army officers with graduate-level education in ORSA versus thirty-two Army positions requiring such education, and that the planned input of officer to graduate schooling in ORSA in FY 1964 was only seventeen.[36]

The practical effect of the Enthoven and Hitch initiatives combined with the Bonesteel study was to spur on Army efforts to increase the number of ORSA-qualified officers. In October 1964, the Army established an informal ORSA officer specialist program that identified the need for post-graduate-level skills in mathematics, economics, international relations, operations research, systems analysis, systems engineering, other engineering fields, and the physical sciences.[37] Another step forward was taken in October 1965, when the Army chief of staff approved the establishment of on-the-job ORSA training programs for officers at the Research Analysis Corporation in McLean, Virginia, and at the Stanford Research Institute in Menlo Park, California.[38] The pilot program was limited to only five officers, but establishment of the program indicated the Army's continuing interest in improving its ORSA capabilities by whatever means. In November 1965, the list of disciplines suitable to produce eligibility for the informal ORSA specialist program was increased by the addition of mathematical statistics, decision theory, automatic data-processing system engineering, industrial management, economic analysis, and econometrics.[39]

The Haines Board, February 1966

A major step toward the creation of a formal Army ORSA Officer Specialist Program was taken with the report of the Department of the Army Board to Review Army Officer Schools issued in February 1966.[40] Known as the Haines Board after its president, Lt. Gen. Ralph E. Haines, Jr., the board was established pursuant to a Department of the Army letter dated 20 May 1965 to "determine the adequacy and appropriateness of the present system for education and training of Army officers at service schools, service colleges, and civilian institutions, for the period 1965–1975."[41] The Haines Board convened on 6 July 1965, conducted its work over a period of seven months, and issued its final report in February 1966. The members of the Haines Board included General Haines as president; three general officers representing the Army Materiel

Command (AMC), the Army Combat Developments Command (CDC), and the Continental Army Command (CONARC); and one representative each of six principal Army Staff elements plus three full-time consultants: an active duty Army colonel (John H. Crowe) who was a graduate of the U.S. Naval Academy; Brig. Gen. Henry C. Newton (U.S. Army Reserve Ret.), then the chairman of the board of Marymount College of Virginia; and Dr. Thornton L. Page, a distinguished astronomer who had been involved in military operations research since World War II and had been a senior manager at ORO.[42] William G. Bell of the U.S. Army Center of Military History provided editorial and historical research support.

Board members reviewed the reports of three earlier Army boards dealing with officer education and training and discussed their topic with a broad range of senior DOD, Army, and other government officials.[43] Detailed briefings were received from the other services, and the officer education and training systems of four foreign armies as well as those of eight large industrial corporations were investigated. The board also visited more than seventy installations, including all Army schools and colleges, DOD schools, schools operated by the other services and by industry, civilian universities, and operations research agencies. Board members also interviewed the commanding generals of CONARC, CDC, AMC, and the Army Air Defense Command and received detailed written comments from the commanding general of the United States Strike Command.

The Haines Board specifically considered the changing defense environment and in particular the fact that "Increasing emphasis is being given to the development and exercise of sound management skills and practices in industry and in government" that in the Department of Defense had "manifested itself in the institutionalizing of certain planning, programming, budgeting, systems analysis, and cost effectiveness techniques," and that during the next decade would "be refined further and expanded to lower levels of the Military Establishment."[44] The board also assumed that during the period 1965–1975 the Army would experience major increases in training requirements in the fields of communications and electronics; automatic data-processing equipment; and pilot training and other aspects of Army aviation as well as "operations research/systems analysis, related to the expanding complexity and scope of the art and science of warfare, the increasing sophistication of analytical tools, and the requirement to quantify alternatives in the decision-making process."[45]

The Haines Board studied the full range of Army officer education and training at all levels but devoted a good deal of attention to such specialty fields as resource management, comptroller activities, automatic data processing, and operations research/systems analysis. The board's detailed discussion of ORSA education and training are contained in Appendix 11 (Operations Research/Systems Analysis Education and Training) of Annex D (Analysis of Current Army System of Officer Schooling) in Volume III of the board's final report. The board found that ORSA education and training was available to Army officers in four forms: instruction in officer career and specialist courses in Army schools; courses at other service, DOD, and government agencies; graduate schooling at civilian colleges and universities; and on-the-job training.[46] The board also found that the United States Military Academy provided cadets with a sound foundation for advanced ORSA training, offering more than the equivalent of thirteen credit hours in ORSA plus a number of elective courses involving ORSA concepts and techniques.[47]

However, the Haines Board also found that there was no ORSA instruction at all at the officer basic course level, and that at the officer career (advanced) course level only seven Army branch schools offered instruction in ORSA, varying in time from three to thirteen hours.[48] The board thus concluded that the curricula of the various branch career courses should be revised to provide increased emphasis on operations research and systems analysis as well as several other subjects. The board also found that the United States Army Command and General Staff College regular courses included only one hour of instruction in ORSA as such, but twelve hours were devoted to related subjects, such as management control techniques and war-gaming, and references to ORSA were to be found in other courses throughout the curriculum.[49] The Army War College curriculum was found to include some twelve hours of ORSA instruction, mainly in the four-day Command Management Seminar that covered the theory and principles of decision making, techniques of ORSA, and

war-gaming concepts.[50] The board thus recommended that increased time be devoted to ORSA instruction at both the Command and General Staff College and the Army War College.[51] Furthermore, the board recommended that the Army War College increase the representation on its faculty of specialists in research and development, logistics, ORSA, and project management, and that the Institute of Advanced Studies, then under the Combat Developments Command, should be made a part of the Army War College.[52] The Haines Board also explored ORSA instruction available in the form of short courses at the United States Army Management Engineering Training Agency (AMETA) and the United States Army Logistics Management Center (ALMC); courses offered by the other services, DOD, and government agencies (such as the Naval Postgraduate School, the Air Force Institute of Technology, the Institute for Defense Analyses (IDA), and the United States Civil Service Commission); graduate courses in ORSA at no fewer than fifteen universities in the United States; and other short courses such as that offered by SRI as well as through on-the-job training.

The conclusions reached by the Haines Board with respect to ORSA education and training for Army officers were:

32. Three levels of OR/SA officer training and education should be established: specialist, executive level, and familiarization.
33. The Systems Analysis Specialist Program should be established as a formal program under the direction of the Deputy Chief of Staff for Personnel in coordination with the Assistant Chief of Staff for Force Development.
34. Position requirements in SA Specialist Program in the grades of captain and major should be increased to provide program balance and an adequate junior officer base to support validated senior positions filled on a reutilization basis. An annual input of approximately 60 officers in junior grades into graduate schooling in OR/SA would meet estimated requirements.
35. For the OR/SA education of specialists, advanced degree courses tailored to Army requirements should be established at a limited number of civilian universities. To supplement this graduate schooling, on-the-job training programs should be developed with selected contract research agencies.
36. For OR/SA executive level training, the branch career (advanced) courses, C&GSC, and Army War College should adopt a progressive elective program for approximately 20% of students in the combat arms and technical services.
37. For OR/SA familiarization training, branch-oriented instruction should be conducted as part of the career (advanced) course. At least eight hours should be devoted to this subject in courses of the professional and administrative branches and 24 hours in those of the technical services and combat arms. Students at the C&GSC and Army War College should receive approximately 24 hours of OR/SA training in each course.
38. The C&GSC should be the proponent agency for OR/SA instructions in Army schools.[53]

The "progressive elective" recommended by the Haines Board was to include study at the branch advanced (career) course level of the principles of decision making; mathematical models and data collection; probability concepts and statistical analysis; simulations; and case studies and applications related to the branch orientation (tactical or technical) plus, for officers at the advanced courses of the technical branches, replacement and inventory models.[54] At the Command and General Staff College level, the "progressive elective" would include review of previous instruction and the study of linear and nonlinear programming, network analysis, waiting line theory, systematic gaming, and applications and case studies related to combined arms operations and their support. At the Army War College level, previous instruction would be reviewed and additional study would be made of simulations and gaming, modeling techniques, cost analysis and effectiveness, and applications and case studies related to strategic deployment and force development and evaluating doctrine and new equipment.

The more general formal recommendations of the Haines Board with respect to ORSA education and training were the following:

31. That a formal Systems Analysis Specialist Program be established under the direction of the Deputy Chief of Staff for Personnel in coordination with the Assistant Chief of Staff for Force Development.
32. That graduate schooling in operations research/systems analysis, limited to officers in the grades of captain and major, be expanded and concentrated at a limited number of educational institutions which agree to tailor programs to meet Army requirements.
33. That operations research/systems analysis training be included in the core curricula and as a progressive elective in the upper three levels of officer career schooling.[55]

In general, the Haines Board had a profound impact on Army officer education and training long after its February 1966 report. And in time, each of the Haines Board recommendations with respect to ORSA education and training for Army officers would be implemented with only minor adjustments. It was thus a major step on the way to the establishment of a formal program of Army ORSA officer training and management.

The August 1966 ASAC Study of Army ORSA Personnel Requirements

The author of the April 1964 DA letter on systems analysis and cost-effectiveness had noted that while "OR methods are becoming more and more evident in everyday Army activity. . . [t]here is no good indicator as to how well the Army is doing in the OR field," and had proclaimed the need for an in-depth study of the situation.[56] He had also recommended that Army elements in DOD, the JCS, the Office of the Secretary of the Army, the Army Staff, major Army command headquarters, and selected Army units in the field be surveyed to determine the number of positions by type and level of expertise requiring ORSA knowledge they had in order to determine the Army's requirements for ORSA education at the bachelor's degree level, in Army service schools, and in orientation courses (one-week seminars).[57] It was also recommended that Army education and training facilities be surveyed to determine the type and nature of ORSA training already being undertaken. The 1966 Haines Board on Army officer education had accomplished some of the tasks set out by the 1964 DA letter and had gone on to recommend improvements in ORSA instruction at all levels of the Army school system, increases in the number of officers attending graduate school in ORSA, and the creation of a formal program for the development and management of ORSA-qualified officers. Taken together, the April 1964 DA letter, the May 1964 Bonesteel study, and the February 1966 report of the Haines Board prepared the way for the breakthrough toward a formal program of education and career management for Army ORSA officers represented by the 1966 Army Study Advisory Committee (ASAC) study of Army ORSA requirements, assets, and education.

By the late fall of 1965, it was obvious that additional steps had to be taken to increase the number of ORSA-qualified officers in the Army and to provide a more formal and more efficient means of identifying, developing, and managing the careers of such officers. The demands of OSD for integrated data and quantitative analyses continued to grow exponentially, and throughout the Army a large number of officers were working as ORSA "specialists" or "executives" in some twenty-eight Army Staff agencies and major commands. There was an annual ORSA contracting budget of about $30 million to be managed, and some 70–100 Army officers per year were engaged in the management of OR contract activity alone.[58]

The decisions of Army Chief of Staff General Harold K. Johnson regarding the recommendations of the Haines Board were contained in *CSM 66–277*, dated 15 June 1966.[59] With respect to the Haines Board recommendation regarding ORSA, a week later General Johnson directed that the DCSPER, in coordination with the director of special studies, "review and revise Army-wide requirements and prepare a policy paper."[60] The Army Study Advisory Committee, under the direction of Col. D. P. McAuliffe, the acting chairman of the ASAC, was charged with collecting the necessary data; making an estimate of the Army's ORSA personnel requirements, both military and civilian, to include required skills levels, time phasing of requirements, and the time required for requisite training and education; preparing a time-phased plan for "the orderly development of OR/SA personnel over an extended period"; and developing proposed guidance and policy pertaining to the organization and management of Army ORSA personnel.[61] The ASAC was instructed to complete its work and submit the results to the DCSPER (with a copy to the ACSFOR) by 15 August 1966 in order that the DCSPER could prepare and coordinate the necessary formal policy paper and comprehensive implementation plan for submission to the vice chief of staff for approval not later than 28 October 1966.[62]

Under the direction of Colonel McAuliffe, the ASAC completed its work and submitted its report to the DCSPER on 30 August 1966, only nine weeks after it was tasked.[63] The twenty-seven-page *Main Report*, supported by several hundred pages of

annexes and appendixes, was something of a tour-de-force of the art of the military staff study. The ASAC defined the problem, laid out the facts bearing on the problem, settled on a definition of operations research/systems analysis, and proceeded to a comprehensive investigation of the state of what they chose to call "the Army Analytical Community."[64] The term Army analytical community was chosen in order to expand the definition of ORSA to include a wide variety of organizations involved in analytical activities.[65] The term itself appears to have been coined by Mr. Reid Davis of the Office of Operations Research in the Office of the Under Secretary of the Army, who prepared a report on the Army analytical community that was incorporated into the *Main Report* as an enclosure.[66]

The ASAC then proceeded to collect the necessary data on Army ORSA requirements, assets, education and training facilities and programs, costs, and organizations. A comprehensive detailed survey was made of all elements of the Army analytical community, to include Army elements in OSD, the JCS, and DOD agencies; the Army Staff and related Class II activities; the Army major commands; Army ORSA contractors; and educational institutions offering programs in ORSA. The results were digested, correlated, and laid out in the annexes and appendixes to the *Main Report*. Once the data-collection and arrangement phases were complete, the ASAC members analyzed the data and arrived at seventeen conclusions and twelve recommendations. The essence of the conclusions reached and recommendations made were that Army requirements for ORSA personnel were increasing; the increased requirements should be met by an orderly increase of the Army's in-house ORSA capability rather than by major increases in contract efforts; the Haines Board definitions of ORSA "specialist" and "executive" should be adopted; a three-phase program for expanding Army ORSA personnel resources, both military and civilian, through 1970 should be adopted; and the Army should develop a well-publicized, comprehensive program for identifying, recruiting, training, and managing both military and civilian ORSA personnel.[67]

Three key elements of the ASAC *Main Report* were the committee's working definition of ORSA, its definition of the terms ORSA "specialist" and ORSA "executive," and the time-phasing proposed for the expansion of the Army's ORSA personnel resources. The ASAC examined some twenty-four definitions of operations research and systems analysis and determined that, for its own purposes and "for the future use in the Army," the best definition of ORSA was the following:

> the application of objective, analytical, orderly thinking, supported by selected research tools (normally of a mathematic, statistical and economic type), to the analysis of complex problems and related implications. Through its analytical methodology, OR/SA serves to identify and clarify major factors of a problem, and provides a more precise range of possible solutions for consideration in reaching decisions. As an important aid in the decision making process, OR/SA is a tool of command, complementing the qualitative and subjective factors on which decisions must be based.[68]

CSM 66–288 required the ASAC to consider requirements for both military and civilian ORSA personnel "at two skills levels and in three phases," and directed that ORSA requirements be determined in terms of the "specialist" and "executive" levels described earlier in the Haines Board report.[69] Accordingly, the ASAC adopted the following definitions of "specialist" and "executive" based on the Haines Board report:

1. "SPECIALIST" LEVEL
   - Application
     - Uses OR/SA techniques most of the time; has the ability to initiate and conduct independent OR/SA studies. Major duties of the position can be performed only by an individual who has had the training indicated. May be a supervisor of OR/SA analysts, but has constant need to apply the techniques himself.
   - Training
     - Graduate degree in OR/SA or related field; or extensive on-the-job training and experience in OR/SA.
2. "EXECUTIVE" LEVEL
   - Application
     - Needs a practical working skill in OR/SA techniques for the direct supervision of OR/SA "specialist" personnel, and the evaluation of professional work in this field.
   - Training
     - Short course (4–6 weeks duration), or equivalent on-the-job training and experience, in OR/SA techniques. (Subsequently, successful participation in a progressive OR/SA elective program, as part of the Army school curricula, should provide this level of training).[70]

CSM 66–288 also required the ASAC to "prepare a plan, on a time phased basis, for the orderly development

of OR/SA personnel assets over an extended period."[71] Accordingly, the ASAC adopted the following three-phased scheme for discussing requirements, assets, and allocations of Army ORSA personnel and their training and education:

> (1) Phase I is the period from the summer of 1966 to the summer of 1968; it is characterized primarily by a scarcity of OR/SA resources.
> (2) Phase II, the two years from the summer of 1968 to the summer of 1970, is the period of rapid build-up.
> (3) Phase III commences with the summer of 1970, by which time the target requirements for OR/SA personnel will have been reached.[72]

The ASAC also considered the important question of whether the expansion of the Army's ORSA capability should take the form of an increase in contractual arrangements or an expansion of the Army's in-house capabilities. As the Army leadership had already determined, the ASAC concluded that the preferable course of action was to augment the Army's in-house ORSA capability rather than increasing its contractual ORSA effort.[73] The expansion of in-house capability, it was believed, would enable the Army:

> (a) To achieve a better balance between in-house and contract OR/SA.
> (b) To improve the responsiveness, flexibility and depth of the Army's OR/SA capability.
> (c) To improve the Army's capability to assess technical data and to evaluate and use OR/SA products.
> (d) To comply with the intent of Congress to improve in-house study capabilities and limit expenditures for contract studies.[74]

The committee noted, however, that "[w]hile fostering the orderly, in-house growth of OR/SA resources, the Army continues to rely upon contract agencies for the support of OR/SA requirements that are beyond the in-house capabilities."[75]

In most respects, the ASAC study met the goals established in the April 1964 DA letter and reinforced the conclusions and recommendations made by the Bonesteel study and the Haines Board with respect to the training and education of Army officers in ORSA. In the breadth and depth of its assembled data and the comprehensive details of its proposals, the ASAC study went far beyond earlier attempts to survey the field and solve the knotty problems of how to improve the Army's ORSA capabilities. In so doing, the August 1966 ASAC report became the basis for the subsequent expansion of ORSA officer education and the creation of a formal ORSA Officer Specialist Program in March 1967.

Army ORSA Personnel Requirements

Based on detailed data provided by DOD and Army agencies, the ASAC determined the Army's in-house requirements for ORSA personnel, both military and civilian, in the two previously defined categories of "specialist" and "executive" for each of the three proposed phases of the buildup period (1966–1970). The results were summarized in Annex C (Requirements for OR/SA Personnel), Table C–1 (Consolidated OR/SA Personnel Requirements), of the ASAC *Main Report*.[76] The data from Table C–1 is summarized here in Table 4–1.

The rough distribution of the total Phase III requirements to the Army Staff, OSD and other DOD agencies, the Joint Staff, Combat Developments Command, Army Materiel Command, and other Army major commands and agencies is shown in Table 4–2. The percentage of the total requirement represented by each command/agency is shown in Table 4–3.

Thus, Army Staff requirements represented the bulk of all Phase III in-house requirements identified by the ASAC. The Combat Developments Command and Army Materiel Command also had significant requirements, while OSD/DOD agencies, the Joint Staff, and other Army major commands and agencies accounted for smaller portions. It should be noted that only in the specialist category for CDC and AMC did civilian requirements outnumber the requirements for military personnel.

Army ORSA Personnel Assets

Having determined the time-phased requirements for trained ORSA personnel, the ASAC then proceeded to determine the trained ORSA assets available in each of the proposed three phases.[77] The identification of ORSA personnel assets, both military and civilian, was complicated by the lack of a firm definition of what degree of formal education, on-the-job training (OJT), or practical experience (or combinations thereof) were

TABLE 4–1—CONSOLIDATED ARMY ORSA PERSONNEL REQUIREMENTS

		Phase I (Present to Summer 1966)				*Phase II (Summer 1966–Summer 1970)*				*Phase III (Summer 1970 onward)*				*Phase III Totals*	
		Specialist		Executive		Specialist		Executive		Specialist		Executive			
Line	Agency/Class II Installation	Mil	Civ	Mil	Civ	Mil	Civ	Mil	Civ	Mil	Civ	Mil	Civ	Spec	Exec
1	OCSA	18	15	27	1	23	15	27	6	23	15	30	6	28	36
2	USAIDSCOM	0	1	5	1	0	1	13	9	0	1	13	9	1	22
3	DCSPER	2	2	0	0	3	3	4	0	3	6	4	0	19	4
4	DCSLOG	0	2	0	1	4	8	4	1	9	12	7	2	21	9
5	LD&S Agency	1	1	1	1	5	15	2	2	12	37	5	3	49	8
6	DCSOPS	2	6	5	0	5	6	9	0	9	6	13	0	15	13
7	STAG	6	25	3	0	6	30	3	0	6	35	3	0	41	3
8	COA	2	2	4	2	4	5	8	6	4	5	8	6	9	14
9	Ch of R&D	7	2	12	3	9	3	30	7	11	3	39	9	14	48
10	OR Advisory Group	0	0	1	0	0	0	2	0	0	0	3	0	0	3
11	Ch of Reserve Component	0	0	1	0	0	0	1	0	0	0	1	0	0	1
12	ACSI	3	1	3	1	9	1	5	5	9	1	5	5	10	10
13	Special Res Det	0	0	1	0	0	0	1	0	0	0	1	0	0	1
14	IT&F Group	2	6	4	0	2	6	11	3	2	6	11	3	8	14
15	ACSFOR	3	0	4	1	6	0	7	1	10	0	9	1	10	10
16	Ch, OPO	3	0	12	2	3	1	20	3	3	1	21	3	4	24
17	Enlisted Eval Ctr	0	9	0	4	0	9	0	4	0	9	0	4	9	4
18	RC Personnel Center	0	0	0	0	0	0	2	1	0	0	2	1	0	3
19	Surgeon General[a]	1	1	2	0	2	1	3	0	7	1	8	0	8	8
20	PM General	1	0	0	0	1	0	0	0	1	0	0	0	1	0
21	Ch of Chaplains	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	Adjutant General	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 4–1—Consolidated Army ORSA Personnel Requirements—Continued

Line	Agency/Class II Installation	Phase I (Present to Summer 1966)				Phase II (Summer 1966–Summer 1970)				Phase III (Summer 1970 onward)				Phase III Totals	
		Specialist		Executive		Specialist		Executive		Specialist		Executive			
		Mil	Civ	Mil	Civ	Mil	Civ	Mil	Civ	Mil	Civ	Mil	Civ	Spec	Exec
23	Data Support Command	2	0	0	0	2	0	0	0	2	0	0	0	2	0
24	Admin Center	0	0	3	0	0	0	3	0	0	0	3	0	0	3
25	Ch of Finance	0	1	1	0	0	1	1	0	0	1	1	0	1	1
26	USAAA	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	Ch, Military History	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	Ch, Comm-Electron.	1	1	1	1	3	2	2	2	3	3	4	2	6	6
29	Ch, NG Bureau	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	Ch, Army Reserve	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	Ch, Engineers	0	3	5	1	1	5	10	7	1	5	10	7	6	17
32	ESSG	0	3	0	0	5	3	0	0	5	3	0	0	8	0
33	Army Map Svc	0	1	1	0	0	3	2	0	0	3	2	0	3	2
34	GIMRADA	0	1	1	0	0	3	2	0	0	3	2	0	3	2
35	CSS	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	Judge Advocate General	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37	Inspector General	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38	Chief of Information	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	**ARMY STAFF SUBTOTAL**	**54**	**83**	**97**	**19**	**93**	**121**	**172**	**57**	**120**	**156**	**205**	**61**	**276**	**266**
40	CDC	63	125	88	0	63	125	88	0	63	125	88	0	188	88
41	ILCS	9	6	0	0	9	13	0	0	12	13	0	0	25	0
42	AMC	10	80	93	0	10	80	93	0	10	80	93	0	90	93
43	AMSAC	0	24	0	0	0	68	0	0	0	68	0	0	68	0

Table 4–1—Consolidated Army ORSA Personnel Requirements —Continued

Line	Agency/Class II Installation	Phase I (Present to Summer 1966)				Phase II (Summer 1966–Summer 1970)				Phase III (Summer 1970 onward)				Phase III Totals	
		Specialist		Executive		Specialist		Executive		Specialist		Executive			
		Mil	Civ	Mil	Civ	Mil	Civ	Mil	Civ	Mil	Civ	Mil	Civ	Spec	Exec
44	AMCL	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45	JCS	14	0	0	0	14	0	0	0	14	0	0	0	14	0
46	OSD[b]	39	0	0	0	39	0	0	0	39	0	0	0	39	0
47	DASA	1	0	1	0	1	0	1	0	1	0	1	0	1	1
48	DIA	10	0	0	0	10	0	0	0	10	0	0	0	10	0
49	DSA	2	0	0	0	2	0	0	0	2	0	0	0	2	0
50	MTMTS	0	0	2	0	0	0	2	0	0	0	2	0	0	2
51	AWC	1	0	0	0	1	0	0	0	1	0	0	0	1	0
52	ARADCOM	1	0	3	0	1	0	3	0	1	0	3	0	1	3
53	USASTRACOM	0	15	5	0	0	15	5	0	0	15	5	0	15	5
54	USMA	3	0	0	0	3	0	0	0	3	0	0	0	3	0
55	USARAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0
56	USAREUR	0	0	0	0	0	0	0	0	0	0	0	0	0	0
57	USARPAC	1	0	0	0	1	0	0	0	1	0	0	0	1	0
58	USARSO	0	0	0	0	0	0	0	0	0	0	0	0	0	0
59	CONARC	40	13	92	20	40	13	92	20	40	13	92	20	53	112
60	OSA Cost Analysis[c]	0	0	0	0	0	0	0	0	14	104	0	0	118	0
61	**TOTALS**	**248**	**346**	**381**	**39**	**287**	**435**	**456**	**77**	**331**	**574**	**489**	**81**	**905**	**570**

Source: ASAC *Main Report,* an. C (OR/SA Personnel Requirements), Table C–1 (Consolidated OR/SA Personnel Requirements). Mathematical errors in Table C–1 have been corrected. For the expansion of certain acronyms, see Selected Acronyms.

[a]Line 19: Phase III data include four military "specialists" and four military "executives" for staff of Medical Field Service School.

[b]Line 46: OSD requirements include ten Army lieutenants in OASD (SA) with advanced degrees in ORSA or related fields requested by name to fill junior systems analyst positions.

[c]Line 60: Integration of cost analysts with ORSA personnel requires further clarification (see *ASAC Main Report,* app. 34 [Cost Analysts]).

TABLE 4–2—DISTRIBUTION OF PHASE III ORSA PERSONNEL REQUIREMENTS BY COMMAND/AGENCY

	Specialist		*Executive*	
Command/Agency	***Military***	***Civilian***	***Military***	***Civilian***
Army Staff	120	156	205	61
OSD/DOD Agencies	52	0	3	0
Joint Staff	14	0	0	0
CDC	75	138	88	0
AMC	10	148	93	0
Other Army MACOMs/Agencies	46	28	100	20
Cost Analysts	14	104	0	0
TOTAL	331	574	489	81

Source: Based on ASAC *Main Report*, an. C, Table C–1, with mathematical errors corrected.

required to produce a qualified ORSA specialist or executive. To simplify their task, the ASAC members agreed to include as qualified ORSA specialists officers who possessed any one of the following qualifications:

1. An advanced degree in either operations research or systems analysis or in a clearly related specialty.
2. One year or more of experience or on-the-job training in ORSA, such as that offered by RAC and SRI.
3. A combination of advanced degree and experience in ORSA work.

The ASAC members also determined that they would count as a qualified ORSA executive any individual who met one of the following criteria:

1. Qualified to be a "specialist."
2. Attended the four-week defense management systems course conducted at the Naval Postgraduate School.
3. Attended the proposed special Army ORSA executive course of four to six weeks' duration.
4. Successfully served in a position requiring specific application of ORSA in supervising "specialists" and in evaluating professional ORSA work.
5. Successfully completed the Army Command and General Staff College progressive elective ORSA program.

The process for identifying qualified civilian ORSA specialists and executives was even more complicated. For working purposes, the ASAC defined as a qualified civilian ORSA specialist asset any Department of the Army civilian (DAC) who held the civil service classification code GS–015–0 or was qualified to be a GS–015–0 but was then carried in some other career field.[78] A DAC ORSA executive was identified using the same criteria used to identify military ORSA executives.

Having settled on workable criteria, the ASAC found that they could identify only 129 qualified military and 159 qualified civilian ORSA specialists. Of 118 officers then in the informal ORSA officer specialist program, 100 appeared to be qualified as specialist per the ASAC definition.[79] Another twenty-one officers held ORSA degrees, and eight other officers, not included in the 121 just mentioned, were identified as having had on-the-job training with RAC.[80] When the ten lieutenants serving as junior analysts in OSD were subtracted, a total of 129 qualified ORSA officer specialists remained.[81] In addition, 101 officers were then in training and were expected to complete that training between September 1966 and September 1968.[82]

Some of the 159 Department of the Army civilian employees identified as ORSA specialists may have in

Table 4–3—Command/Agency Requirements as a Percentage of Total Requirements

	Specialist		*Executive*	
Command/Agency	*Military Percentage*	*Civilian Percentage*	*Military Percentage*	*Civilian Percentage*
Army Staff	36	27	42	75
OSD/DOD Agencies	16	0	1	0
Joint Staff	4	0	0	0
CDC	23	24	18	0
AMC	3	26	19	0
Other Army MACOMs/Agencies	14	5	20	25
Cost Analysts	4	18	0	0
TOTAL	100	100	100	100

Source: Based on *ASAC Main Report*, an. C, Table C–1, with mathematical errors corrected.

fact been "executives," and the ASAC noted that "there are most likely many individuals with other Civil Service Classification Codes who are qualified to do OR/SA work."[83] At the time of the ASAC study, there were also seven Department of the Army civilians in the Institute of Defense Analyses/University of Maryland systems analysis course.[84]

Identified ORSA requirements represented required positions, not individuals, and thus the number of ORSA requirements did not correspond to the number of trained ORSA personnel actually required on a 1:1 basis. It was assumed that a trained military ORSA officer would be available for assignment to an ORSA position a little more than half the time. Thus, with a small safety margin, personnel managers in 1966 commonly used a ratio of 2.5 trained military assets for every identified requirement. Greater stability allowed the use of a 1:1 ratio for trained civilian ORSA personnel. Thus, 828 qualified military ORSA executives would have been needed to man the 331 Phase III military specialist positions (requirements) identified by the ASAC in August 1966. At the time, the Army was able to identify just 129 qualified military ORSA specialists. Inasmuch as the Army could not clearly identify the number of officers on hand qualified as ORSA executives, the situation with respect to executives was even more desperate: 1,223 qualified officers would have been needed to man the 489 identified ORSA military executive positions, but the number available was zero. In the case of civilian ORSA specialists, the 574-person Phase III requirement could be met by 574 civilian ORSA specialists, but as of August 1966 the identified assets included only 159, a shortfall of 415. As was the case with military ORSA executives, no civilian ORSA executive assets were identified by the ASAC.

To overcome potential shortages, the ASAC recommended:

> (1) A program to insure the maximum utilization of current assets. This requires an Army-wide identification of personnel and monitoring of assignments.
> (2) An active, long-range program to attract qualified personnel to OR/SA specialization.
> (3) A long-range education and training program to develop personnel as qualified assets.[85]

In short, the ASAC recommended the establishment of a formal ORSA specialty program to recruit, develop, and manage Army ORSA personnel.

The Allocation of ORSA Assets

The ASAC recognized that until Phase III was reached and sufficient ORSA assets had been developed to meet the established requirements it would be necessary to allocate the available assets in such a way that the effect of shortages was minimized. Accordingly, the ASAC stated priorities for the assignment of ORSA specialists and laid out a plan of recommended

allocations on an annual basis.[86] The committee did not attempt to allocate ORSA executive personnel, assuming that requirements for ORSA executives would be met by OJT and short-term skill courses. For military ORSA specialists, the ASAC proposed an allocation plan that recognized:

(a) Army commitments to OSD, the Joint Staff, and the Defense agencies;
(b) an immediate need to provide an OR/SA study management capability to the Army General Staff;
(c) a requirement to form a base for OR/SA capability development within the two proposed, centralized OR/SA agencies (AMC and CDC), the field agencies of CDC, the subordinate commands of AMC, and the study-doing Class II installations; and
(d) a need to initiate and expand OR/SA training within the Army school system.[87]

For civilian ORSA specialists, the ASAC recognized the constraints imposed by civil service reassignment procedures and the limited funds and spaces available for graduate-level civilian schooling. The allocation of civilian specialists was thus identical to the estimated requirements submitted by each command and agency, but the ASAC provided a priority scheme for use "where competition for available resources and a means for central control of assignment, allocation, and transfer of civilian personnel exist":

(a) Staffing the CDC and AMC subordinate command elements charged with conducting special studies and OR/SA.
(b) Providing study management capability within the Army General Staff.
(c) Increasing the depth of OR/SA capability within the Class II study/research agencies.
(d) Meeting the initial staffing requirements of the two proposed OR/SA agencies of AMC and CDC.
(e) Providing OR/SA training capability in CONARC schools and satisfying the remainder of Army OR/SA needs.[88]

Army ORSA Education Programs

Once the time-phased ORSA requirements, current ORSA assets, and proposed allocations were determined, the ASAC was able to propose a time-phased plan for training and education of Army officers and DA civilian personnel as ORSA specialists and executives to meet the requirements foreseen for 1970 and after (Phase III).[89] In general, the plan laid out in Annex F called for a substantial increase in the number of Army officers sent for graduate-level ORSA education at civilian colleges and universities and maximum use of existing degree-granting programs at the Naval Postgraduate School (NPGS) and in the Defense Systems Analysis Program, the RAC/SRI OJT programs, and short courses and independent self-study. The plan also called for a maximum effort to identify those DA civilians qualified as ORSA specialists, to recruit additional qualified individuals as necessary, and to offer special incentives as necessary to attract additional civilian ORSA specialists. The ASAC concluded that the ORSA executive-level training requirement for both military and civilian personnel could be met by in-house, interagency, or contract training courses designed to convey the necessary information.

To meet the Army's Phase III requirements for trained ORSA specialists and executives, the ASAC proposed to "educate, train or hire":

a. Sufficient officer "specialists" by 1970 to fill 375 "specialist" positions.
b. Sufficient DA civilian "specialists" by 1970 to fill 600 "specialist" positions.
c. 1470 military and civilian "executive" level personnel by 1970 with as early an output as possible.[90]

This would require, beginning in 1967, the expansion of "the Army's postgraduate level schooling program for OR/SA and, depending upon the evaluation of the present pilot effort, continuation of the OJT program with RAC/SRI."[91] Such an expansion would require in turn that 100 more officers would have to begin ORSA graduate schooling in 1967 than began in 1966, with probable impact on other Army officer graduate training programs. The preferred ASAC plan (Plan A) called for the production of new military specialists as follows: 50 in 1967, 60 in 1968, 160 in 1969, 155 in 1970, 125 in 1971, and 125 in 1972.[92] Thereafter, the Army would have to replace approximately one-third of the in-place military ORSA specialists each year, assuming a "non-reutilization" policy was in place.

The plan for meeting the requirement for civilian ORSA specialists by 1970 was broken down into five steps:

1. Survey, and if necessary, examine and interview, present professional level DA civilians to determine those who are qualified for ORSA work.
2. Determine those DA civilians, identified in Step 1, who will accept transfer to fill positions for ORSA specialists.
3. Place an identifier in the records of those DA civilians identified as assets (Step 2) by assignment of Classification Series 015 or occupational experience code 300.
4. Initiate an active recruitment program to obtain the additional qualified ORSA personnel.
5. If the preceding actions do not result in sufficient assets to meet requirements, develop and place in effect special incentives, such as expanded DA civilian ORSA education and intern programs to increase in-house assets.[93]

With respect to ORSA executives, the ASAC plan was to develop them over the period 1966–1970 "through the use of the Defense Management System Course at NPGS and a proposed special OR/SA course of four to six weeks to be established in the Washington area."[94] The cumulative planned output of the two courses would be: 105 in 1967, 560 in 1968, 1,015 in 1969, and 1,470 in 1970. The author of the ASAC report also stated:

> In addition to the assets gained from these two short courses, it can be expected that a few "specialists" will move into "executive" positions, a few personnel will develop "executive" level skills through a mixture of OJT experience and self-study, and, in a few years, it is anticipated that the OR/SA curriculum introduced into service schools will start producing military "executives."[95]

Opportunities for the Training of ORSA Specialists

The Army had available a number of ORSA education and training facilities to which Army officers and DA civilian personnel could be sent.[96] For the training of specialists, several civilian universities offered graduate-degree programs in OR (business or engineering oriented), systems analysis, or closely related fields. Degrees in ORSA were also granted by the operations analysis program at the Naval Postgraduate School and the Defense Systems Analysis Program operated by the Institute for Defense Analyses and the University of Maryland. Non-degree-granting, but nevertheless comprehensive, on-the-job training programs were available at RAC and SRI, and the Combat Operations Research Group at Headquarters, CDC, also conducted some ORSA training for CDC officers at Fort Belvoir in the late 1960s.

University Graduate Programs in ORSA

By 1966, a number of American colleges and universities offered advanced-degree programs in ORSA. The various programs differed in content and focus, but most of them covered most of the key OR-related subjects.[97] As of academic year 1965–1966, a total of forty-nine Army officers were undergoing graduate education in ORSA at eleven universities.[98] The schools attended and the number of Army officer students in ORSA programs at each included University of Alabama (one), University of Arizona (two), Arizona State University (four), Georgia Institute of Technology (six), University of Indiana (one), Ohio State University (four), University of Pennsylvania (three), Purdue University (one), Stanford University (six), Tulane University (twenty), and University of Wisconsin (one). Of the forty-nine officers enrolled, twenty-four were in OR (business) programs, twenty-four were in OR (engineering) programs, and one was in a systems analysis program. Only one officer was enrolled in a doctoral program (at Ohio State).

The ORSA Program at the Naval Postgraduate School

By 1966, the Naval Postgraduate School operations analysis program was well into its second decade. It had begun at the direction of the chief of naval operations in September 1950, and the first class of nine naval officers graduated from the six-term program in January 1953.[99] In July 1953, the master's degree–granting course was lengthened to eight terms, and in 1961, a Department of Operations Research was created with Dr. Tom Oberbeck from the mathematics department

as the first chairman.[100] After 1961, economists were added to the faculty, systems analysis was added to the course curriculum, and, in 1967, the program title was changed from "Operations Analysis" to "Operational Research/Systems Analysis."[101] In the mid-1960s, the NPGS ORSA program was opened to Army officers as well as those from the other services and foreign armies, and it soon became the primary source for the education of Army ORSA officer specialists.[102] In academic year 1965–1966, twenty-three Army officers were enrolled in degree programs at the Naval Postgraduate School.[103]

As of 1966, the Naval Postgraduate School offered both a bachelor of science degree with a major in OR and a master of science degree in OR.[104] One of the two sequences of the master's degree program was designed specifically to meet the needs of Army and Marine Corps officers. Unlike the curricula of ORSA programs at civilian universities, that of the NPGS was oriented toward military applications of ORSA.[105] The stated objective of the program was "to provide selected officers with a sound education in quantitative methods and to develop their analytical ability in order that they may (1) formulate new concepts and apply the results of ORSA with greater effectiveness, and (2) define and solve military problems more effectively."[106] The program also involved a six-week practical work experience. Army officers enrolled in the program spent their six-week work tour working on ORSA problems at a variety of locations, including the Army's Combat Developments and Experimentation Command at Fort Ord, California, Combat Developments Command headquarters, and the Pentagon.[107]

The Defense Systems Analysis Program

The Defense Systems Analysis Program was established by Charles J. Hitch, the DOD comptroller, in 1964.[108] Given responsibility for establishing and managing the course, the Navy contracted with the Institute of Defense Analyses in Arlington, Virginia, to run the course in cooperation with the University of Maryland. Graduates of the one-year course were awarded a master of science degree in economics from the University of Maryland. The objective of the course, the curriculum of which was outlined by Assistant Secretary of Defense (Systems Analysis) Dr. Enthoven, was "to train military and civilian personnel in the techniques of planning, programming, and financial management for ultimate assignment to agencies concerned with systems analysis and force level planning."[109] In the first year, thirty students attended the course, nine of whom were Army officers.[110] In 1966, twenty-two Army officers were enrolled in the Defense Systems Analysis Program.[111]

The RAC/SRI On-the-Job Training Pilot Program

For some years before 1966, the Research Analysis Corporation (RAC) (and its predecessor, ORO, before it) had offered the opportunity for selected officers to undergo OJT in ORSA in the RAC offices. As of August 1965, there were seventeen alumni of that program, ten of whom were still on active duty.[112] The Army had also initiated a pilot program that encompassed a one-year OJT program with either RAC or SRI.[113] The program combined lectures, tutorial conferences, seminars, panels, and study assignments with practical training during assignments on the RAC or SRI staff.[114] Although no advanced degree was offered, the ASAC considered the RAC/SRI OJT program "to produce as usable an asset as degree courses at educational institutions."[115] In 1966, there were four Army officers undergoing OJT with RAC and another three with SRI.[116]

Training of ORSA Executives

In 1966, opportunities for the training of ORSA executives, both military and civilian, were more limited. The new defense management systems course at the Naval Postgraduate School was one possibility, and short courses for ORSA "orientation" or "appreciation" were offered by the Army Management Engineering Training Agency, the United States Civil Service Commission, and several other agencies. The ASAC also recommended that the Army develop its own ORSA executive training course, emphasize off-duty independent study, and improve ORSA instruction in the Army service schools and colleges

so as to provide military officers with an adequate knowledge of ORSA.

The Defense Management Systems Course

A defense management systems course was established at the Naval Postgraduate School by DOD directive in 1965 to

> provide an appreciation of the concepts, principles, and methods of defense management as they concern planning, programming, budgeting, and related activities. The course will cover force planning, the DOD Programming System, program budgeting and their interrelationships with resource management systems. Emphasis will be placed on the analytical aspects of management, including requirements studies, systems analysis/cost effectiveness, cost estimating and analysis.[117]

The four-week course, conducted by the Naval Postgraduate School in accordance with guidance provided by the assistant secretary of defense (comptroller), was designed to orient rather than to produce experts and consisted of 149 hours of instruction, including eight hours on systems analysis, twenty-one hours on cost estimating and analysis, and twenty-five hours on quantitative tools for decision making.[118] Students in the course were generally military personnel in the grade of lieutenant colonel/commander and above and civilian personnel in the grade of GS–13 and above.[119]

Army Management Engineering Training Agency Courses

The Army Management Engineering Training Agency (AMETA) at Rock Island, Illinois, offered six courses in various aspects of ORSA ranging from one to six weeks in duration.[120] A one-week "operations research appreciation" course covered the potentials and limitations of OR, the capabilities required of analysts and managers, and some OR techniques such as queuing theory, inventory theory, simulations, and game theory.[121] AMETA also offered a three-week course titled "Probabilistic Methods in Operations Research," the purpose of which was to provide an introduction to the theory of probability and random variables with emphasis on mathematical models with important applications in military OR studies. Aimed at engineers, scientists, and OR analysts, the course provided excellent coverage of sixteen key OR topics, although not in as great a depth as the program at an OR degree–granting institution. The ASAC concluded that the one-week AMETA course did not qualify an attendee as an ORSA executive, but the three-week course appeared "to provide an excellent base around which a four- to six-week course could be designed specifically for 'executives.'"[122]

The Proposed Army ORSA Executive Course

The ASAC proposed that the Army should develop and offer a special course that would provide the necessary instruction to produce a qualified ORSA executive.[123] The proposed course of four to six weeks' duration to be held in the Washington area was to include background, history, essence, and uses of ORSA; an orientation on basic ORSA mathematics; an introduction to ORSA techniques (such as linear, nonlinear, stochastic, and dynamic programming; queuing theory; production and inventory theory; statistics applications; simulations, models, and gaming; probability theory; and decision theory); the fundamentals of cost-effectiveness studies; case studies in OR using actual completed OR studies; and liberal use of practical exercises.[124]

Other Short-term ORSA Training Opportunities

The United States Civil Service Commission offered a one-week "Operations Research Orientation" course comparable to the one-week course offered by AMETA.[125] The Civil Service Commission also offered a three-day seminar and a two-day executive seminar on ORSA. None of the Civil Service Commission courses/seminars were considered by the ASAC to be sufficient to qualify an attendee as an ORSA executive. In 1964, Secretary of Defense McNamara directed the Air Force to establish two new cost and economic analysis courses at the Air Force Institute of Technology in Dayton, Ohio.[126] The planned five-year input for the basic and advanced courses, both of eight weeks' duration, were 1,420 and 819 students, respectively, of whom 480 (basic) and 175 (advanced) were to be Army personnel. In FY 1966, the assistant secretary of defense (comptroller) directed the Army to establish a Joint Executive Development Seminar Program to train selected DOD students at the grade of major/GS–12 equivalent and above in planning, programming, and

budgeting. The four-week program began in FY 1966 at the Army Management School at Fort Belvoir, Virginia, with about fifty students per session.[127] The ASAC also anticipated that the expertise necessary for a qualified ORSA executive might be developed through independent off-duty study and that improvements in the ORSA instruction offered at the Army's service schools and colleges might in time produce officers with ORSA skills sufficient to qualify them as ORSA executives.

Army ORSA Education and Training Costs

The ASAC also attempted to estimate the costs of implementing the proposed ORSA education and training program as well as the overall costs of existing and proposed Army ORSA activities.[128] However, cost data were not available at all for many Army ORSA activities, and the data that were available varied widely as to completeness and reliability. The ASAC estimated that in FY 1966, the Army spent a total of about $27.7 million on ORSA activities—about $6.8 million on in-house activities and about $20.9 million on contract ORSA work. The committee also noted that over the previous four years (1962–1965), the Army's in-house costs had risen at a rate of about $1 million per year and that the proposed gradual expansion of the Army's in-house ORSA capabilities would increase that rate to $4 million annually.

In attempting to estimate the cost of existing and proposed ORSA training and education programs, the ASAC found that Army training costs (excluding temporary duty [TDY] and permanent change of station [PCS] costs, pay and allowances, and travel costs to and from school) were approximately $2,400 per student at a civilian university, $2,700 per student at the Naval Postgraduate School, $4,000 in travel and per diem for officers in the RAC OJT program, $6,000 in travel and per diem for officers in the SRI OJT program, and $14.25 per semester hour (maximum) for those individuals in OJT and self-study programs.[129] Total individual costs thus amounted to about $20,000 for educating a military ORSA specialist (including about $2,400 in graduate school costs and $17,500 in military pay and allowances for the student for twenty months); $2,500 for training a military or civilian executive (including around $570 in course costs and $1,900 in pay, allowances, and per diem); and $17,000 per year in direct salary and benefits for a trained DA civilian ORSA specialist (at the average pay rate for a GS–14).[130] The ASAC estimate of costs for the education of officer ORSA specialists in the period FY 1967–FY 1971, in accordance with the planned increases recommended by the ASAC, are shown in Table 4–4.

The ASAC explained that the 88 percent increase in OMA costs in FY 1968 over FY 1967 with only a modest 20 percent increase in the number of officers trained was due in part to the fact that in FY 1967 there were twenty-two officers enrolled in the Defense Systems Analysis Program run by the Institute of Defense Analyses/University of Maryland and funded by the Navy. The only cost for Army students enrolled in the course was approximately $100 for books. Of the remaining twenty-eight officers undergoing training in ORSA in FY 1967, twenty-one were attending civilian universities or the Naval Postgraduate School at an average cost of around $2,500, and seven were in the RAC/SRI OJT programs with costs of around $1,400. In FY 1968, on the other hand, only thirteen officers were to be enrolled in the Defense Systems Analysis Program, while forty-seven would be enrolled in the higher-cost university, NPGS, and OJT programs.

Regarding the costs of ORSA executive training, the ASAC found that no cost data were available for the defense management systems course at NPGS but noted that Army costs were limited to TDY and per diem costs for the 105 persons scheduled to attend each year. The ASAC also estimated that the minimum direct operating cost for the proposed six-week Army ORSA executive course, if established in the Washington area, would be approximately $100,000 per year for 350 students with another $100,000 required for personnel costs (travel and per diem).

Overall program costs were estimated to be $200,000 per year for the proposed ORSA executive training program ($100,000 in course costs and $100,000 in student per diem payments); $160,000 in OMA and MPA funds to cover the increase of the proposed FY 1968 officer education program over the FY 1967 program; and $1,290,000 for the increase in the proposed FY 1969 officer ORSA education program over the proposed FY 1968 program. The ASAC estimated that the proposed net increase of

Table 4–4—Costs for Educating Officer ORSA Specialists, FY 1967–FY 1971

Fiscal Year	*Student Output*	*Education (OMA) Costs*	*Personnel (MPA) Costs*	*Total Costs*
1967	50	$ 64,000	$ 525,000	$ 589,000
1968	60	120,000	630,000	750,000
1969	160	360,000	1,680,000	2,040,000
1970	155	348,000	1,620,000	1,968,000
1971	125	275,000	1,310,000	1,585,000

Source: The Operations and Maintenance, Army (OMA) appropriation covered the actual costs of tuition. The Military Pay and Allowances (MPA) appropriation covered pay, allowances, and travel costs associated with attending civilian schooling. Estimates are based on Plan A, the preferred plan. Plan B called for an annual input of 125 officers at an annual cost of $275,000 over the period FY 1969–FY 1970.

263 military and civilian ORSA spaces would cost approximately $4 million, exclusive of possible costs for overhead, facilities modifications, computer usage, office furniture, personnel transfers, and general administration and support.

Management of Army ORSA Personnel

The ASAC investigated in some depth the existing management of both military and civilian ORSA personnel and proposed a number of changes and improvements. The committee found that an informal ORSA officer specialist program had been established in March 1964, and that the April 1964 DA letter, the May 1964 Bonesteel report, and the February 1966 Haines Board had all recommended the establishment of a formal program for the recruitment, development, and career management of Army officers qualified as ORSA specialists or executives. That goal was finally reached with the publication of *AR 614–139* in March 1967, which created the operations research/systems analysis officer program. Thereafter, the Army had a systematic program for the management of Army officer ORSA assets, and as time went on the program continued to be refined. Opportunities for ORSA education and training were also expanded, and in the late 1960s positive steps were also taken to improve Army management of its civilian ORSA assets. By 1973, both the military and civilian programs were functioning well and provided the Army with a substantially improved means of managing its in-house ORSA personnel.

The Informal ORSA Officer Specialist Program, 1964–1966

In recognition of the growing importance of advanced analytical techniques to the Army, an informal ORSA officer specialist program was started in March 1964, reportedly at the behest of Assistant Secretary of Defense (Systems Analysis) Dr. Enthoven, to identify officers with the requisite skills and to coordinate their assignments to positions requiring those skills.[131] Curiously, officers were apparently enrolled in the informal program without their knowledge.[132] Based on nominations by the various officer career branches, the Office of Personnel Operations simply prepared a list of those officers who met the established requirements, and they were subsequently managed as ORSA specialists. By November 1965, there were 109 officers enrolled in the informal ORSA officer specialist program, of whom sixty were colonels or lieutenant colonels, thirty-nine were majors, and ten were captains.[133] As of 1 December 1965, some 175 positions in OSD, the JCS, the Army Staff, and the Army Combat Developments Command had been identified as requiring a trained

ORSA officer, but only 116 positions had been validated by the AERB.[134]

In response to the inquiry of the ASAC study group in 1966, OPO identified 129 officers with advanced education or on-the job training in ORSA, of whom 118 were enrolled in the informal ORSA officer specialist program.[135] At the same time, the Civil Schools Branch reported that the number of officers with specific ORSA formal schooling totaled twenty-six, of whom seven were already in recognized specialist programs (four in the R&D specialist program and one each in the logistics and the procurement specialist programs).[136] Five of the twenty-six (including the four in the R&D specialist program) were already in the informal ORSA specialist program. In August 1966, there were also 101 officers in training as ORSA specialists, and they were expected to complete their training between September 1966 and September 1968, bringing the Army's total identified ORSA assets to 230 officers, disregarding any losses.

As of August 1966, the selection criteria for the informal program prescribed that officers eligible for inclusion should be in the grade of captain through lieutenant colonel without regard to branch; have general military experience commensurate with their grade with emphasis on operations and command; have a high intellectual capacity, an inquiring analytical mind, and a high performance capacity; have a well above average military record; and possess an advanced degree (master's or Ph.D.) in mathematics, mathematical statistics, operations research, decision theory, systems analysis, systems engineering, ADPS engineering, other engineering and physical sciences, industrial management, economics, econometrics, economic analysis, or business administration with a strong mathematics content.[137]

Creation of the Formal Army ORSA Officer Specialist Program

In February 1966, the Haines Board recommended that the informal ORSA officer specialist program be formalized under the direction of the DCSPER in coordination with the ACSFOR and that the annual input into graduate schooling in ORSA be increased from thirty-five to sixty captains and majors per year.[138] The recommendation of the Haines Board to establish a formal ORSA Officer Specialist Program was approved by Army Chief of Staff General Harold K. Johnson on 15 June 1966.[139] Following the submission of the ASAC study in August 1966, its recommendations were also approved, and the Army operations research/systems analysis officer program was officially established by the publication of *Army Regulation No. 614–139* on 6 March 1967.[140] At that time, formal and informal officer special career programs already existed in the following fields: army aviation, atomic energy, automatic data processing, information, intelligence, logistics, procurement, and research and development.

The rough edges of the initial regulation were soon smoothed out, and *AR 614–139* was reissued in July 1968.[141] As stated in *AR 614–139*, the purpose of the program was to "identify and develop commissioned officers of proven ability and high intellectual capacity for assignment to important positions within the Department of the Army and Department of Defense."[142] The regulation defined "operations research/systems analysis" as well as "ORSA specialist" ("a highly trained and skilled individual who has the ability to conduct detailed OR/SA studies") and an "ORSA executive" ("an individual who has a practical working knowledge of OR/SA techniques and has the ability to evaluate OR/SA studies").[143] Responsibility for promulgating policies governing the program was assigned to the DCSPER, and the ACSFOR was charged to provide "technical guidance and assistance in the operation of the program."[144] The chief of personnel operations was tasked to operate the program "within the broad guidance of the Deputy Chief of Staff for Personnel," and the director of officer personnel, OPO, was instructed to "exercise career development and assignment jurisdiction over officers participating in the program."[145] Commanders at all levels were directed to properly assign program members and to maintain the required records and reports in a timely and correct manner.

The chief of personnel operations, OPO, was to select officers for the program on a "best qualified" basis from among the applications and nominations received, and officers so selected were awarded MOS 8700 (for qualified ORSA specialists) or MOS Prefix H (for qualified ORSA executives).[146] The regulation also specified the conditions under which an officer could be released from the program as well as the process for

requisitioning qualified officers for AERB-validated ORSA positions.

AR 614–139 also spelled out the prerequisites for selection and entry into the program as either an ORSA specialist or an ORSA executive. To be eligible for the program as a specialist, an active duty officer was required to:

a. Be in a branch *other than* Chaplains, Judge Advocate General's Corps, or Army Medical Service.
b. Be serving in grade of captain through colonel.
c. Indicate a desire to participate in the program.
d. Have a varied military background commensurate with branch, grade, and length of service, with emphasis on command and operational-type experience.
e. Have the following educational background which may be waived in clearly justifiable cases:
   (1) *Military*. Military schooling appropriate to grade and length of services; this includes Command and General Staff College or equivalent for field grade officers and Advanced Course for company grade officers.
   (2) *Civil*. Master's degree in any one of the following disciplines:
   Economics, Business
   Operations Research (Business)
   Systems Engineering
   Systems Analysis
   Operations Research (Engineering)
   Mathematics, General, or possession of a master's degree in another engineering field, a physical science, or Business Administration when supported by a strong quantitative analytical background.
f. In lieu of the civil education in e (2) above, 1 year's experience in a designated OR/SA specialist position or successful completion of a formal on-the-job training program in OR/SA techniques may be considered as meeting the prerequisite.
g. Have a record of exceptional performance which reflects a high level of intellectual capacity, an inquiring and analytical mind, objectivity and industriousness, imagination and creativity, and the capability to perform under sustained pressure.
h. Have at least 3 years of active service remaining.
i. *Not* be a participant in another Army special career program, except that Army aviators will be considered for acceptance into the program on an individual case basis.[147]

To be selected as an ORSA executive, an officer was required to:

a. Meet the criteria listed in paragraphs 1–1a through d, e (1), g, and h.
b. Have the following training or experience:
   (1) Completion of an appropriate short course such as the OR/SA Executive Course at the Army Management School, or
   (2) Completion of the USACGSC progressive elective OR/SA program, or
   (3) One year's experience in a designated OR/SA executive position.[148]

The July 1968 edition of *AR 614–139* listed 413 positions for ORSA officer specialists (forty-three colonels, 249 lieutenant colonels, 100 majors, and twenty-one captains) and 493 positions for ORSA officer executives (185 colonels, 234 lieutenant colonels, fifty-seven majors, and seventeen captains), for a total of 906 positions in OSD, the JCS, DOD agencies, the Army Secretariat, the Army Staff, major Army commands, and Army schools and colleges.[149]

Change 18 to *AR 611–101*, dated 30 July 1968, established MOS Code 8700 (Operations Research/Systems Analysis [OR/SA] Officer) and prescribed the duties performed and the required qualifications for MOS 8700. In summary, the officer holding MOS 8700:

> Conducts qualitative and quantitative analyses of complex military and military-related problems and studies by application of the analytical methodology of operations research/systems analysis (OR/SA). Identifies and clarifies major factors of the problems and studies, and as an aid in decision-making, provides to the decisionmaker qualitative and quantitative bases for assessment and the derivation therefrom of the relative desirability of various alternate choices.[150]

Examples of the duty positions to which qualified MOS 8700 officers were to be assigned included operations research officer, systems analyst, staff officer, project officer, force structure analyst, and operations research analyst.

Management of Army ORSA Officers

All of the Army officer special career programs were managed by the Office of Personnel Operations, and each program was monitored by an element of the Army Staff.[151] The ACSFOR was assigned responsibility for monitoring the Atomic Energy Program and ORSA Officer Specialist Program.[152] The principles and procedures for the management of ORSA officer specialists were reasonably straightforward.[153] First, the Army's requirements for positions requiring a qualified ORSA

officer were determined. Then, personnel records were screened and qualified officers were identified. If not already a member of the ORSA officer program, officers were invited to join, and officers lacking the requisite schooling were sent to graduate school to obtain a graduate degree in ORSA.[154] The whole process was managed by the DCSPER and OPO. The relationship of the elements of the Army Staff and OPO involved in the career management of ORSA officer specialists is shown in Figure 4–1.

The ORSA Program Office was established in OPO to monitor and manage ORSA officers but did not actually participate actively in the process. After a token effort to solicit voluntary enrollment of qualified officers as ORSA executives, the ORSA Program Office participated only by keeping a list of officers in the ORSA executive category, and no attempt was made by the ORSA Program Office to maintain contact with its program members.[155]

In reality, the officer's Career Branch and the Civil Schools Branch in OPO played the key role in the ORSA officer program by handling jointly the graduate education of ORSA officers.[156] The process involved the submission by units in the field of requests for validation of given positions for graduate-level schooling to the director of OPO in accordance with *AR 621–108*.[157] The requests were directed to the Civil Schools Branch, and once a year the AERB met to judge the validity of each request. The AERB validated a certain number of positions, and a certain number of officers each year were authorized to attend graduate school in ORSA, the total number authorized being allocated among the various career branches.

Officers selected as ORSA specialists could expect to be developed through "increasingly important branch material staff and command assignments," to receive "equal consideration with their contemporaries for command assignments, attendance at service schools and colleges, and attendance at civilian educational institutions," and to serve at least one full tour of duty on the Army Staff.[158] Officers selected as ORSA executives were managed in the same way as specialists except that they did "not necessarily follow the alternating branch—OR/SA assignment pattern" and were permitted to be enrolled as ORSA executives even if they were enrolled in one of the other officer specialist programs.[159]

Management of Army Civilian ORSA Personnel

Department of Army civilian employees were managed by the United States Civil Service Commission, and their recruitment, qualifications, assignments, career development, pay and benefits, and other personnel matters conformed to the regulations set down for all civil service employees. Most DA civilian ORSA specialists were managed under classification GS–015–0 (operations research series), which included

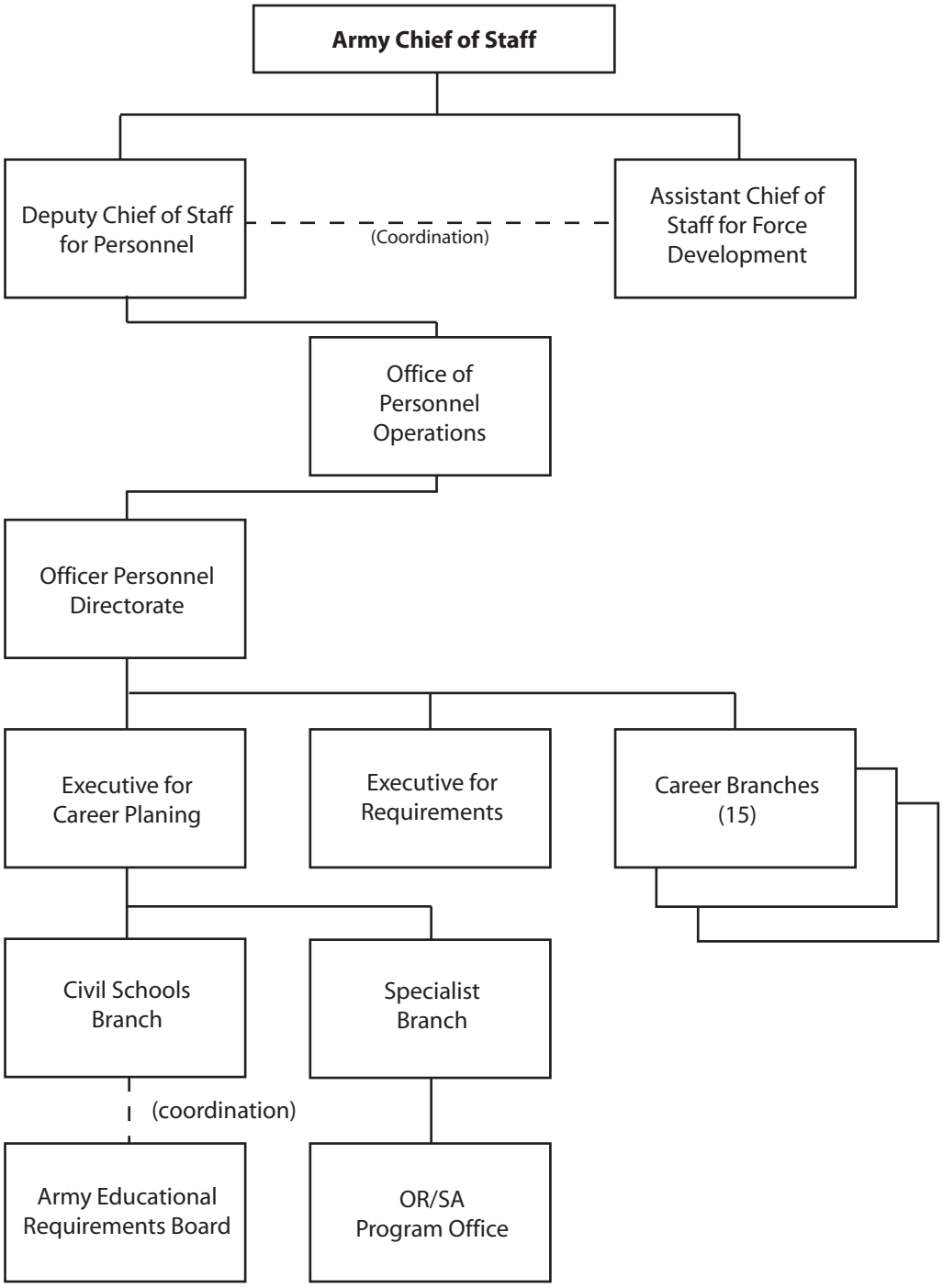
> all classes of positions the duties of which are to administer, direct, supervise, or perform professional and scientific work drawing on mathematical, statistical, and other scientific methods and techniques common to mathematics, engineering, and physical, biological, and social sciences.[160]

The commanding general, Army Materiel Command (AMC), was the "functional chief" for DA civilian career programs in science and engineering (other than construction functions) and thus for civilian ORSA specialists.[161] However, most of the positions requiring a trained civilian ORSA specialist were not in AMC but were spread throughout the Army with large concentrations in the Army Staff, Combat Developments Command, and AMC.[162] This raised the question as to whether or not the commanding general, AMC, should continue to be the functional chief for ORSA. The ASAC concluded that the matter required further study by the DCSPER with the goal of "insuring the best possible management of DA civilian OR/SA 'specialists' and 'executives' to meet the Army's needs."[163]

The Development of Army ORSA Specialist Programs, 1967–1973

The establishment of the formal ORSA officer program in March 1967 marked a definite step forward, but there was some opposition to the program, and until all the pertinent *Army Regulations* could be collated and revised, there was some dysfunction. For example, the AERB continued for some time to recognize three kinds of training for ORSA specialists (OR-business, OR-engineering, and systems analysis) even though *AR 614–139* made no such distinction.[164] Such problems were soon sorted out, however, and the

Figure 4–1—Relationship of Staff Elements Involved in Management of the ORSA Officer Program, 1968



Source: Gerald R. Wetzel, *Analysis of Balance: An Allocation of Officer Resources to Maximize Efficiency of Operations Research in the Army*, MBA thesis (Washington, D.C.: George Washington University, 30 Sep 1969), p. 134 (app. I: Organizational Relationship of Elements Involved in the Management of the Army's Operations Research/Systems Analysis Officer Program). Deputy Chief of Staff for Personnel was convening authority for Army Educational Requirements Board and coordinated with the Assistant Chief of Staff for Force Development on technical guidance and assistance for ORSA Officer Program operations.

selection, development, and utilization of ORSA officer specialists and executives went forward.

The establishment of the ORSA officer program was not greeted with acclaim by all senior Army officers. Several powerful voices were raised against the program, including that of General DePuy, but other senior officers and civilians worked to save the program from its critics. As Abraham Golub, Wilbur Payne's deputy in the Office of the Deputy Under Secretary of the Army (OR) in the late 1960s and early 1970s, boldly asserted:

> I'm the guy that saved the Army's OR designation amongst the military. . . . Bill DePuy and others around the early 1970s tried to kill that. They said, "Well, we'll let them study OR, but we don't want to designate anybody as OR. You know, he's a cannoneer or a tanker, or an air defender, but he ain't an OR." I fought that. The guy who supported me and made the case was General Creighton Abrams [Army Chief of Staff, 1972–1974] . . . the first problem he had to decide [was] whether to side with DePuy or with my boss at that time, who later became Chief of Staff—[General Frederick C.] Fred Weyand. Abrams backed Weyand and me, and we saved that program. . . . My argument was that all of the branches need OR, but I'm not willing to take this rather small contingent of people that we have—a rather rare commodity—and spread it out amongst five different places. That'd leave the branches with the option of either building it or killing it, or what you have. You know, whoever is in charge of the artillery school or the tank school—leave them with whether or not they're going to support it and how well; leave it in the hands of people who usually themselves weren't schooled in the discipline. So if the Army was really going to preserve it, they'd better centralize. I said that someday the day may come when you had so many OR types that you may be able to distribute it. I think he [General Abrams] began to feel like I did, that it would be lost altogether and there would be no discipline exercised. So that's why we have it in the Army today.[165]

Although the principal means of qualifying Army officers and civilians as ORSA specialists was through formal education, some long-time Army ORSA leaders pointed out that formal education was not enough to create a capable ORSA analyst. As Abe Golub told Dr. James W. Williams and Eugene P. Visco in 1992:

> The ORSA schools . . . do a good job of teaching them ORSA as a discipline from a theoretical standpoint. think they do a pretty nice job teaching them about some of the tools that they use in OR, but they don't make analysts out of them. They can't. No school can make you into an analyst.[166]

Abe Golub also pointed to another serious problem: the potentially adverse effect on an officer's career of spending too much time in ORSA training and repetitive ORSA assignments and the consequent need for centralized management and career development of ORSA officer specialists. In the early days of the formal program, qualified officer ORSA specialists were in short supply and were thus required to fill two ORSA specialists' tours back to back before being allowed to return to a troop unit.[167] As Golub stated, many of the best ORSA officer analysts, with all the requisite education and experience, felt that they could not afford to give it all of their time without ruining their career prospects.[168] In research for his 1969 MBA thesis at George Washington University, Gerald R. Wetzel found that although Army personnel managers stressed that designation as an ORSA specialist would not be detrimental to an officer's career, "from the forward thinking officer's point of view, identification as a senior lieutenant colonel or colonel 'specialist' had a terminal ring to it in terms of career development."[169]

Nevertheless, in his 1967 review of the new program, the DCSPER, Lt. Gen. A. O. Connor, reported that the program was attractive to outstanding young officers and was already one of the more popular special career programs.[170] In fact, losses in the first two years of the ORSA officer program were "negligible," an indication of "a substantial degree of acceptability of the Program by its formal 'specialist' membership."[171] The acceptance rate by officers invited to join the ORSA officer program in 1967 was 62 percent, and there was an upward trend during 1968–1969.[172] In his February 1968 student research paper at the Industrial College of the Armed Forces, Lt. Col. Harlan W. Tucker reported that there were 128 officers formally enrolled in the ORSA officer program; twenty-seven officers who were qualified but not enrolled due to participation in another officer specialist program; fifty-five officers qualified as ORSA specialists who declined formal membership; and twenty-three qualified officers whose applications for membership in the program were pending.[173] During the period March 1968 to March 1969, the ORSA Program Office successfully recruited as program members 84 percent of the eligible officers.[174]

Another problem was created by the fact that the AERB validated ORSA positions at a much greater rate than the Army could train and qualify ORSA officers. The first ORSA positions were validated by the AERB

Table 4–5—Cumulative Growth in AERB-Validated ORSA Positions, 1963–1969

Date	*AERB-Validated ORSA Positions*
1963	23
1964	31
1965	116
1966	286
1967	449
1968	410
1969	550

Source: U.S. Department of the Army, *Report of the Special Review Panel on Department of the Army Organization, Part II: Detailed Organizational Discussion* (Washington, D.C.: HQDA, 1 Feb 1971), p. 22 (cited in Martin, *The Role and Progress of the Office, Assistant Vice Chief of Staff in the Management of Army Resources*, p. 29, Table 1 [Army Spaces Requiring Advanced Degrees in OR]).

in December 1963, before even the informal ORSA officer specialist program was established.[175] The subsequent validations of ORSA positions (cumulative) through 1969 were as shown in Table 4–5.

By the end of 1968, the Army had requirements for some 871 trained ORSA personnel, military and civilian (384 specialists and 487 executives), of which the rough distribution was 10 percent in OSD and JCS, 40 percent in HQDA, and 50 percent in the major Army commands.[176] But by 1968, only 184 officers had received graduate-level education in ORSA, and the AERB reported that the ORSA officer program was supplying fewer than one out of every eleven validated positions with a qualified ORSA officer specialist.[177] In 1968, at the request of the chief of staff the DCSPER initiated a new study of the ORSA graduate-education program to recommend improvements and, specifically, to determine the feasibility of tailoring an ORSA graduate school curriculum to meet the special needs of the Army.[178]

In the aftermath of the ASAC study and the creation of a formal ORSA officer program in March 1967, the Army also followed up on the recommendations of the Haines Board with respect to improvements in the ORSA instructional programs at West Point and in the Army service schools, Command and General Staff College, and Army War College.[179] The progressive course in ORSA starting in the branch advanced courses and continuing through the Command and General Staff College and the Army War College, recommended by the Haines Board in February 1966 in the expectation that over time such a course would serve to qualify a large number of Army officers as ORSA executives, was approved.[180] The course consisted of a total of fifty-one hours of instruction, of which twelve hours were to be taught at the Command and General Staff College beginning in academic year 1967–1968, and forty hours were to be prepared by a contractor for delivery to the Army service schools in October 1967.[181] Of the forty hours, thirty-nine were to be offered as electives at C&GSC beginning in 1968.[182]

In January 1968, the Army initiated an ORSA executive course at the Army Management School at Fort Belvoir, Virginia, to train ORSA executives.[183] The planned output of the four-and-a-half-week course was 550 students per year in the grades of major/GS–13 and above.[184] By December 1968, eight courses had been completed, and the program had been revised to provide for ten courses per year with sixty-four students from all services in each class, about half of them from the Army.[185] As of December 1968, other new opportunities for ORSA training included an executive course at the Naval Postgraduate School and an annual one-week course offered by the Army Research Office; and the comptroller of the Army was considering the creation of a study management course in the summer of 1968.[186] The Army Material Command had also initiated a senior officer orientation course operated on contract by Mathematica at Princeton, New Jersey.[187] The three-week course focused on executive decision making, and about half the 300 students who attended in FY 1967 were Army officers in the grade of colonel.[188] In July 1968, AMC moved the senior officer orientation course to the Army Logistics Management Center at Fort Lee, Virginia, and continued to plan for 300 students per year, although attendance at the first four courses at Fort Lee was down by 25 percent and only one officer was enrolled in the fifth course.[189]

In his 1969 George Washington University MBA thesis, Gerald R. Wetzel concluded that "only 27 per cent of the stated requirement for officers trained to a graduate level in operations research is valid"; the AERB had "been led to overstate the requirements for OR/SA specialists"; and only 40 percent of the Army's ORSA

officer specialists assigned to ORSA specialist positions were being "properly utilized."[190] Wetzel went on to recommend a number of changes in the ORSA officer program, including discontinuing the ORSA executive designation; the definition of two skill levels (a junior level to remain identified as "OR/SA specialist" and a new level, that of "integrator," to be called "command analyst"); a resurvey of Army ORSA requirements and AERB validations in the light of the new definitions he proposed; and a revitalization of the ORSA officer management process, particularly the role of the ORSA Program Office in OPO.[191] Nevertheless, Wetzel found that ORSA was "becoming an integral part of decision-making in a complex environment," and that ORSA in the Army was "remarkably healthy."[192]

Conclusion

The increased emphasis Army-wide on developing an effective ORSA capability carried with it the need to significantly increase and improve the Army's in-house capability to conduct ORSA analyses and to review analyses conducted by other agencies. The May 1964 Bonesteel study, the February 1966 Haines Board report, and the August 1966 ASAC study all recommended an increase in the number of Army officers and DA civilians trained in operations research and systems analysis as well as the creation of a centralized system for the identification, development, and management of both officers and DA civilian ORSA specialists and executives. The August 1966 ASAC study of Army ORSA personnel requirements made the breakthrough with its detailed examination of existing ORSA agencies, future Army ORSA personnel requirements, and projected Army ORSA assets. The time-phased plan proposed by the ASAC to increase Army ORSA assets was adopted, and the Army embarked on a sustained effort to increase both the number of officers sent for graduate training in ORSA and the number of qualified DA civilians. In March 1967, the Army finally established a formal program for the career management of officer ORSA specialists.

As General Chesarek, the Army's assistant vice chief of staff, told students at the Army Management School in 1968: "Since 1962, our population of computers has increased fourfold, the number of officers with graduate degrees is up 50 percent, and attendance at operations research/systems analysis schools has increased tenfold."[193] In fact, in 1956 there was just one officer in the United States Army who held an advanced degree in operations research; in August 1966 there were 129 officers with advanced education in ORSA-related fields, and another 101 officers were then in graduate school; and by the end of 1968, there were 154 officers enrolled in ORSA graduate degree programs at some twenty-three colleges and universities.

And by 1968, the emphasis on education of both ORSA specialists and ORSA executives was beginning to pay off. As Brig. Gen. C. D. Y. Ostrom told attendees at the seventh Army Operations Research Symposium: "The Army as a whole now is getting an appreciation of the limitations of OR/SA studies, an idea of the climate required to do a good study, and an idea of the effort required to insure that the study meets the need. The extremes of blind faith and noncomprehension are giving way to realistic appraisals of capabilities and utility."[194] In his 1967 MMAS thesis at the Command and General Staff College, Maj. F. L. Smith had posited:

> Increased emphasis by the Army in training its officer personnel in operations research/systems analysis will provide the necessary background and expertise to support centralization of manpower, management and expansion of operations research technical knowledge throughout the Army. As this talent becomes more widely dispersed in the Army, operations research should influence many new areas of Army operations.[195]

By 1974, there were nearly 600 Army officers qualified as ORSA specialists, and Major Smith's hypothesis was being realized.[196]

CHAPTER FOUR NOTES

[1] Wlbur B. Payne, "Operations Research in and for the Army," pp. 2–3 (staff paper quoted in Gerald R. Wetzel, *Analysis of Balance: An Allocation of Officer Resources to Maximize Efficiency of Operations Research in the Army*, MBA thesis [Washington, D.C.: George Washington University, 30 Sep 1969], p. 18).

[2] Ralph E. Haines, Jr., "Operations Research & Systems Analysis—Tools That Can Help Us," *Army Management Views* XIII, no. 1 (May 1968), p. 3.

[3] Robert J. Weeks, *The Army's Operations Research Training Program* (Carlisle Barracks, Pa.: U.S. Army War College, 2 Dec 1968), p. 1.

[4] Wetzel, *Analysis of Balance*, p. 17.

[5] Ibid., p. 19.

[6] U.S. Department of the Army, Office of the Chief of Staff, Systems Analysis Division, *DA Letter on Systems Analysis and Cost Effectiveness* (Washington, D.C.: Office of the Adjutant General, HQDA, 23 Apr 1964), Incl 5, pp. 6–7.

[7] As late as 1968, about 80 percent of the Army's ORSA capability was still in the hands of civilian contractors (see Weeks, *The Army's Operations Research Training Program*, p. 4).

[8] U.S. Department of the Army, Army Study Advisory Committee (ASAC), *Main Report: Army Study Advisory Committee Examination of the Army's Operations Research/Systems Analysis Personnel Requirements* (Washington, D.C.: Office of the Director of Special Studies, Office of the Chief of Staff, HQDA, 30 Aug 1966), pp. 2–3 (cited hereafter as ASAC *Main Report*).

[9] On the demise of ORO and the origins of RAC, see vol. I, ch. 3, of this history.

[10] Haines, "Operations Research & Systems Analysis—Tools That Can Help Us," p. 6.

[11] Ibid.

[12] Weeks, *The Army's Operations Research Training Program*, p. 9.

[13] Ibid. Weeks notes that Combat Developments Command was recently able to fill only about half of 100 open civilian analyst positions.

[14] Allen W. Wiegand, "Military Participation in Systems Analyses," *Signal* 21, no. 4 (December 1966), p. 11.

[15] Wetzel, *Analysis of Balance*, p. 5. General Bruce Palmer, Jr. (Army vice chief of staff, 1968–1972) called ORSA "an essential tool to all levels of management in the Armed Services" (quoted in Weeks, *The Army's Operations Research Training Program*, p. 17).

[16] John G. Waggener, "Scientific Military Decision Making," *Military Review* 49, no. 10 (October 1969), p. 67.

[17] Col. Oliver R. Dinsmore, *Requirements for Operations Research Training of Army Officers* (Carlisle Barracks, Pa.: U.S. Army War College, 8 Apr 1966), p. 41. Colonel Dinsmore served as an Army adviser at ORO/RAC.

[18] DA Letter on Systems Analysis and Cost Effectiveness, 23 Apr 1964, Incl 5, pp. 3–4.

[19] U.S. Department of the Army, Office of the Comptroller of the Army, Management Division, Memo, Washington, D.C., Jun 1951, sub: Sound Business Management Practices for the Army, p. 1.

[20] Selim Seymour Podnos, *The Development of Army Comptrollership Functions during the Span 1942–1949 with Particular Reference to Management Control during World War II*, thesis (Washington, D.C.: George Washington University School of Government and Business Administration, 7 Jun 1966), p. 156.

[21] U.S. Army Research Office-Durham, *Proceedings of the [First] United States Army Operations Research Symposium, 27, 28, 29 March 1962, Durham, North Carolina, Part I—Proceedings* (Durham, N.C.: U.S. Army Research Office-Durham, 1962), p. 9.

[22] Dinsmore, *Requirements for Operations Research Training of Army Officers*, p. 26.

[23] Col Oliver R. Dinsmore, Jr., and others, *Report of the ORTAG Committee on Operations Research Education* (quoted in Dinsmore, *Requirements for Operations Research Training of Army Officers*, pp. 26–27).

[24] Department of the Army Letter on Systems Analysis and Cost Effectiveness, 23 Apr 1964, Incl 5, p. 6.

[25] Weeks, *The Army's Operations Research Training Program*, p. 9.

[26] U.S. Department of the Army, *Report of the Special Review Panel on Department of the Army Organization*, pt. II: *Detailed Organizational Discussion* (Washington, D.C.: HQDA, 1 Feb 1971), p. 22 (cited in John R. Martin, *The Role and Progress of the Office, Assistant Vice Chief of Staff in the Management of Army Resources* [Carlisle Barracks, Pa.: U.S. Army War College, 8 Mar 1971], p. 29, Table 1 [Army Spaces Requiring Advanced Degrees in OR]).

[27] Wilbur B. Payne, "Operations Research—A View from the Pentagon," in *Proceedings of the [Third] United States Army Operations Research Symposium, 25, 26, 27 May 1964, Rock Island, Illinois, Part I—Unclassified Papers* (Rock Island, Ill.: Operations Research Technical Assistance Group, U.S. Army Research Office-Durham, 1964), p. 7. Dr. Payne's point is not entirely clear. He was perhaps speaking ironically or was referring to the annual input of Army officers to formal graduate schooling in ORSA. In any event, he soon revised his opinion. In his response to an ad hoc working group convened by the director of special studies in 1965 to determine the degree to which the Army should continue to rely on outside contractors for its ORSA needs, Dr. Payne estimated that some 200–400 professional analysts would be required within the next five years by Army in-house ORSA agencies (see Wetzel, *Analysis of Balance*, p. 25).

[28] Ibid.

[29] Dinsmore, *Requirements for Operations Research Training of Army Officers*, p. 27.

[30] Wiegand, "Military Participation in Systems Analyses," p. 10.

[31] Ibid.

[32] Ibid.

[33] U.S. Department of the Army, Office of the Chief of Staff, Director of Special Studies, *The Army Study System: A Staff Study by the Director of Special Studies, Office of the Chief of Staff, United States Army*, vol. I: *Main Report* (Washington, D.C.: Director of Special Studies, Office of the Chief of Staff, HQDA, May 1964), sec. 7 (cited hereafter as Bonesteel Study).

[34] Ibid., p. 61.

[35] Ibid.

[36] Dinsmore, *Requirements for Operations Research Training of Army Officers*, pp. 28–29. At the same time, the Navy had ninety-six officers with graduate-level education in ORSA to apply against 163 identified positions, and the Air Force had thirty-two for fifty-four identified positions. In FY 1964, the Navy planned to send ninety-nine officers for graduate schooling in ORSA, and the Air Force planned to send twenty-two.

[37] Wiegand, "Military Participation in Systems Analyses," p. 10.

[38] Ibid.

[39] Ibid.

[40] See U.S. Department of the Army, Board to Review Army Officer Schools (Haines Board), *Report of the Department of the Army Board to Review Army Officer Schools [Haines Board]*, 3 vols. (Washington, D.C.: HQDA, Feb 1966) (cited hereafter as Haines Board Rpt).

[41] U.S. Department of the Army, Letter of Instruction (LOI), Washington, D.C., 20 May 1965, sub: Department of the Army Board to Review Army Officer Schools, p. 1 (reproduced in Haines Board Rpt, vol. I, an. A [Background Information], app. 2 [Terms of Reference], p. 1). The complete list of tasks assigned the board are to be found in the 20 May LOI.

[42] A complete listing of the members of the board can be found in Haines Board Rpt, vol. I, an. A, app. 1 (Composition of the Board).

[43] The three earlier boards concerned with Army officer education and training were the War Department Military Education Board headed by Lt. Gen. Leonard T. Gerow in the fall of 1945; the Department of the Army Board on Educational System for Army Officers headed by Lt. Gen. Manton S. Eddy in 1948; and the Department of the Army Board to Review the System of Officer Education headed by Lt. Gen. Edward T. Williams in 1958. Collectively, the three boards defined and extended civil schooling programs for officers; established the National War College and the Armed Forces Staff College; re-established the Army War College; set up associate courses and additional extension courses for officers of the Reserve components; and made various recommendations concerning the organization, goals, and curricula of the various Army schools (see Haines Board Rpt, vol. I, p. 9).

[44] Haines Board Rpt, vol. I, p. 6.

[45] Ibid., p. 7.

[46] Ibid., vol. III, an. D (Analysis of Current Army System of Officer Schooling), app. 11 (Operations Research/Systems Analysis Education and Training), p. 595.

[47] Ibid., pp. 594–95.

[48] Ibid., pp. 595–96. The seven schools that did offer instruction in ORSA and the number of hours offered were Women's Army Corps (three), Transportation (four), Army Medical Service (four), Chemical (six), Infantry (eight), Military Police (nine), and Signal (thirteen) (see Haines Board Rpt, vol. III, p. 448).

[49] Ibid., vol. III, an. D, app. 11, p. 596.

[50] Ibid.

[51] Ibid., vol. III, pp. 479 and 492. The board recommended that the Army War College double its coverage of ORSA from 12 hours to 24 hours.

[52] Ibid., pp. 490 and 493. The Institute of Advanced Studies conducted some ORSA-type research.

[53] Ibid., pp. 603–04.

[54] Ibid., p. 602, Figure D11–4 (Progressive Elective in Operations Research/Systems Analysis in 60- to 90-Hour Blocks).

[55] Ibid., vol. I, p. 79.

[56] Department of the Army Letter on Systems Analysis and Cost Effectiveness, 23 Apr 1964, p. 7.

[57] Ibid., pp. 7–8.

[58] Dinsmore, *Requirements for Operations Research Training of Army Officers*, p. 28; Wetzel, *Analysis of Balance*, p. 17.

[59] U.S. Department of the Army, Office of the Chief of Staff, *Chief of Staff Memorandum No. 66–277*, Washington, D.C., 15 Jun 1966, sub: Report of the DA Board to Review Army Officer Schools ("Haines Board").

[60] U.S. Department of the Army, Office of the Chief of Staff, *Chief of Staff Memorandum No. 66–288*, Washington, D.C., 22 Jun 1966, sub: Operations Research/Systems Analysis Personnel Requirements, p. 1.

[61] Ibid., par. 3.

[62] Ibid., par. 4.

[63] ASAC *Main Report*. I am greatly indebted to Robert Claude and Terese Sweet of the Office of the Office of the Deputy Chief of Staff, G–8 (Programs), HQDA, for providing me with a copy of the ASAC *Main Report*, without which this chapter, indeed much of this entire volume, could not have been written. The ASAC *Main Report* is the principal surviving source of information on the Army's ORSA programs during the 1960s and early 1970s.

[64] In reviewing the existing ORSA environment, the ASAC took into consideration a number of pending staff actions related to the development of the Army's ORSA capability. These included, *inter alia*, proposals for the establishment of an Army Materiel Command Systems Analysis Center; an Army Intelligence Threats and Forecast Group as a Class II activity of ACSI; a Logistics Doctrine and Systems Office in DCSLOG and a Logistic Doctrine System Agency as a Class II activity of DCSLOG; an Advanced Concepts Laboratory under the Army Materiel Command; and an Institute of Land Combat Systems under the Combat Developments Command (see ASAC *Main Report*, p. 3, and app. 2 [Current Staff Actions Related to Development of OR/SA Capability]).

[65] Ibid., an. B (Operations Research in and for the Army), an. 1 (Nature of and General Army Requirements for Operations Research), p. 5.

[66] Ibid., an. B, an. 4 (The Army Analytical Community).

[67] Ibid., pp. 22–27.

[68] Ibid., an. A (Definitions), par. 6.

[69] *CSM 66–288*, pars. 5 and 3a.

[70] ASAC *Main Report*, app. 1, Incl 1 (Operations Research/Systems Analysis Skill Levels), and app. 20 (Haines Board Operations Research/Systems Analysis Skill Levels). It should be remembered that the "executive" level referred to the training required (less than for a "specialist") and had no necessary relationship to position in a military hierarchy.

[71] *CSM 66–288*, par. 3b.

[72] ASAC *Main Report*, p. 3. See also ASAC *Main Report*, an. F (Time-Phased Plan for Development of OR/SA Assets); app. 1, Incl 2 (Phasing of Operational Research/Systems Analysis Personnel Requirements); app. 49 (Time-Phased Plan for Development of Officer OR/SA Specialist Assets); app. 50 (Time-Phased Plan for Development of OR/SA Executives); and app. 53 (Phasing to Achieve OR/SA Objectives).

[73] Ibid., p. 22 (Conclusions), par. 4b.

[74] Ibid., p. 5.

[75] Ibid.

[76] See also ASAC *Main Report*, pp. 7–9; app. 3 (Grade Distribution of OR/SA Personnel Requirements); and app. 4 (OR/SA Personnel Requirements Requested by Agencies and Commands in Excess of Current TD). Note that only *in-house* requirements are addressed. The considerable contractor effort in support of Army ORSA activities is not included but is addressed in general terms elsewhere in the ASAC report and below in ch. 5.

[77] Unless otherwise noted, the following discussion of Army ORSA assets is based on ASAC *Main Report*, pp. 9–11, and an. D (OR/SA Personnel Assets).

[78] Civil service career field 300 covered operations research, and the civil service classification code for ORSA specialists was later changed to GS–1515. The required qualifications by civil service grade were listed in ASAC *Main Report*, app. 40 (Qualifications–Civil Service 015 "Examination").

[79] The grade distribution of the 118 officers in the informal ORSA officer specialist program was thirteen colonels, fifty-nine lieutenant colonels, forty-three majors, and three captains. Forty of the 118 officers were already enrolled in other Army specialist programs (see ASAC *Main Report*, app. 23 [Informal Specialist Program Officer OR/SA Assets]).

[80] In July 1966, OPO was able to identify twenty-six officers with formal schooling in ORSA: eight in OR (business), thirteen in OR (engineering), and five in systems analysis. Of the twenty-six, seven were

already enrolled in specialist programs, five of them in the informal ORSA officer specialist program (see ASAC *Main Report*, app. 24 [Officers with Specific OR/SA Formal Schooling]). In a 5 August 1965 letter to Lt. Gen. Charles H. Bonesteel III, Director of Special Studies Frank A. Parker, the president of RAC, listed seventeen military officers who had had on-the-job training at ORO/RAC. Of the seventeen, only ten were still on active duty. One was a general officer and one was already enrolled in the informal ORSA specialist program (see ASAC *Main Report*, app. 25 [Officers with On-the-Job Training in OR from RAC/ORO]).

[81] See ASAC *Main Report*, app. 26 (Junior Systems Analysts in OASD [Systems Analysis]).

[82] There were thirty-one officers enrolled in OR (business) programs, forty-seven enrolled in OR (engineering) programs, and twenty-three enrolled in systems analysis programs. The 101 officers included four at RAC and three at SRI in OJT programs. The rest were pursuing master's degrees, except for one Ph.D. candidate at Ohio State. The largest single contingent (twenty officers) was at Tulane (see ASAC *Main Report*, app. 27 [Officers in OR/SA Training]).

[83] ASAC *Main Report*, an. D, p. 4. The grade distribution of the 159 DAC OR/SA personnel was one GS–17, two GS–16, twenty-seven GS–15, fifty-four GS–14, forty-three GS–13, twelve GS–12, eight GS–11, eleven GS–9, and one GS–7 (see app. 30 [DA Civilian Personnel OR Assets - 015]). The GS–015–0 job description can be found in ASAC *Main Report*, app. 29 (OR Job Description).

[84] Ibid., app. 33 (DA Civilian OR/SA Trainees).

[85] Ibid., an. D, p. 6.

[86] Ibid., pp. 16–20 and Table G–1 (Estimated Requirements and Recommended Allocations OR/SA "Specialist" Personnel). See also ASAC *Main Report*, pp. 5–6.

[87] Ibid., p. 16.

[88] Ibid., p. 18.

[89] Unless otherwise noted, the following discussion of the ASAC plan for ORSA training and education is based on ASAC *Main Report*, pp. 12–16, and an. F (Time-Phased Plan for Development of OR/SA Assets).

[90] ASAC *Main Report*, an. F, p. 2. See also ASAC *Main Report*, an. C, Table C–1. The requirements stated here are rounded up and do not account for the mathematical errors in Table C–1.

[91] ASAC *Main Report*, p. 12.

[92] Ibid., pp. 13–14. See also ASAC *Main Report*, app. 49 (Time-Phased Plan for the Development of Officer OR/SA "Specialist" Assets).

[93] Ibid., pp. 14–15.

[94] Ibid., p. 15, and an. F.

[95] Ibid., p. 15.

[96] See, for example, the extensive listing of opportunities for university degree programs and courses and short-term training courses in ORSA available in the Washington, D.C., area in August 1965 in ASAC *Main Report*, app. 45 (report of the WORC Education Committee, August 1965, "Education in Operations Research in the Washington Area").

[97] See ASAC *Main Report*, app. 42 (Comparison of Actual Cases) and app. 43 (OR Subject Offerings of Operations Research Educational Programs). The latter surveyed programs leading to an ORSA degree at Arizona State, UCal Berkeley, Georgia Tech, Ohio State, Stanford, the Naval Postgraduate School, MIT, and Cal Tech. One-semester introductory courses at Cornell, MIT, Penn, and Stanford were also surveyed. In February 1966, the Haines Board had recommended that the Army work with selected universities, perhaps in the Durham, N.C., area or the University of Michigan, to create an ORSA graduate program specifically tailored to the needs of Army officer ORSA specialists; but this apparently never came to pass (see Haines Board Rpt, vol. III, an. D, app. 11, pp. 599–600).

[98] Ibid., app. 27. As of July 1966, OPO could identify only twenty-six officers with advanced degrees in OR business (eight), OR engineering (thirteen), or systems analysis (five). Nearly a third (eight) had attended Ohio State University and the rest had attended Arizona (four), Case Institute of Technology (one), Georgia Tech (one), Johns Hopkins (three), the Naval Postgraduate School (one), Pitt (one), Stanford (one), or Tulane (six) (see ASAC *Main Report*, app. 24).

[99] Thomas L. Meeks, "Operations Research Education for the Navy," in *7th United States Army Operations Research Symposium—Preprints: Unclassified Contributed Papers* (Durham, N.C.: U.S. Army Research Office-Durham, 1968), p. 161; David Schrady, "Golden Anniversary," *OR/MS Today*, (Feb 2001), p. 39.

[100] Schrady, "Golden Anniversary," p. 40.

[101] Ibid.; Meeks, "Operations Research Education for the Navy," p. 164.

[102] Schrady, "Golden Anniversary," p. 40. In 1968, more than 90 percent of the Navy officers educated in ORSA were products of the NPGS program (see Meeks, "Operations Research Education for the Navy," p. 161).

[103] ASAC *Main Report*, app. 27. By September 2000, there were 3,340 alumni of the NPGS ORSA program, of whom 583 were Army officers (see Schrady, "Golden Anniversary," p. 41).

[104] Ibid., app. 22 (Review of Selected Institutions Offering Degrees in Operations Research or with Operations Research Major), p. 2. By 1968, the NPGS was offering both a two-year master's degree program in ORSA and a fourteen-month defense systems analysis course sponsored by the Institute of Defense Analyses, which also conferred a master's degree (see Meeks, "Operations Research Education for the Navy," p. 161). A doctoral program was authorized in 1971, and by 2001, the NPGS program in ORSA had awarded twenty-eight doctorates (see Schrady, "Golden Anniversary," p. 40).

[105] For subject areas covered by the NPGS ORSA course, see ASAC *Main Report*, app. 27.

[106] Meeks, "Operations Research Education for the Navy," p. 163.

[107] Ibid., p. 165.

[108] Haines Board Rpt, vol. II, p. 330.

[109] Ibid.; ASAC *Main Report*, an. F, p. 3.

[110] Haines Board Rpt, vol. II, p. 330.

[111] ASAC *Main Report*, app. 27.

[112] Ibid., app. 25. On 5 August 1965, Frank A. Parker, the president of RAC, had identified the seventeen military officers who had had OJT at ORO/RAC. Of the seventeen, one was an Air Force officer, six were Army officers since retired, and ten were Army officers still on active duty, including one general officer and one officer already enrolled in the informal ORSA officer specialist program.

[113] Weeks, *The Army's Operations Research Training Program*, p. 11.

[114] Haines Board Rpt, vol. III, an. D, app. 11, p. 600.

[115] ASAC *Main Report*, an. F, p. 4.

[116] Ibid., app. 27. SRI also offered a short "appreciation" course of several weeks' duration to prepare officers assigned to the Combat Developments Experimentation Command for work in field experiments (see Haines Board Rpt, vol. III, an. D, app. 11, p. 597).

[117] ASAC *Main Report*, an. F, p. 5.

[118] Ibid. See also ASAC *Main Report*, app. 47 (Subject Areas–Sections II and VII, NPGS Defense Management Systems Course).

[119] Haines Board Rpt, vol. II, p. 331.

[120] Maj F. L. Smith, *A History of the U. S. Army in Operations Research* (Fort Leavenworth, Kans.: U.S. Army Command and General Staff College, 22 May 1967), p. 93.

[121] ASAC *Main Report*, an. F, p. 6.

[122] Ibid.

[123] Ibid. See *also* ASAC *Main Report*, app. 48 (Concept of OR/SA "Executive" Skill Level Short Course).

[124] Ibid., app. 48, p. 4.

[125] Ibid., an. F, p. 6.

[126] Dinsmore, *Requirements for Operations Research Training of Army Officers*, p. 31.

[127] Ibid., pp. 31–32.

[128] Unless otherwise noted the following discussion of the estimated costs of Army ORSA training and education is based on ASAC *Main Report*, p. 5, and app. 52 (Cost Considerations). The total Army-wide costs of ORSA activities, both in-house and contract, are discussed in detail below in ch. 5.

[129] ASAC *Main Report*, app. 46 (Data on Specialist Education Programs). The cost per student at a university was based on average costs at Alabama, Arizona, Arizona State, Purdue, Stanford, Tulane, and Wisconsin.

[130] ASAC *Main Report*, app. 52 contains a detailed discussion of cost calculations. The ASAC made no estimate of the costs of educating DA civilians as ORSA specialists but assumed that new hires would already possess the necessary educational prerequisites. There were six DA civilians enrolled in the Defense Systems Analysis course, and the ASAC assumed that their book costs ($100) were being paid by their parent commands.

[131] Haines Board Rpt, vol. III, an. D, app. 11, p. 595; ASAC *Main Report*, an. E (Personnel Motivation and Career Management Aspects), p. 5.

[132] ASAC *Main Report*, app. 36 (Army Officer Specialist Programs).

[133] Haines Board Rpt, vol. III, an. D, app. 11, p. 595. Nearly all of the 109 officers identified held advanced degrees (master's or Ph.D.) in ORSA or a closely related field.

[134] Ibid. At that time, the ORSA positions in the Army Materiel Command had not yet been worked out.

[135] See ASAC *Main Report*, apps. 23–26.

[136] Haines Board Rpt, vol. III, an. D, app. 11, p. 595. The schools represented included the University of Arizona, Case Institute of Technology, Georgia Tech, Johns Hopkins, Ohio State, University of Pittsburgh, Stanford, Tulane, and the Naval Postgraduate School. One measure of the growth of the informal ORSA specialist program was that the number of Army officers enrolled in graduate schooling in ORSA in academic year 1965–1966 (twenty-one) was 50 percent greater than the total number who received graduate degrees in ORSA in the previous ten years (see Haines Board Rpt, vol. III, an. D, app. 11, p. 597).

[137] Ibid.

[138] Haines Board Rpt, vol. I, 51, and vol. III, an. D, app. 11, p. 599. The board's recommendation was based on an estimate of 100 ORSA supervisory positions being validated by 1970, a base of 300 junior officers to support those 100 requirements, and an average annual input of sixty officers into ORSA degree programs.

[139] U.S. Department of the Army, Office of the Chief of Staff, *Chief of Staff Memorandum No. 66–277,* Washington, D.C., 15 Jun 1966, sub: [Haines Board Report Recommendations]. Other recommendations of the Haines Board, including the definition of three levels of ORSA officer training and education (specialist, executive, and familiarization) and the designation of the Army Command and General Staff College as the proponent agency for ORSA programs in the Army school system, were also approved by the chief of staff in U.S. Department of the Army, Office of the Chief of Staff, *Chief of Staff Memorandum No. 66–300,* Washington, D.C., 5 Jul 1966, sub: [Haines Board Report Recommendations]. See also ASAC *Main Report*, app. 38 (Atomic Energy Specialist Program vs Operations Research/Systems Analysis "Specialist" Program) and app. 39 (Nuclear Weapons Employment Officer [Prefix 5] vs OR/SA "Executive" Skill Program).

[140] U.S. Department of the Army, *Army Regulations No. 614–139: ASSIGNMENTS, DETAILS, AND TRANSFERS—Operations Research/Systems Analysis Officer Program* (Washington, D.C.: HQDA, 6 Mar 1967).

[141] Ibid., 15 Jul 1968.

[142] Ibid., par. 1–1.

[143] Ibid., par. 1–3. *AR 614–139* also restated the position that "[t]he term 'executive' does not necessarily relate to military grade or the level of authority within an organization."

[144] Ibid., pars. 1–4a and b.

[145] Ibid., pars. 1–4c and d.

[146] Ibid., pars. 1–5 and 1-6. Until the publication of the July 1968 edition of *AR 614–139*, no particular MOS or MOS prefix code was associated with the ORSA specialist or executive designation (see U.S. Department of the Army, *Army Regulations No. 616–115: PERSONNEL UTILIZATION—Officer Special Career Programs Position Report [Reports Control Symbol OPO–91]* [Washington, D.C.: HQDA, 5 Jun 1967], par. 3).

[147] Ibid., par. 2–1.

[148] Ibid., par. 3–1.

[149] Ibid., p. 5–23.

[150] *Change 18* (30 Jul 1968) to U.S. Department of the Army, *Army Regulations No. 611–101: PERSONNEL SELECTION AND CLASSIFICATION—Manual of Commissioned Officer Military Occupational Specialties* (Washington, D.C.: HQDA, 2 Jun 1960), pp. 218.1–218.2.

[151] The process by which ORSA officer specialist and executives were managed was logical but fairly complex. The process as it existed in 1968 is described in some detail in Wetzel, *Analysis of Balance*. In any event, the process changed over time and for reasons of space can only be outlined here.

[152] Raymond P. Singer, "U.S. Army Training in OR/SA," in *7th United States Army Operations Research Symposium—Preprints: Unclassified Contributed Papers* (Durham, N.C.: U.S. Army Research Office-Durham, 1968), p. 157.

[153] Weeks, *The Army's Operations Research Training Program*, pp. 5–6. The ASAC addressed in some detail the principles and procedures for motivation and career management of both military and civilian ORSA personnel in ASAC *Main Report*, an. E (Personnel Motivation and Career Management Aspects) and an. H (Proposed Army Policy for the Use and Development of Operations Research/Systems Analysis Personnel).

[154] Participation in the ORSA Officer Program was voluntary, and thus the number of officers formally enrolled in the program did not include all Army officers qualified to be ORSA specialists or executives.

[155] Wetzel, *Analysis of Balance*, pp. 42 and 69.

[156] Ibid., p. 42.

[157] The process is described by Wetzel, *Analysis of Balance*, pp. 31 and 44–45.

[158] *AR 614–139*, par. 2–2.

[159] Ibid., par. 3–3.

[160] "Job Description for Operations Research Series GS–015–0" from the *Civil Service Handbook of Occupational Titles and Definitions*, reproduced in ASAC *Main Report*, app. 29 (OR Job Description).

[161] ASAC *Main Report*, app. 51 (Functional Chiefs–DAC Career Programs).

[162] Ibid., p. 20. Of the Phase III requirements identified by the ASAC for civilian ORSA specialists, 156 were in the Army Staff, 148 were in AMC, and 138 were in CDC.

[163] ASAC *Main Report*, p. 21.

[164] U.S. Department of the Army, *Army Regulations No. 621–108: EDUCATION—Military Personnel Requirements for Graduate Level*

Education (Reports Control Symbol OPO–41[R2]) (Washington, D.C.: HQDA, 22 Sep 1967), pp. 7–8.

[165] Abraham Golub, conversation with Dr. James W. Williams and Eugene P. Visco, Arlington, Va., 19 May 1992.

[166] Ibid. Golub made the same point in a private interview with Gerald R. Wetzel in April 1969 (see Wetzel, *Analysis of Balance*, p. 82).

[167] Col Brian R. McEnany (USA Ret.), personal communication with the author, 13 November 2004. Colonel McEnany entered the ORSA Officer Program in 1970 and served five ORSA tours in the Pentagon before retiring from active duty.

[168] Golub, conversation with Williams and Visco, 19 May 1992.

[169] Wetzel, *Analysis of Balance*, pp. 46–47.

[170] Weeks, *The Army's Operations Research Training Program*, p. 5

[171] Wetzel, *Analysis of Balance*, p. 56. Of eight losses, four (three colonels and one lieutenant colonel) were due to retirement; one major resigned from the service; and three officers (one colonel, one lieutenant colonel, and one major) were released from the program at their request.

[172] Ibid., p. 66.

[173] Harlan W. Tucker, *Overcoming the Systems Analyst Shortage*, student research paper (Fort McNair, D.C.: Industrial College of the Armed Forces, Feb 1968), p. 16 (cited by Wetzel, *Analysis of Balance*, p. 65).

[174] Wetzel, *Analysis of Balance*, p. 65.

[175] Weeks, *The Army's Operations Research Training Program*, p. 9.

[176] Singer, "U.S. Army Training in OR/SA," pp. 158 and 170, Table (OR/SA Position Requirements, 1968).

[177] Weeks, *The Army's Operations Research Training Program*, p. 10; Wetzel, *Analysis of Balance*, p. 62. Wetzel (*Analysis of Balance*, p. 64, Table 10 [Officers Graduate with Advanced Education in OR/SA Disciplines]) put the total number of ORSA officers graduated as of 30 September 1969 at only 168.

[178] Weeks, *The Army's Operations Research Training Program*, p. 8; Wetzel, *Analysis of Balance*, p. 107. See U.S. Department of the Army, Office of the Deputy Chief of Staff for Personnel, Classification and Standards Division, *Special Study: Improving Graduate Schooling in Operations Research/Systems Analysis (OR/SA GRAD)* (Washington, D.C.: Classification and Standards Division, Office of the Deputy Chief of Staff for Personnel, HQDA, 18 Dec 1968).

[179] For the Haines Board recommendations regarding ORSA training in the Army school system, see Haines Board Rpt, vol. III, an. D, app. 11, pp. 600–03.

[180] Haines Board Rpt, vol. III, an. D, app. 11, pp. 600–01; Joseph P. D'Arezzo, "Systems Analysis in the Army," *Military Review*, p. 47, no. 7 (July 1967), p. 93 note.

[181] Smith, *A History of the U. S. Army in Operations Research*, p. 101; Weeks, *The Army's Operations Research Training Program*, pp. 15–16.

[182] Smith, *A History of the U. S. Army in Operations Research*, p. 101. See *Instructional Packet for Common Subjects—Modern Analytical Methods (Operations Research/Systems Analysis)* (Fort Leavenworth, Kans.: U.S. Army Command and General Staff College, Apr 1967).

[183] Singer, "U.S. Army Training in OR/SA," p. 160; Weeks, *The Army's Operations Research Training Program*, p. 14.

[184] Ibid.

[185] Weeks, *The Army's Operations Research Training Program*, p. 14. Weeks noted that with approximately 300 Army graduates of the course per year, the shortage of qualified ORSA executives should have been nearly eliminated by the end of FY 1969.

[186] Singer, "U.S. Army Training in OR/SA," p. 160.

[187] Ibid.

[188] Weeks, *The Army's Operations Research Training Program*, p. 16.

[189] Singer, "U.S. Army Training in OR/SA," p. 160.

[190] Wetzel, *Analysis of Balance*, pp. 120–26 passim.

[191] Ibid., pp. 126–31 passim.

[192] Ibid., pp. 132–33

[193] Lt Gen Ferdinand J. Chesarek, "Limited War 'Stretch Management,'" *Army Management Views* XIII, no. 2 (December1968), p. 19.

[194] Brig Gen Charles D. Y. Ostrom, Jr., "Operations Research and Systems Analysis: Its Use by the Army" in *Proceedings of the [Seventh] United States Army Operations Research Symposium, 22–24 May 1968, Durham, North Carolina, Part I—Unclassified Volume* (Durham, N.C.: U.S. Army Research Office-Durham, 1968), p. 10.

[195] Smith, *A History of the U. S. Army in Operations Research*, p. 101.

[196] Abraham Golub, "Present & Future ORSA Trends—A Forecast for the US Army," in *Proceedings of the Thirteenth Annual United States Army Operations Research Symposium (AORS XIII), 29 October–1 November 1974, Fort Lee, Virginia, Volume I* (Fort Lee, Va.: U.S. Army Concepts Analysis Agency, 1974), p. 20.

CHAPTER FIVE

The Army Analytical Community, 1961–1973 Part I: General Characteristics

The McNamara revolution, with its increased emphasis on centralized management and the use of scientific decision-making techniques, had a significant impact on all Army operations research and systems analysis (ORSA) elements, both contract and in-house. While the Army Secretariat and Army Staff struggled to create effective means for meeting the increased demands of the Whiz Kids in the Office of the Secretary of Defense (OSD) for scientific management and analyses, analytical organizations throughout the Army applied the traditional methods of OR and the new techniques of systems and cost-effectiveness analysis to the perennial problems of weapons systems development, the formation of tactical and strategic doctrine, and force structuring. Indeed, the number and scope of Army organizations, contract and in-house, employing ORSA methods to solve current Army problems and plan for the future increased substantially during the McNamara years. Coordinated through the Army Study System, the ORSA study became an essential tool at every level.

Initially, the Army's in-house ORSA capability was judged inadequate to meet the Army's needs, and Army leaders acted forcefully to improve its in-house capabilities as seen in the substantial increase in ORSA training programs in the mid-1960s and the creation of the Army ORSA Officer Specialist Program in March 1967. Although Army leaders focused on improving in-house capabilities, they also increased ORSA contracting activities, and Army ORSA contractors, such as the Research Analysis Corporation (RAC), the Human Resources Research Office (HumRRO), and the Special Operations Research Office (SORO), received additional tasks and funding.

The enthusiasm and growth prompted by Secretary McNamara's emphasis on scientific management and analysis continued through 1968 but began to wane with the advent of the Nixon administration in 1969. President Richard M. Nixon and his secretary of defense, Melvin R. Laird, focused on ending the war in Vietnam and reducing the overall cost of the armed forces. Although they accepted the utility of the new analytical methods introduced by Secretary McNamara, they were less focused on centralization of power in the hands of the secretary of defense and more willing to rely on the judgment and experience of senior military commanders, with a corresponding reduction in the power of OSD systems analysts.[1] One consequence of the changes introduced by President Nixon and Secretary Laird was a reduction in the resources allocated to Army ORSA activities. Army ORSA activities did not decline precipitately, but the growth of in-house organizations slowed and opportunities for contract work declined. At the same time, other forces, notably congressional criticism of Army contract studies and the dissatisfaction of Army leaders with the malleability of Army ORSA contractors such as RAC, led to increased efforts to replace contract ORSA work with in-house resources because they were cheaper and more controllable. Consequently, Army ORSA contractors, such as RAC, began to diversify their client list and took on projects in such diverse nonmilitary fields as the criminal justice system, public housing, and international affairs.

The Army Analytical Community Defined

The term Army analytical community was adopted by the Army Study Advisory Committee (ASAC) in its 1966 study of Army ORSA personnel requirements to describe the entire range of in-house and contract organizations engaged in analytical work for the Army.[2] As defined by the ASAC, the Army analytical community included all those Army and Army-sponsored agencies involved in conducting studies using operations research, systems analysis, cost analysis, cost-effectiveness analysis, systems engineering, and other scientific methods to conduct advanced studies aimed at improving "existing systems, comparing alternative proposals for new systems, arriving at substantial justification for professed requirements, and assessing the relative worth of systems in being."[3]

Generally, the Army agencies engaged in analytical activity can be grouped into five main categories: (1) major Army contractors designated as Federal Contract Research Centers (FCRCs), such as RAC and HumRRO; (2) other independent contractors performing analytical work for the Army; (3) internal elements of the Army Secretariat and Army Staff, such as the Office of Operations Research (OOR) in the Office of the Under Secretary of the Army and the Office of the Assistant Vice Chief of Staff; (4) Class II activities reporting to the Army Staff, such as the Strategy and Tactics Analysis Group (STAG); and (5) analytical activities in the headquarters and subordinate commands of Army major commands (MACOMs), such as the Army Materiel Command (AMC) and the Combat Developments Command (CDC).[4] Those analytical elements covered the full range of Army problem areas from the analysis of weapons performance to training methods to tactical organization and doctrine to counterinsurgency policy to management procedures. They included both in-house and contract organizations involved in studies and analyses per se; laboratories; test and evaluation agencies, field experimentation agencies, troop test units, and test controllers; war-gaming and simulation activities; headquarters for maneuvers, exercises, and training tests; management and comptroller offices; and Army Secretariat and Staff elements.

The common element that linked these disparate organizations was a "belief in development of rigorous models and application of precise measurements to the phenomena they study."[5] In one form or another, all of them used the systematic analytical method prescribed for operations research. That method included, with various permutations, the following:

1. Definition of the problem;
2. Development of a hypothesis/model and means of measuring performance/outputs;
3. Collection of data;
4. Analysis of the data, testing of the hypothesis/model, and drawing of conclusions;
5. Formulation and delivery to the decision-maker of a recommendation for action to improve existing designs, procedures, doctrines, and policies.[6]

Growth of the Army Analytical Community, 1961–1973

In March 1963, Charles J. Hitch, the assistant secretary of defense (comptroller), told attendees at the second Army Operations Research Symposium that the trend toward greater acceptance and use of analytical techniques in military decision making was not to be underestimated and that

> [g]roups of analysts are being formed and gathering experience in places where they have not existed before. In addition to the well-established centers for operations research, many smaller groups are springing up—at many levels in the Services, as adjuncts to military contractors, as small firms offering analytical facilities, in association with universities, and so on.[7]

Although it is clear that the number of analytical organizations, the number of ORSA managers and analysts, and the Army's overall expenditures on analytical studies expanded significantly during the McNamara era from 1961 to 1969, it is all but impossible to define the exact dimensions of the Army analytical community over the period 1961–1973 with any reliable degree of thoroughness and accuracy. Even the compilers of the very thorough August 1966 ASAC report were unable to state definitively the total number of organizations, professional personnel, and annual costs of the Army's ORSA program.[8]

Nevertheless, it is possible to make some rough estimates of the size and costs of the Army analytical community at various points in time during the period under consideration. In his 1967 thesis at the United

States Army Command and General Staff College, Maj. F. L. Smith noted that in addition to five "permanent contract agencies" (RAC, HumRRO, the Special Operations Research Office/Center for Research in Social Systems [SORO/CRESS], the Combat Operations Research Group [CORG], and the Stanford Research Institute [SRI]), the Army's in-house ORSA groups included some nineteen organizations in eleven different Army commands with around 203 professional personnel and annual costs of about $5,075,000.[9] We know from other sources that in 1962, RAC, the largest of the Army's FCRCs, had a staff of 418, of whom about half were professionals.[10] The 1964 review of the Army Study Program conducted by the Army's director of special studies, Lt. Gen. Charles H. Bonesteel III, identified fifty-one agencies and facilities engaged in the conduct of Army studies and analyses.[11]

The September 1965 OOR study of the Army analytical community, which was a major input to the August 1966 ASAC study of Army ORSA personnel requirements, also identified more than fifty Army agencies engaged in analytical work.[12] Detailed examination of the ASAC study itself shows that the ASAC identified more than 180 separate Army or Army-sponsored organizations involved in some way in analytical studies. Those organizations, which included Army elements in six different DOD and JCS organizations, ranged from one-man ORSA elements at some Army service schools to major contractors employing several hundred professional analysts. They included thirty elements of the Army Secretariat and Army Staff, fifty-three contractors and Class II activities, thirteen CDC activities, forty-nine AMC activities, and thirty-two other activities.[13] The ASAC estimated requirements for trained Army ORSA personnel in the summer of 1966 to be some 625 officers and 384 civilians, and that the requirements for trained Army ORSA personnel by the summer of 1970 would be some 820 officers and 652 civilians.[14] The September 1969 study of the Army Study System chaired by Army Assistant Vice Chief of Staff Lt. Gen. William E. DePuy subsequently identified twenty-five "study-capable" Army elements (three FCRCs, seven Class II agencies, ten CDC activities, and five AMC activities)—obviously *not* the entire Army analytical community—with authorizations for some 2,177 professional personnel, of whom 1,815 were on hand, as shown in Table 5–1.[15]

Thus, by the early 1970s, the number of agencies and the number of professionals involved in analytical work for the Army was large indeed. Analytical organizations ranged from major contractors, such as RAC, holding multimillion-dollar-per-year contracts to individual analysts assigned to lower-level headquarters. Although many smaller contractors and analytical agencies fell by the wayside during the Nixon-Laird retrenchment after 1969, the overall size and capability of the Army analytical community in 1973 was substantially greater than it had been when Secretary McNamara took office in 1961.

The Army Study System

In general, the various elements of the Army analytical community operated independently. However, their principal activity—the conduct of studies and analyses—was coordinated to some degree by elements of the Army Staff. In particular, the director of studies in the Office of the Assistant Vice Chief of Staff (formerly the director of special studies and later the coordinator of studies) and the chief of research and development (CRD) played key roles in establishing priorities, coordinating Army studies and analyses, overseeing the conduct of such studies, and reviewing and evaluating the results.

The Army Study System was generally decentralized and consisted of both formal and informal study efforts. The formal effort included both in-house and contract studies managed by the Army Staff, major Army commands, and the Army's principal ORSA contractors, such as RAC. The informal effort generally consisted of minor studies and analyses managed through normal staff procedures. The primary mechanism by which the Army Study System was regulated was the annual Army Master Study Program (AMSP; later renamed the Army Study Program, or TASP). As noted in the 1966 ASAC study, the AMSP presented "the rationale of the Army study system" and provided "a mechanism by which the extensive, overall study effort is correlated and integrated with appropriate Army objectives."[16]

During the 1960s and early 1970s, the Army Staff sought to refine the Army Study System and exercise greater centralized control over it. During the

period two major in-house studies of the Army Study Program were undertaken: the study directed by Lt. General Charles H. Bonesteel III in 1964 and the study directed by General William E. DePuy in 1969. As a result of improvements recommended by the two study groups, Army Staff efforts to coordinate and streamline the Army Study System and to exercise control over it achieved a degree of success.

Primary Army Staff responsibility for the Army Study System was assigned to the director of special studies, a position established on 15 September 1963.[17] Until the establishment of the Office of the Director of Special Studies, there was little coordination of the studies and analyses conducted by the various elements of the Army analytical community. As a consequence, knowledge of the studies undertaken was not widespread and their usefulness to the Army as a whole was limited accordingly.[18]

The director of special studies was charged with monitoring and reviewing "important studies affecting the readiness and capabilities of the Army" and making recommendations to the chief of staff and vice chief of staff regarding such studies.[19] Assigned tasks included coordinating and integrating the Army Master Study Program and related systems, and acting as chairman of a DA steering group of senior officers to guide, monitor,

Table 5–1—Capabilities of Principal Army Study Organizations, FY 1970

Activity/Location [HQDA Staff Monitor]	*Typical Study Area Specialty*	*Professional Personnel*		*Total FY 1970 Effort*
		Authorized	*On Hand*	
U.S. ARMY FEDERAL CONTRACT RESEARCH CENTERS				
Research Analysis Corporation (RAC), McLean, Virginia [CRD]	Combat Analysis, Economics and Costing, Logistics, Military Gaming, Science and Engineering, Strategic Studies, Unconventional Warfare	227[a]		1,800
Human Resources Research Organization (HumRRO)[b] [CRD]	Training and Behavioral Research	120		1,047
Center for Research in Social Systems (CRESS), American University, Washington, D.C. [CRD]	Military Research Concerned with Foreign Area Problems	62		756
U.S. ARMY CLASS II STUDY–CAPABLE ORGANIZATIONS				
U.S. Army Strategy and Tactics Analysis Group (STAG), Bethesda, Maryland [DCSOPS]	Strategic and Tactical Operational Planning, Evaluation, and War-gaming	40	37	744
U.S. Army Intelligence Threat Analysis Group (ITAG), Arlington Hall Station, Virginia [ACSI]	Long-Range Trend Analysis with Emphasis on USSR and PRC Military Capabilities	35	35	240
U.S. Army Logistics Doctrine, Systems & Readiness Agency[c] (LDSRA), New Cumberland Army Depot, Pennsylvania [DCSLOG]	Logistics System Concepts	137	131	396

Table 5–1—Capabilities of Principal Army Study Organizations, FY 1970—Continued

Activity/Location [HQDA Staff Monitor]	*Typical Study Area Specialty*	*Professional Personnel*		*Total FY 1970 Effort*
		Authorized	*On Hand*	
U.S. Army Field Operating Cost Agency (FOCA), Alexandria, Virginia [COA]	Cost Research	33	33	373
U.S. Army Behavioral Sciences Research Lab (BSRL), Arlington, Virginia [CRD]	Manned Systems and Human Performance Research; Military Selection Research	80	66	828
Engineer Strategic Study Group (ESSG), Washington, D.C. [OCE]	Engineer Implications of Strategic and Logistics Studies; Nuclear Weapons; Other Engineer Areas	65	57	570
Engineer Agency for Resources Inventories (EARI), Washington, D.C. [OCE]	Resources, Inventories, Data Management, Planning, and Engineering Services	41	29	348
U.S. ARMY COMBAT DEVELOPMENTS COMMAND STUDY–CAPABLE ACTIVITIES				
Combat Arms Group (CAG), Fort Leavenworth, Kansas	Concept Doctrine, Organization, and Evaluation in the Aviation, Artillery, Armor, and Infantry Areas	97	79	843
Combat Support Group (CSG), Fort Belvoir, Virginia	Concept Doctrine, Organization, and Evaluation in the Air Defense, Engineer, Military Police, Intelligence, and Chemical, Biological, and Radiological (CBR) Areas	183	149	1,650
Combat Service Support Group (CSSG), Fort Lee, Virginia	Concept Doctrine, Organization, and Evaluation in the Chaplain, Judge Advocate, Maintenance, Supply, Transportation, Medical and Admin Service Areas	220	189	2,060
Institute of Special Studies (ISS), Fort Belvoir, Virginia	High-Priority (Complex, Short Lead Time, Unusual Nature) Special Studies	65	61	651
Institute of Nuclear Studies (INS), Fort Bliss, Texas	Nuclear Weapon Effects, Targeting, and Equipment Hardening	27	15	180
Institute of Advanced Studies (IAS), Carlisle Barracks, Pennsylvania	Broad International, National, and Departmental Matters Affecting the Future Requirements for Land Warfare	32	27	212

Table 5–1—Capabilities of Principal Army Study Organizations, FY 1970—Continued

Activity/Location [HQDA Staff Monitor]	*Typical Study Area Specialty*	*Professional Personnel*		*Total FY 1970 Effort*
		Authorized	*On Hand*	
Institute of Combined Arms and Support (ICAS), Fort Leavenworth, Kansas	Combined Arms Warfare	53	49	568
Institute of Land Combat (ILC), Alexandria, Virginia	Conceptual Design and Analysis of the Land Combat System	54	64	685
Institute of Systems Analysis (ISA), Fort Belvoir, Virginia	Combat Effectiveness and Cost Analysis, Review and Development of Combat Simulation and Cost Models	115	38	605
Institute of Strategic and Stability Operations (ISSO), Fort Bragg, North Carolina	Low-Intensity Conflict Studies	58	42	456
U.S. ARMY MATERIEL COMMAND STUDY–CAPABLE ACTIVITIES				
U.S. Army Management Engineering Training Agency (AMETA), Rock Island, Illinois	Management Engineering	60	57	720
U.S. Army Logistics Management Center (ALMC), Fort Lee, Virginia	Logistics Research	39	21	468
U.S. Army Materiel Systems Analysis Agency (AMSAA), Aberdeen Proving Ground, Maryland	Materiel-Oriented Systems Analysis	209	196	2,508
U.S. Army Human Engineering Lab (HEL), Aberdeen Proving Ground, Maryland	Human Factors Research and Engineering	67	87	804
U.S. Army Maintenance Board (USAMB), Fort Knox, Kentucky	Concepts for Providing Materiel to Users	58	44	696

Source: U.S. Department of the Army, Committee to Evaluate the Army Study System, *Final Report of the Committee to Evaluate the Army Study System* (Washington, D.C.: HQDA, Sep 1969), pt. II, sec. D.

Note: Total FY 1970 study effort, given in man-months, represents only that effort dedicated to Army projects.

[a]In 1970, the entire staff, including support personnel, of RAC was 447; of HumRRO, 230; and of CRESS, 140 (see *RAC Briefing Slides ca. 1970* in box 338B, "The Research Analysis Corporation Archives," U.S. Army Military History Institute Archives, Carlisle Barracks, Pa.).

[b]Elements were located in Alexandria, Va.; Fort Knox, Ky.; Fort Benning, Ga.; Fort Rucker, Ala.; Fort Bliss, Tex.; and Fort Ord, Calif.

[c]LDSRA had approximately 1,300 man-months of professional talent available; most used in areas other than studies.

develop, and review designated studies.[20] The director of special studies also maintained liaison with OSD, JCS, the other services, and the Office of the Secretary of the Army; maintained information on the status of major studies and on study facilities and resources; conducted some analysis of the need for and priority of proposed studies; and, after August 1964, supervised the Army Study Documentation and Information Retrieval System.[21] Under director of special studies supervision, a Study Processing Group directed, monitored, reviewed, and processed special studies for the chief of staff and vice chief of staff; maintained liaison with other agencies regarding ongoing and future studies; and monitored and coordinated the overall DA study effort.[22] After February 1967, the DSS was also assisted by a special assistant who tracked developments in the international political and military fields and by the secretary of the ASAC, who handled ASAC administration.

The CRD shared with the director of special studies the Army Staff responsibility for overseeing and coordinating the studies and analyses performed by the various elements of the Army analytical community. The specific responsibilities of the CRD were related primarily to monitoring contracts for Army research conducted using Research, Development, Test, and Evaluation (RDTE) funds and overseeing the operations, including the annual work program, of the Army's principal ORSA contractors (RAC, HumRRO, and SORO/CRESS) and other analytical agencies. *AR 10–5* assigned to the CRD responsibility for "planning, coordinating, and supervising all Army research, development, test, and evaluation including review and analysis, research and development objectives, policies, and funds essential to the discharge of this responsibility" as well as responsibility for directing the activities of the Army Research Office (ARO).[23] In accordance with *AR 1–110*, the CRD was also responsible for monitoring all Army activities with RDTE implications and for reviewing and recommending for approval to the assistant secretary of the Army (research and development) all requests for ORSA studies of more than $100,000 regardless of the source of funding.[24] The CRD had authority to approve requests for studies costing less than $100,000, and he also coordinated Operations and Maintenance, Army, projects if they had RDTE implications.

ARO in Arlington, Virginia, created in January 1961, discharged the responsibilities of the CRD for supervising and coordinating the Army's research program. In the course of the 1960s, ARO became the Army's official sponsor of in-house ORSA research, providing a centralized agency to coordinate and contract out ORSA studies and to oversee ORSA contractors, and also became the principal publisher of Army ORSA publications. ARO efforts to monitor and coordinate Army ORSA studies contracts—including the operations of the Army Operations Research Steering Committee and the Project Advisory Groups established for each project or study contract—were governed by *AR 1–110*, which established overall policy guidance, procedures, responsibilities, and evaluation criteria concerning both management advisory services and ORSA studies or projects performed under contract. ARO exercised staff supervision on behalf of the CRD over a wide variety of analytical agencies, including contractors, Class II activities, and in-house elements. ARO also supervised the operations of the Army Research Office-Durham (ARO-D) at Duke University in Durham, North Carolina, which was responsible for coordinating and supporting basic research in the physical sciences and mathematics and for administering contracts with, and grants to, educational, research, and industrial agencies on behalf of the Army.[25]

On behalf of the CRD, the director of Army research also oversaw the operations of the Army Operations Research Steering Committee (AORSC), which met semiannually to oversee requirements and allocation of resources for ORSA activities and to advise the CRD on the Army's overall ORSA program.[26] The AORSC was composed of the director of Army research as chairman and a senior representative from the Office of the Special Assistant to the Secretary of the Army for Operations Research (later the deputy under secretary of the Army for operations research); the Office of the Chief of Staff; the DCSPER, the DCSOPS, and the DCSLOG; the ACSI and the ACSFOR; AMC; CDC; CONARC; and ARADCOM.[27] The AORSC met twice a year or at the call of the chairman to review the Army ORSA study program, evaluate reports and records of ORSA contractor performance, evaluate the contribution of Army ORSA, advise the CRD on the status of the Army ORSA study program,

and recommend improvements. The AORSC was something of an ad hoc group, and the permanent Army Study Advisory Committee, created in July 1964 under the director special studies, absorbed the functions of the AORSC, which was then discontinued.

AR 1–110 prescribed that an ad hoc Project Advisory Group (PAG) was to be established or designated for each project or study contract.[28] The composition of each PAG was determined by the CRD in coordination with the interested Army Staff agencies and commands with an interest in the study or project. Normally, the chairman of the PAG was the representative of the Army Staff agency or command with primary interest. The PAG monitored the project or study, facilitated it, and ensured that it was responsive to the project directive. The PAG met at least once a quarter to review the project and reports submitted by the contractor or project manager, to advise the CRD on project progress, and to provide to the study or project manager data, information on DA trends and policies, and other matters affecting the project. The PAG also served as the formal agency for review and comment on the completed study or project.

The Bonesteel Study

During the 1960s, the Army Staff conducted two major studies of the Army Study System. The study directed by General Bonesteel in 1964 and the study directed by General DePuy in 1969 were both aimed at clarifying the parameters of the Army Study System and making recommendations for its improvement. The Bonesteel study was initiated by Army Chief of Staff General Earle G. Wheeler in September 1963.[29] Acting for General Wheeler, Army Vice Chief of Staff General Barksdale Hamlett issued a memorandum in which he noted that one of the major problems facing the Army Staff was "the lack of knowledge of what studies have been completed and where they can be found for ready reference by all agencies of the Army who need to refer to them."[30] Accordingly, Director of Special Studies General Bonesteel was directed to undertake, "as a matter of priority, a study to examine the current arrangements for in-house and contractual Army studies, with a view toward developing new policies and procedures which will insure adequate control and use of the over-all Army study effort."[31] It was intended that General Bonesteel's study would be

> the basis for the establishment of a system for: evaluating requirements for new studies and recommendation as to the command or staff agency which should initiate them; the substantive review of studies by qualified agencies; reporting on, and disseminating of, all studies; effective integration of this effort with the plans-programs-budget cycle; and the establishment of appropriate study priorities.[32]

General Bonesteel was also instructed that the system he recommended should "neither unduly centralize authority at the Department of the Army nor infringe upon commander's responsibilities and authority."[33]

The Bonesteel study group completed its work and forwarded its report to the vice chief of staff on 18 May 1964.[34] The study examined major Army study activities, including strategic and planning studies as well as ORSA studies; evaluated the effectiveness of those studies as inputs to Army planning, programming, and budgeting; and recommended a number of improvements in the Army Study System, including development of a more comprehensive and timely study effort, the creation of a master study program, and improved access to and use of Army studies.[35]

The study group found that between 1962 and April 1964 some 567 studies were conducted by some thirty-six Army agencies.[36] The 567 studies included eighty-nine strategic studies, 347 development studies, ninety-one management and administration studies, and forty methodological studies and covered such diverse topics as the role of the military establishment in developing nations; elimination and consolidation of headquarters in Europe; computer simulation and gaming in logistics research; the Army role in general thermonuclear war, 1975–1985; military support of civil defense; the Army's plan for tailoring its forces for movement by air; the special warfare language-training program; machine guns for rifle platoons; the use of defoliants to support Army operations; and the long-term storage of military rations.

In its report the Bonesteel study group stated certain basic considerations that governed its more detailed conclusions and recommendations. Those considerations included:

- Study programs should remain as decentralized as feasible although a better system for providing guidance and overall integration of the study effort appears necessary.
- Any changes in the current system should be evolutionary.
- An improved study system should require no important reorganization.
- The study system should be more clearly oriented towards providing inputs to the Army planning cycle.
- The study system will profit by a better organized and universally applicable procedure for handling intelligence projections of potential conflict situations and enemy capabilities.
- The principle of net evaluations (US *vs* potential enemy) is a realistic testing device to enhance the validity of many studies and should be made more generally applicable.
- Any improved system should aim at decreasing the ratio of manpower and effort required to results obtained.
- Avoidance of duplication in the study effort should be achieved primarily by emphasizing the requirement for initiators or sponsors fully to think through and coordinate the initial descriptions of the subject, scope and method of a study rather than by attempting to control duplication by higher authority.
- Agencies initiating studies could often spend greater time and effort in defining and coordinating the statement of the problem to be studied.
- Within all segments of the Army's study system greater emphasis should be placed on integrating the potentials of science and technology with military professionalism.[37]

The study group devoted special attention to the documentation and information retrieval aspects of the Army Study System and hypothesized that "*a systematic approach* to both the *conduct of study effort* and the later *use* of the *results of study* will increase the effectiveness of Army Study Effort."[38] They found that among eight relatively independent Army study programs there were some seventeen different information flow mechanisms for their documentation. They also found the Army Study System documentation and information retrieval mechanisms to be "weak," and they studied the latest advances in library science and documentation/retrieval trends to come up with their recommendation for a "modest pilot system, to include a central reference library with a searching aid and a periodic bibliographic publication."[39]

In general, the Bonesteel study group found that there was insufficient coordination and correlation of the overall Army Study System and that, as a consequence, "there was a need for higher quality work—more professionalism and objective analysis," and "there should be wider use of study material and more efficient means of identifying subject matter and retrieving information."[40] The group also concluded that the decentralized Army Study System as it existed in May 1964 was "responsive to the needs" of its various users, but that there was

> no formal system for the exchange of study information among the various study systems, nor is there an Army-wide mechanism to allocate restricted resources to meet the increasing requirement to conduct unprogrammed studies directed by headquarters superior to that of the Department of the Army.[41]

Accordingly, the detailed recommendations of the Bonesteel study group included:

- Strengthening of the position of the DSS;
- Creation of an Army Study Advisory Committee (ASAC) to be chaired by the DSS;
- Creation of "Study Coordinators" in each Army Staff agency, educated and experienced in OR and allied study techniques, who were to advise their commander or agency head on study matters and act as the agency's point of contact on all such matters;
- Establishment of an "Army Studies Documentation and Information Retrieval System" (ASDIRS) to provide a central repository for major Army studies; periodic bibliographic catalogs;
- A number of procedural changes designed to streamline and coordinate the design, format, and dissemination of Army studies.[42]

Most of the Bonesteel study recommendations were quickly implemented, and Secretary of the Army Stanley R. Resor was able to announce four major improvements in the Army Study System in his report for FY 1965. The Army Study Advisory Committee, chaired by the director of special studies, was established on 14 July 1964 to act as the principal advisory group to the chief of staff on study matters; "study coordinators" were designated in each Army Staff section to act as their office's point of contact for studies and analyses and to assist the ASAC in the preparation of the annual Army Master Study Program; the Army Study Documentation and Information Retrieval System was set up in the Army Library; work began on the design of "a common,

realistic background against which a greater number of studies can be developed and evaluated"; and a 1965 Army Master Study Program was developed and published.[43]

The DePuy Study (Evaluation of the Army Study System)

The adoption of the recommendations of the Bonesteel study substantially improved the Army Study System, but a number of problems remained. Despite the work of the Bonesteel study group, there was still "no formal Army Study System" as such, and although a "fairly adequate 'shadow' system of management of the overall Army study efforts" was in place, there was still "some undesirable duplication of study effort," costs of many studies were too high, studies having "marginal payoff potential" were often undertaken, the study product was not fully used, and there was "an increasing trend toward relying on contractors."[44] These problems were addressed by yet another Army Staff study in 1969. On 28 April 1969, Army Chief of Staff General Westmoreland directed Assistant Vice Chief of Staff General DePuy to conduct a comprehensive evaluation of the Army Study System in the light of the budget limitations being imposed by the Nixon administration.[45] The problem to be investigated, as defined in the terms of reference, was that the Army Study System did not exist as "a single definable entity. Rather, moneys are expended and studies are conducted by a variety of sponsors. Overlaps and duplication of effort are inherently possible in such a system."[46] Accordingly, the study committee sought to examine the management and operation of the Army Study System and to recommend measures that would

> (1) enhance the effectiveness of the system at less cost, (2) make the system more responsive to needs of top Army managers, (3) identify more clearly those selected subjects of critical interest to the Army that should receive early attention, (4) insure adequate resources are assigned to priority studies, and (5) improve overall management of the Army study effort.[47]

Thus, the specific objectives of the study were to

> (1) Review the current Army study program to determine duplicative studies, studies having marginal pay-off potential, and excessively expensive studies which could be eliminated in view of the need to reduce expenditures.
> (2) Evaluate the current Army study system to assess adequacy of control mechanisms and procedures for review of results.
> (3) Establish a means of providing adequate financial visibility.
> (4) Recommend to the Chief of Staff any current study projects which should be terminated prior to their scheduled completion.
> (5) Define, for the purposes of all users within the Army Staff, the terms "Management Study," "Operations Research Study," "ADP Study," and other categories as necessary.[48]

The members of the Evaluation of the Army Study System (ETASS) study committee included Lt. Gen. DePuy as chairman, Dr. Wilbur B. Payne (then the deputy under secretary of the Army for operations research), and representatives of the DCSPER, DCSOPS, DCSLOG, ACSFOR, CRD, comptroller of the Army, CDC, and AMC.[49] They completed their work and submitted their final report in September 1969. The report covered the planning, programming, budgeting, and accounting for studies processed by the Army Staff, AMC, and CDC and reviewed the processing of both contract and major in-house studies.[50] Six subcommittees considered various aspects of the overall problem (*AR 1–110*, Summary Tables, Priority Studies, Principal Army Study Organizations, Study Service Center Concept, and Army Study Program Management).[51]

The ETASS committee identified a number of key problems, including deficiencies in the existing Army Master Study Program; adjustments required to *AR 1–110*; the lack of a common understanding of what constituted a study effort; lack of a complete listing of Army in-house study-capable organizations; insufficient knowledge of study procedures on the part of many Army Staff officers and staff officers in the major commands; insufficient cost data on studies; the significant research resources consumed by studies conducted under *AR 70–8: Behavioral and Social Sciences Research and Development* (28 April 1969) and *AR 705–5: Army Research and Development* (9 April 1968); the need for more effective application of scarce trained ORSA personnel to the Army study effort; and the need for a formal plan for developing in-house study capabilities that would offset the disadvantages of contract studies.[52]

The ETASS committee determined that the essential characteristics of any effective study system would be responsiveness (to the chief of staff or higher authority), efficiency (in terms of use of resources), flexibility (ability to change to meet new requirements or constraints), effectiveness (output meets Army requirements), and coordination.[53]

Although the ETASS committee considered all types of studies, special attention was devoted to ORSA studies and analyses. The committee noted: "The requirement for Operations Research/Systems Analysis (OR/SA) talent exceeds present and forecast availability. Thus, OR/SA skills should be pooled within major commands and Army Staff agencies, and OR/SA training within the Army school system increased, particularly at USACGSC."[54] As a result of their deliberations, the ETASS committee concluded:

a. The existing Army Master Study Program (AMSP) prepared on a calendar year basis was inadequate and should be replaced by the Army Study Program (TASP) keyed to the fiscal year.
b. *AR 1–110*, which regulated contract study support, required revision.
c. An omnibus *Army Regulation* (to be designated *AR 1–5*) was needed to "describe the Army Study System, assign broad responsibilities, and furnish a mechanism for integrating the many study efforts going on throughout the Army."
d. A detailed analysis of the ORSA Specialist Program was needed.
e. Research efforts controlled by *AR 705–5* should continue to be reviewed closely by the CRD to best use available R&D resources.
f. The improvements and changes to various regulations and directives recommended by the ETASS committee would:

(1) Lay out clear and logical procedures for arranging the Army Study System.
(2) Provide for management by exception at Chief of Staff level, thus not derogating the authority of heads of Army Staff agencies or major commanders.
(3) Greatly improve visibility of the Army study effort.
(4) Highlight priority problem areas and the studies which address them.
(5) Help insure that necessary study resources are assigned to priority studies.
(6) Expose all study programs to review.
(7) Differentiate more clearly between studies and research and development to assist Army staff agencies and major commands.
(8) Tighten up contract study approval procedures without over-centralization.
(9) Offer a vehicle by which reductions in study funding levels can be apportioned properly among Army Staff agencies and major commands or, alternatively, among study categories.
(10) Strengthen the Army Study Advisory Committee to facilitate changes in study balance and level of effort.[55]

In addition to recommending the specific changes derived directly from its conclusions, the ETASS committee also outlined procedures for selecting and announcing priority study problem areas; offered a method for illuminating priority study requirements; identified a means for displaying financial visibility to the Army study effort; and reemphasized the role of the study coordinator.[56]

As was the case with the Bonesteel study, many of the recommendations of the ETASS committee were subsequently implemented, thereby improving the Army Study System substantially. *AR No. 1–5: MANAGEMENT—Army Study System* was soon published to define the Army Study System and establish policies, procedures, and responsibilities for the management of contract studies.[57] In FY 1972, the Army Study System was extended to include other important Army commands in the United States; the study planning and programming process was modified to synchronize it with the Army budget cycle; and study projects were "defined in sufficient detail to permit evaluation of a study's value in comparison to its cost."[58] And in accordance with the ongoing trend, the OCRD continued to disengage from contract ORSA study management. During the last quarter of FY 1972, the ASAC agreed that responsibility for staffing and monitoring ORSA studies would be transferred from OCRD to the sponsors of each study on the Army Staff.[59] OCRD also negotiated an agreement with AMC to transfer responsibility for contracting ORSA studies from OCRD to the AMC Harry Diamond Laboratories.[60]

Costs of the Army Analytical Community, 1961–1973

The costs associated with the conduct of the Army Study System and other analytical activities in and for

the Army during the period 1961–1973 are difficult to determine some three decades later. In fact, as Mr. Davis of OOR told the ASAC in his February 1966 letter, they were nearly impossible to determine at the time.[61] Lack of a clear and consistent definition of what organizations were involved in analytical work and what actually constituted analytical work inhibited the determination of accurate cost data. Moreover, the costs for analytical work were seldom identified separately in Army budget documents, more often being included under the heading of research and development or some other category. Due to close congressional scrutiny and the controls provided by the Army's own financial management requirements, cost data for the four Army-sponsored Federal Contract Research Centers (RAC, HumRRO, SORO/CRESS, and AMRC) and for contractors providing analytical services to the Army are marginally better than for the multitude of Army in-house ORSA activities. The figures for FY 1964 through FY 1966 are also somewhat better due to the focus of the 1966 ASAC study on that period. However, a complete and accurate accounting of the costs of the Army analytical community during the 1960s and early 1970s must remain something of a mystery.

Despite the gaps and uncertainties, two facts emerge: Army expenditures for analytical work increased substantially over the period 1961–1968, and the bulk of the funds allocated to Army analytical work—something over 50 percent—went to contractors. At the second Army Operations Research Symposium in March 1963, Assistant Secretary of the Army for Financial Management Edmund T. Pratt, Jr., told attendees:

> The Army is currently spending more than twenty million dollars per year in operations research projects. In addition, there are other projects involving operations research but not identified as such. Of these funds approximately one-half goes to outside research corporations such as the Research Analysis Corporation, Combat Operations Research Group, Stanford Research Institute, and Planning Research Corporation. The remainder is about equally divided between in-house activities and the universities. This includes Special Operations Research Office and Human Resources Research Office contracts and work at universities throughout the country.[62]

The following year, Brig. Gen. Walter E. Lotz, Jr., the director of Army research, told attendees at the third Army Operations Research Symposium nearly the same story, noting:

> Operations Research in the Army is a big business. A recent estimate [May 1964] prepared by my office identified annual expenditures of about $11 million O&MA and $19 million RDT&E on operations research. This $30 million expenditure appears to be growing at a rate of about 7% annually. Although some of these funds support in-house operations research facilities, the great bulk of them go to contractors. In spite of these large expenditures, the demand for studies and analyses in the Army exceeds our resources. The job of seeing to it that these precious operations research resources that we have are applied to the Army's most urgent and challenging problems is a major one.[63]

The 1964 Bonesteel review of the Army Study Program estimated that during FY 1963 the Army spent a total of $29,521,000, or about one-quarter of one percent of the Army budget, on special studies, including ORSA analyses.[64] Of the total amount, $19,179,000 went for contract studies (including the Army-sponsored FCRCs and Class II activities such as STAG), and $10,344,000 went for in-house study costs.[65] The Bonesteel study report also noted that in FY 1963, Army-wide there were about 700 professional military and civilian personnel engaged in full-time in-house study activities, and they were supported by about 275 administrative personnel.[66]

The ASAC estimated that in FY 1966 the Army spent a total of about $27.7 million on ORSA activities—about $6.8 million on in-house activities and about $20.9 million on contract ORSA work.[67] This represented a ratio of 1:3, in-house to contract effort. The ASAC also noted that over the previous four years (1962–1965), the Army's in-house costs had risen at a rate of about $1 million per year, and the proposed gradual expansion of the Army's in-house ORSA capabilities would increase that rate to $4 million annually.[68] By 1968, the Army was spending more than $50 million per year on studies and analyses, but following the inauguration of President Richard M. Nixon in January 1969, the overall funding for Army analytical activities declined.[69] As Abraham Golub told attendees at the thirteenth Army Operations Research Symposium:

> Certainly the most prominent and the most critical trend impacting on Military O.R. is the decreasing defense budget. In actual purchasing power it is lower than at any time in the past quarter-century. . . . This trend

> impacts on Army Operations Research in two principal ways: First, ORSA activity will have to continue to adapt to reduced funding, and secondly the reduced funds to support new R&D starts on weapons systems and maintenance of a reasonably structured Army will require a much better analytical batting average than ever before. . . . The continuing trend toward fewer dollars to support Army Operations Research means that fewer tasks and studies can be undertaken. That will force us to be more critical and selective in choosing which one to fund. From the standpoint of quality, however, it should enable us to concentrate our best resources on the fewer but very important studies . . . we will shortly be entering an era of near-zero contractual effort.[70]

As noted above, a fair amount of reasonably accurate data is available regarding the costs of the DOD Federal Contract Research Centers (FCRCs). Throughout most of the 1960s and early 1970s there were sixteen FCRCs, of which four were managed by the Army: the Research Analysis Corporation, the Human Resources Research Office, the Center for Research in Social Systems (formerly the Special Operations Research Office), and the Army Mathematics Research Center.[71] Two others (the Applied Physics Laboratory of Johns Hopkins University and Aerospace Corporation) were managed by other services but held contracts for Army research projects. Funding for the four Army FCRCs generally increased between 1961 and 1968 but began to level out in FY 1968.[72] The estimates of Army FCRC funding are $11,600,000 in FY 1963; $17,707,000 in FY 1965 (peak); $14,200,000 in FY 1968; and $14,800,000 in FY 1969.[73] By the early 1970s, congressional criticism of the FCRC program was accompanied by significant reductions in the annual defense appropriations for the FCRCs. DOD requested $273,452,000 to fund twelve FCRCs in FY 1972, but Congress appropriated only $264,639,000.[74] The RAC budget request was reduced from $9,914,000 to $9,000,000, but the HumRRO budget request for FY 1972 remained unchanged at $4,750,000.[75] Estimates of annual RDTE funding for Army-sponsored FCRCs for selected fiscal years is given in Table 5–2.

The actual operating costs of the various Army-sponsored FCRCs are even more obscure. However, Elton Fay, writing in the 28 September 1968 issue of *Armed Forces Journal*, noted:

> An annual statement for RAC for the fiscal year 1967 shows, as an example, that of $10,581,000 for direct project costs, $5,246,547 was pay to workers, executives and others. But technical support service and expenses accounted for another $3,778,248. Computer equipment and operation for the year ran to $612,393.[76]

The 1966 ASAC report identified no fewer than forty-four contractors performing analytical work for

Table 5–2—RDTE Appropriations for Army-Sponsored FCRCs, Selected Fiscal Years, 1963–1972

FCRC	*FY 1963*	*FY 1964*	*FY 1965*	*FY 1969*	*FY 1972*
RAC	$6,550,000	$7,972,000	$8,910,000	$8,350,000	$4,980,000
HumRRO	2,867,000	3,080,000	3,105,000	3,190,000	3,600,000
SORO	947,000	920,000	979,000	1,960,000	—
AMRC	1,050,000	1,100,000	1,150,000	1,350,000	—
Other	55,000	76,000	76,000	—	—
TOTAL	$11,469,000	$13,148,000	$14,220,000	$14,850,000	$8,580,000

Source: Elton Fay, "Army Evaluates FCRCs against In-House Programs," *Armed Forces Journal* 106, no. 4 (28 September 1968), p. 13; U.S. House of Representatives, Committee on Appropriations, *Hearings on DOD Appropriations for 1965* (Washington, D.C.: Government Printing Office, 1964), p. 42; U.S. Senate, Committee on Appropriations, 92d Congress, 1st sess., *Senate Report No. 92–498: DOD Appropriations Bill, 1972* (Washington, D.C.: Government Printing Office, 1971); ASAC *Main Report*, an. B, an. 3 (Expenditures for Army Operations Research), Incl "Other" Army-sponsored FCRCs represents funding for the Army contribution to the National Academy of Sciences' Prevention of Deterioration Center.

Note: In FY 1969, the funding for Army projects at Aerospace Corporation was $1,700,000, and at Johns Hopkins University Applied Physics Laboratory it was $550,000 (see Fay, "Army Evaluates FCRCs against In-House Programs," p. 13).

the Army during FY 1964–1966.[77] The top six Army ORSA contractors in terms of annual expenditures were the Research Analysis Corporation of McLean, Virginia; the Stanford Research Institute of Menlo Park, California; Technical Operations, Inc. (parent of CORG) of Boston, Massachusetts; Booz-Allen Applied Research, Inc., of Bethesda, Maryland; American Power Jet Company of Ridgefield, New Jersey; and Operations Research, Inc., of Silver Spring, Maryland. Total Army expenditures on ORSA contracts by contractor for the period FY 1964–FY 1966 are shown in Table 5–3. Total Army expenditures on ORSA contracts by contracting agency for the same period are shown in Table 5–4. Overall Army funding for ORSA contracts during the period FY 1962–FY 1966 are shown in Table 5–5.

As was noted above, determining the full extent of Army funding for in-house ORSA work is more difficult due to the number of Army and Army-sponsored agencies doing ORSA studies and the vagaries of Army accounting for ORSA expenditures. In his 1967 MMAS thesis, Maj. F. L. Smith stated that in 1962 some nineteen Army in-house ORSA groups employed 203 professionals at an estimated annual cost of $5,075,000.[78] In terms of both the number of professional personnel and annual costs, the largest of the nineteen organizations listed was the Weapons Systems Division of the Ballistic Research Laboratories at Aberdeen Proving Ground.[79]

In its August 1966 report, the ASAC was unable to provide definitive information on the full costs of Army in-house ORSA work for the reasons already mentioned. The ASAC did, however, report the response of ten Army in-house ORSA activities at the November 1965 request of the chief of research and development.[80] Table 5–6 displays the data provided by the ten respondents.

Conclusion

Spurred on by the increased demand for accurate data, systematic analysis, and scientific decision making by Secretary of Defense McNamara and the Whiz Kids in the Office of the Secretary of Defense, the Army analytical community, broadly defined, increased steadily in both size and importance during the period 1961–1969. Both the Army's in-house and contract ORSA organizations and the personnel and fiscal resources dedicated to them expanded substantially, and the need for rigorous scientific analysis came to be recognized generally throughout the Army. At the same time, the Army Study System was systematically reviewed and improved, its governing regulations were clarified and updated, and its organization and administrative procedures streamlined. By the time the Nixon administration took office in January 1969 and initiated a retrenchment in military expenditures generally and in Army ORSA funding specifically, all elements of the Army analytical community had enjoyed a period of unparalleled growth and had reached a level that ensured their continued viability even in a period of reduced funding and de-emphasis.

Table 5–3—Department of the Army Expenditures on ORSA Contracts by Contractor, FY 1964–FY 1966

Company	*FY 1964*	*FY 1965*	*FY 1966*
American Institute for Research	$0	$43,685	$0
American Power Jet Company	79,989	593,949	399,469
American Research Corporation	0	300,063	40,802
Ballistic Analysis Laboratory, JHU	225,000	200,000	225,000
Bendix Corporation	0	500,000	0
Booz-Allen Applied Research, Inc.	983,132	729,852	1,021,238
Braddock, Dunn & McDonald, Inc.	0	48,000	77,195
Case Institute of Technology	20,805	20,805	20,805
City University of New York	0	18,943	20,264
Communications Systems, Inc.	34,000	0	0
Computer Usage Company	0	74,984	0
Cornell Aeronautical Laboratory	338,519	86,000	384,189
Davidson, Talbirdy, McLynn, Inc.	0	116,948	0
Defense Research Corporation	0	40,000	0
Denver Research Institute	0	0	118,146
Douglas Aircraft Company	0	89,500	0
Franklin Institute	96,771	98,573	0
Georgia Institute of Technology	174,462	124,000	0
Historical Evaluation Research Organization	79,302	91,256	0
Hudson Institute	0	30,000	0
IBM Corporation	289,944	0	0
Litton Systems	0	204,716	0
Lockheed Aircraft Corporation	0	0	98,400
M Tech Corporation	0	10,000	0
Marcom, Inc.	0	55,000	0
Martin-Marietta Corporation	0	0	488,000
Massachusetts Institute of Technology	30,000	30,000	30,000
Northrop Corporation	332,000	452,500	100,000
Northwestern University	32,825	32,825	32,819
Ohio State University Research Foundation	73,000	77,000	77,000
Operations Research, Inc.	763,391	358,520	349,403
Peat, Marwick, Caywood Schiller	85,000	88,700	89,900
Philco Corporation	0	189,953	0
Planning Research Corporation	195,089	320,575	196,395
Research Analysis Corporation	7,972,000	8,910,000	9,200,000
Research Triangle Institute	15,781	28,549	28,852
Stanford Research Institute	3,579,381	4,749,057	4,834,000
Technical Operations, Inc.	1,584,000	2,625,000	2,595,000
Tempo	0	39,950	0
University of California, Berkeley	42,966	42,966	42,966
University of Michigan	0	0	24,072
University of Pennsylvania	333,000	353,000	360,000
URS Corporation	68,000	56,000	0
University of Oklahoma Research Institution	98,000	98,000	0
TOTAL	$17,526,357	$21,928,869	$20,853,915

Source: ASAC *Main Report*, an. B, an. 3, Incl. Includes both RDTE and OMA funding. An unknown amount was also paid to Kaman Nuclear Corporation.

Table 5–4—Department of the Army Expenditures on ORSA Contracts by Contracting Agency, FY 1964–FY 1966

Agency	*FY 1964*	*FY 1965*	*FY 1966*
Deputy Chief of Staff for Personnel	$115,000	$138,635	$0
Assistant Chief of Staff for Intelligence	0	500,000	0
Deputy Chief of Staff for Military Operations	114,789	372,804	77,431
Deputy Chief of Staff for Logistics	0	172,984	78,516
Chief of Research and Development	9,965,758	11,208,088	11,339,778
Chief of Communications-Electronics	271,233	124,000	0
Chief of Engineers	0	383,000	100,000
Army Air Defense Command	0	0	660,341
Army Materiel Command	1,336,989	1,577,193	1,681,958
Combat Developments Command	5,722,588	7,452,165	6,915,891
TOTAL	$17,526,357	$21,928,869	$20,853,915

Source: ASAC *Main Report*, an. B, an. 3, Incl. Includes both RDTE and OMA funding.

Table 5–5—Total Department of the Army ORSA Contract Funding, FY 1962–FY 1966

Type	*FY 1962*	*FY 1963*	*FY 1964*	*FY 1965*	*FY 1966*
RDTE	$11,011,305	$10,613,915	$14,837,536	$17,865,127	$14,034,469
OMA	4,890,020	4,853,315	2,688,821	4,063,742	6,819,446
TOTAL	$15,901,325	$15,467,230	$17,526,357	$21,928,869	$20,853,915

Source: ASAC *Main Report*, an. B, an. 3, Incl, p. 9, and an. 4, Incl 2, p. 1.

Note: The totals for FY 1964–FY 1966 in the cited passages are incorrectly added.

Table 5–6—Army In-House ORSA Activities, December 1965

Organization (Sponsor)	*Authorized Strength*		*Fund Type*	*FY 1964*	*FY 1965*	*FY 1966*
	Officers	*Civilian*				
U.S. Army Strategy and Tactics Analysis Group (DCSOPS)	62	85	OMA	$2,536,745	$1,657,979	$1,601,569
U.S. Army Ballistic Research Laboratories (AMC)	12	189	RDTE	2,490,000	3,005,000	3,245,000
Weapons Operations Research Office, WECOM (AMC)	0	8	OMA	76,000	98,000	101,000
Project Manager Overseer (Project 58A) (AMC)	0	10	RDTE	0	17,000	17,000
Army Aviation Materiel Command (AMC)	0	8	OMA	24,152	74,665	15,331
OR Branch, Future Missile Division, Redstone Arsenal (AMC)	0	14	RDTE	450,000	500,000	600,000
SMC Support Center, Frankford Arsenal (AMC)	0	8	OMA	81,000	115,000	148,000
OR Group, Edgewood Arsenal (AMC)	5	23	RDTE	309,000	464,000	451,000
Analysis Branch, CD Division, G–3, HQ ARADCOM (ARADCOM)	15	10	OMA	126,255	124,417	79,009
Engineer Strategic Study Group (COE)	13	50	OMA	556,000	560,000	590,000
TOTAL RDTE				3,249,000	3,986,000	4,313,000
TOTAL OMA				3,400,152	2,630,061	2,534,909
TOTAL	107	405	—	$6,649,152	$6,616,061	$6,847,909

Source: Maj F. L. Smith, *A History of the U.S. Army in Operations Research*; MMAS thesis (Fort Leavenworth, Kans.: U.S. Army Command and General Staff College, 22 May 1967), pp. 1–2.

Note: The figures given in an. B, an. 4, Incl 2, p. 2, are somewhat different (FY 1964: $6,094,000; FY 1965: $6,079,000; and FY 1966: $5,504,000). In any event, the OMA and grand totals given at ASAC *Main Report*, an. B, an. 3, p. 2, are added up incorrectly.

CHAPTER FIVE NOTES

[1] Clark A. Murdock, *Defense Policy Formation: A Comparative Analysis of the McNamara Era* (Albany, N.Y.: State University of New York Press, 1974), p. 77. The signs of coming change were recognized early on. In November 1968, the commanding general of the Army Materiel Command, Lt. Gen. William B. Bunker, told attendees at the AMC Systems Analysis Symposium that President Nixon had already "indicated that he would reduce the importance of systems analysis in the Department of Defense and return more of the decision-making authority and responsibility to the military" (see Abraham Golub, "Present & Future ORSA Trends—A Forecast for the US Army," in *Proceedings of the Thirteenth Annual United States Army Operations Research Symposium [AORS XIII], 29 October–1 November 1974, Fort Lee, Virginia, Volume I* [Fort Lee, Va.: U.S. Army Concepts Analysis Agency, 1974], p. 15).

[2] U.S. Department of the Army Study Advisory Committee (ASAC), *Main Report: Army Study Advisory Committee Examination of the Army's Operations Research/Systems Analysis Personnel Requirements* (Washington, D.C.: Office of the Director of Special Studies, Office of the Chief of Staff, HQDA, 30 Aug 1966) (cited hereafter as ASAC *Main Report*), an. B (Operations Research in and for the Army), an. 4, Incl (The Army Analytical Community), pp. 1–3. The term "Army analytical community" was apparently first used by Davis in "US Army OR—1965," a study completed in September 1965 in the Office of Operations Research (OOR), Office of the Under Secretary of the Army. Davis' original 1965 study has not been found, but an. B of the ASAC *Main Report* appears to be that study in its entirety.

[3] Ibid., p. 1.

[4] The analytical offices in the Army Secretariat and Army Staff were discussed above in ch. 3. The FCRCs and other contractors are discussed in ch. 6. The Class II activities, MACOM elements, and other Army analytical groups are discussed in ch. 7. The designation of Federal Contract Research Center (FCRC) was changed officially in 1967 to Federally Funded Research and Development Center (FFRDC) but for convenience the more common acronym of FCRC is used throughout this work.

[5] Gerald R. Wetzel, *Analysis of Balance: An Allocation of Officer Resources to Maximize Efficiency of Operations Research in the Army*, MBA thesis (Washington, D.C.: George Washington University, 30 Sep 1969), p. 7.

[6] ASAC *Main Report*, an. B, an. 4, Incl, pp. 2–3.

[7] Charles J. Hitch, "Operations Research in the Office of the Secretary of Defense," in *Proceedings of the [Second] United States Army Operations Research Symposium, 26, 27, 28 March 1963, Durham, North Carolina, Part I* (Durham, N.C.: Operations Research Technical Assistance Group, U.S. Army Research Office-Durham, 1963), p. 8. Hitch's paper was read at the symposium by Russell Murray, systems analysis consultant to the Office of the Assistant Secretary of Defense (Comptroller).

[8] The difficulties of making an accurate assessment were addressed by Davis of the Office of Operations Research, Office of the Under Secretary of the Army, in a 7 February 1966 letter to the ASAC (see ASAC *Main Report*, an. B, an. 4, Incl 2 [Ltr, Mr. Davis {OOR}, 7 Feb 1966, sub: Data on In-House and Contractual Operations Research]). Davis found that it was difficult to identify all the Army elements comprising the Army analytical community; that many of the study-producing organizations that were identified did not respond to requests for personnel and cost data; and that the personnel and cost data that were available were seriously understated (for example, costs did not include pay and allowances, travel, training costs, data-processing support, publication costs, etc.).

[9] Maj F. L. Smith, *A History of the U. S. Army in Operations Research*, MMAS thesis (Fort Leavenworth, Kans.: U.S. Army Command and General Staff College, 22 May 1967), pp. 70 and 72, Table I.

[10] U.S. House of Representatives, 87th Congress, 2d sess., Committee on Science and Astronautics, *Staff Study: Independent Nonprofit Federal Research Contractors* (Washington, D.C.: Government Printing Office, 1963), pp. 3–4 (cited hereafter as Beresford Memorandum). By way of contrast, the same report indicated that RAND Corporation, sponsored by the Air Force, had a staff of 1,036 and that the Institute for Defense Analyses, an OSD-sponsored organization, had a staff of 357.

[11] U.S. Department of the Army, Office of the Chief of Staff, Director of Special Studies, *The Army Study System: A Staff Study by the Director of Special Studies, Office of the Chief of Staff, United States Army* (Washington, D.C.: Director of Special Studies, Office of the Chief of Staff, HQDA, May 1964), I, an. B, pp. 111–15 (cited hereafter as Bonesteel Study).

[12] ASAC *Main Report*, an. B, an. 4, Incl, p. 4.

[13] Ibid., an. B, passim, and an. C (Requirements for OR/SA Personnel), Table C–1 (Consolidated OR/SA Personnel Requirements). See also Table 4–1, above.

[14] Ibid.

[15] U.S. Department of the Army, Committee to Evaluate the Army Study System, *Final Report of the Committee to Evaluate the Army Study System* (Washington, D.C.: HQDA, Sep 1969) (cited hereafter as ETASS), pt. II, sec. D (Capabilities of Principal Army Study Organizations Subcommittee Report), pp. II–D–1 to II–D–16. The DePuy (ETASS) study did not mention either the Army Mathematics Research Center at the University of Wisconsin in Madison or the Combat Operations Research Group (CORG) at HQ CDC.

[16] ASAC *Main Report*, p. 4.

[17] U.S. Department of the Army, Office of the Chief of Staff, *Chief of Staff Memorandum No. 63–105: Terms of Reference for Director of Special Studies, Office of the Chief of Staff, U. S. Army* (Washington, D.C.: Office of the Chief of Staff, HQDA, 15 Aug 1963), p. 1. The mission, functions, organization, and subsequent evolution of the Office of the Director of Special Studies are discussed in detail in ch. 3 above. With the establishment of the Office of the Assistant Vice Chief of Staff of the Army (OAVCSA) in February 1967, the director of special studies was redesignated the director of studies, and the Directorate of Studies was placed under the AVCSA. In May 1969, the Directorate of Studies was reorganized, and the director of studies became the coordinator of Army studies, chief of the Study Processing Group, and deputy chairman of the Army Study Advisory Committee. The bulk of the functions previously originally assigned to the director of studies remained the same throughout the period.

[18] U.S. Department of the Army, Office of the Secretary of the Army, "Annual Report of the Secretary of the Army for Fiscal Year 1967," in U.S. Department of Defense, *Department of Defense Annual Report for Fiscal Year 1967 Including the Annual Reports of the Secretary of Defense, Secretary of the Army, Secretary of the Navy, and Secretary of the Air Force* (Washington, D.C.: Government Printing Office, 1969), p. 201.

[19] *CSM No. 63–105*, par. 2.

[20] U.S. Department of the Army, *Army Regulation No. 10–5: ORGANIZATION AND FUNCTIONS—Department of the Army* (Washington, D.C.: HQDA, Aug 1964), par. 27.

[21] Ibid., May 1965, par. 26.

[22] "Annual Report of the Secretary of the Army for Fiscal Year 1967," p. 201.

[23] The specific responsibilities of the CRD were prescribed in *AR 10–5*, May 1965, par. 35, and subsequent changes and editions. The mission, functions, and organization of the Office of the Chief of Research and Development are discussed in detail above in ch. 3.

[24] U.S. Department of the Army, *Army Regulations No. 1–110: ADMINISTRATION—Contracting for Management Advisory Services and Operations Research Studies and Projects* (Washington, D.C.: HQDA, 28 Jun 1961, with subsequent changes and revisions), par. 9.

[25] The organization and functions of ARO-D and its subordinate activity, the Operations Research Technical Assistance Group (ORTAG), which provided assistance on OR questions to Army elements and ran the annual Army Operations Research Symposia (AORS), are discussed in vol. I, ch. 3, and in ch. 7, below.

[26] See *AR 1–110*, 28 Jun 1961, with *Change 1* (28 May 1963) and *Change 2* (4 Jun 1964); and ASAC *Main Report*, an. B, pp. 11–12.

[27] *Change 1* (28 May 1963) to *AR 1–110*, par. 11.

[28] Ibid., par. 13. The PAG is discussed in greater detail in vol. I, ch. 2. On the composition and functions of the PAG, see also Bernard Brenman, "Contractual Research Management," *Army Management Views* XV, no. 1 (1970), pp. 147–50; George C. Muir, Jr., "Management of OR/SA Studies," *Army Management Views* XV, no. 2 (1970), pp. 146–49; and Russell D. McGovern, "Management of Operations Research and Systems Analysis Studies," *Army Management Views* XIII, no. 2 (December 1968), pp. 39–43. After 1969, the PAGs were redesignated as Study Advisory Groups (SAGs).

[29] U.S. Department of the Army, Office of the Chief of Staff, Memorandum for the Director of Special Studies, Washington, D.C., 10 Sep 1963, sub: Army Studies.

[30] Ibid., p. 1.

[31] Ibid.

[32] Ibid.

[33] Ibid.

[34] U.S. Army, Office of the Chief of Staff, Director of Special Studies, *The Army Study System: A Staff Study by the Director of Special Studies, Office of the Chief of Staff, United States Army*, 3 vols. (Washington, D.C.: Director of Special Studies, Office of the Chief of Staff, HQDA, May 1964).

[35] Ibid., vol. I, Abstract.

[36] Ibid., vol. III, an. D (Bibliography of Current Major Army Studies), 1962 to date.

[37] Ibid., vol. I, pp. 49–51.

[38] Ibid., vol. II, an. C (Study Documentation and Information Retrieval Plan), p. I. Emphasis in original.

[39] Ibid., pp. v–viii.

[40] U.S. Department of the Army, Office of the Secretary of the Army, "Annual Report of the Secretary of the Army for Fiscal Year 1965," in U.S. Department of Defense, *Department of Defense Annual Report for Fiscal Year 1965 Including the Annual Reports of the Secretary of Defense, Secretary of the Army, Secretary of the Navy, and Secretary of the Air Force* (Washington, D.C.: Government Printing Office, 1967), p. 178.

[41] Bonesteel Study, vol. I, pp. 30–31.

[42] Ibid. The detailed conclusions are to be found in Bonesteel Study, vol. I, pp. viii–xiii.

[43] "Annual Report of the Secretary of the Army for Fiscal Year 1965," pp. 178–79. See also ASAC *Main Report*, an. B, an. 4, Incl 1, p. 9.

[44] ETASS, pt. I, p. 1.

[45] U.S. Department of the Army, *Chief of Staff Memorandum No. 69–178*, Washington, D.C., 28 Apr 1969, sub: Evaluation of the Army Study Program (ETASS). See also Ltr, HQDA, Office of the Adjutant General, Washington, D.C., 29 Apr 1969, sub: Evaluation of the Army Study System. The resulting study was generally known by the acronym ETASS (Evaluation of the Army Study System).

[46] *CSM No. 69–178*, par. 4a.

[47] ETASS, pt. I, p. 1.

[48] *CSM No. 69–178*, par. 4b.

[49] For a full list of the committee members, see ETASS, pt. IV, an. K, p. 1.

[50] ETASS, pt. I, p. ii.

[51] Ibid., pt. IV, an. K, p. 2.

[52] Ibid., pt. I, pp. 5–9.

[53] Ibid., 6, Chart 2 (Essential Characteristics of an Effective Study System).

[54] Ibid., pt. II, sec. A (Major Issues and Tasks), par. 7.

[55] Ibid., pt. I, pp. 9–12. See also the individual subcommittee recommendations at ETASS, pt. I, p. 14, Chart 4 (ETASS Subcommittee Recommendation).

[56] Ibid., p. ii. The formal ETASS recommendations are at ETASS, pt. I, p. 12.

[57] *AR 1–5* was later superseded by the series of *AR 5–5: MANAGEMENT—Army Studies and Analyses*, the most recent of which was effective 31 July 1996.

[58] U.S. Army Center of Military History, *Department of the Army Historical Summary, Fiscal Year 1972*, William Gardner Bell, ed. (Washington, D.C.: U.S. Army Center of Military History, 1974), p. 116.

[59] Ibid., pp. 167–68.

[60] Ibid., p. 168.

[61] ASAC *Main Report*, an. B, an. 4, Incl 2.

[62] Edmund T. Pratt, Jr., "Challenges In Army Operations Research," banquet address, 26 Mar 1963, in *Proceedings of the [2nd] United States Army Operations Research Symposium*, p. 91.

[63] Brig. Gen. Walter E. Lotz, Jr., introduction of the keynote speaker, Dr. Wilbur B. Payne (special assistant for operations research, Office of the Assistant Secretary of the Army for Financial Management), in *Proceedings of the [Third] United States Army Operations Research Symposium, 25, 26, 27 May 1964, Rock Island, Illinois, Part I—Unclassified Papers* (Rock Island, Ill.: Operations Research Technical Assistance Group, U.S. Army Research Office-Durham, 1964), p. 4. In a paper presented at the twenty-fourth national meeting of the Operations Research Society of America, M. C. Yovits, the executive director of the Military Operations Research Symposium, and M. N. Chase of CORG estimated that the U.S. Navy spent around $47 million on operations research in FY 1964 and that overall DOD expenditures were probably about $160 million, with more than 5,000 full-time professional scientists engaged exclusively in military operations research. At the same time, civilian operation research activities involved expenditures of roughly $56 million per year, with some 1,800 professionals (see M. C. Yovits and M. N. Chase, "The Role of the Military Operations Research Symposia [MORS] in the Operations Research Community," paper presented at the twenty-fourth National Meeting of the Operations Research Society of America, 7–8 Nov 1963, p. 1).

[64] Bonesteel Study, I, p. 25.

[65] Ibid., pp. 25–26.

[66] Ibid., p. 26.

[67] ASAC *Main Report*, p. 5.

[68] Ibid.

[69] Raymond P. Singer, "U.S. Army Training in OR/SA," in *7th United States Army Operations Research Symposium—Preprints: Unclassified Contributed Papers* (Durham, N.C.: U.S. Army Research Office-Durham, 1968), p. 157.

[70] Golub, "Present & Future ORSA Trends—A Forecast for the US Army," p. 19.

[71] Elton Fay, "Army Evaluates FCRCs against In-House Programs," *Armed Forces Journal* 106, no. 4 (28 September 1968), p. 13.

[72] Ibid., p. 14.

[73] Ibid.

[74] John Maffre, "Defense Report/Congress presses Pentagon to phase out 'think tanks,' shift emphasis to in-house R and D," *National Journal* (12 November 1971), pp. 2421 and 2426.

[75] Ibid. The totals include both RDTE and OMA funding.

[76] Fay, "Army Evaluates FCRCs against In-House Programs," p. 14.

[77] ASAC *Main Report*, an. B, an. 3, Incl.

[78] Smith, *A History of the U. S. Army in Operations Research*, p. 72, Table I.

[79] Ibid. In 1962, the Weapons Systems Division had forty professional employees engaged in ORSA work and annual costs of $1 million.

[80] ASAC *Main Report*, an. B, an. 3. Only ten of the twenty-eight Army Staff agencies and major commands queried responded to the OCRD request. The Combat Developments Command reported no in-house activities, and the Army Materiel Command provided information on selected activities.

CHAPTER SIX

The Army Analytical Community, 1961–1973 Part II: Army ORSA Contractors

During the 1960s the Army steadily expanded its in-house operations research and systems analysis (ORSA) capabilities and significantly increased the number of uniformed ORSA analysts and managers. Even so, it continued to rely on ORSA contractors for the bulk of its analytical requirements, and Army ORSA contractors absorbed about two-thirds of the available funding for Army ORSA operations during the period 1961–1973. Although there was spirited debate within the Army over the relative merits of contract and in-house ORSA operations, the principal Army ORSA contractors, such as the Research Analysis Corporation (RAC), the Human Resources Research Office (HumRRO), the Special Operations Research Office/Center for Research in Social Systems (SORO/CRESS), the Combat Operations Research Group (CORG), and the Stanford Research Institute (SRI), as well as a host of smaller ORSA contractors prospered. By the late 1960s, however, reduced military budgets, Army dissatisfaction with contractor performance, congressional restrictions on the use of contractors, and the effects of the Vietnam War began to erode the position of the large Army ORSA contract organizations such as RAC. In September 1972, RAC was sold to the General Research Corporation (GRC) and the special relationship that had existed for nearly a quarter of a century between the Army and the Operations Research Office (ORO) and its successor, RAC, was dissolved. SORO/CRESS also went out of business, as did many of the smaller Army ORSA contractors. Nevertheless, the contracting out of analytical tasks remained one of the principal methods by which the Army filled its requirements for ORSA support.

Contract versus In-House Capabilities

Even before the Kennedy administration took office in January 1961, Congress as well as some Army leaders had begun to question the wisdom of contracting out studies and analyses of key Army research and development problems. Issues such as the timeliness of contract studies, the failure of contractors to focus on immediate Army problems, the cost of such studies, and the ability of Army authorities to control contractors were raised and contributed to the demise of the Operations Research Office and its replacement by the Research Analysis Corporation after January 1961. The pressures on the Army Secretariat and Army Staff to respond quickly to the many demands from the Office of the Secretary of Defense for data and analyses led to the decision of the Army leadership to enhance the Army's in-house ORSA capability by increased training and education and the creation of a career program for Army officers qualified as ORSA managers and analysts. As the tempo and visibility of contract ORSA work increased during the 1960s, Congress began to examine closely the practice of contracting out ORSA studies, particularly the use of the Federal Contract Research Centers (FCRCs), and to restrict contract studies in various ways.[1] Thus, the preexisting trend toward improving the Army's in-house ORSA capability and reducing reliance on contractors was reinforced by congressional interest and reduced funding.

Soon after taking office, President Kennedy directed a committee chaired by Director of the Bureau of the Budget David E. Bell to prepare a report on contracting for research and development by the federal

government. The so-called Bell report was submitted to the president on 30 April 1962 and released to the public on the following day.[2] The Bell study committee found that about 80 percent of government research and development studies were conducted by non-federal institutions, including private industry, universities, and independent not-for-profit organizations.[3] While the members of the Bell committee recognized the advantages of using such organizations to conduct government studies (including availability, competence, objectivity, and freedom from the restrictions of federal employment regulations), they also noted the potential pitfalls, including costs, competition with the civil service and private industry, inefficiencies and management deficiencies, conflicts of interest, lack of control and focus, and "the hazard to objectivity in close identification of the not-for-profit with a particular agency's concerns."[4] The Bell committee also recognized that the not-for-profit research organizations, such as RAC, had served "to bridge gaps between Government and industry, compensating for Government difficulties in recruiting top technical talent for in-house planning, evaluation, and management, and for industry deficiencies in meeting exacting Government requirements."[5] Thus, in the end they concluded:

> The present intermingling of the public and private sectors is in the national interest because it affords the largest opportunity for initiative and the competition of ideas from all elements of the technical community. Consequently, it is our judgment that the present complex partnership between Government and private institutions should continue.[6]

But despite their endorsement of the existing arrangements, the Bell committee also warned of the problems associated with extensive reliance on non-government organizations for research and development, stating: "There are certain functions which should under no circumstances be contracted out, specifically the determination of the types of research and development to be done, when, by whom and at what cost; the supervision of performance; and the evaluation of results."[7]

As a result of the Bell report, the Army adopted several management improvements, including revised procurement practices, better methods for evaluating contractor performance, and new standards of conduct to prevent unfair competition and conflicts of interest.[8] Improvements in DOD in-house research facilities were also put into effect: the technical directors of DOD laboratories were given greater control of the work and supervision of their operations was reduced; salaries for professional personnel were increased; and more emphasis was placed on training and educational programs for professional personnel.[9]

The Bell committee noted that there were sound reasons for the payment of fees to not-for-profit contract research organizations and that their "corporate integrity ought to be preserved and a degree of financial independence assured, both by diversity of clients and by adequate fees."[10] But industry and Congress both objected to the use of not-for-profit research corporations for "systems management and technical direction," and as Herbert Roback noted:

> When conditions are not so favorable, as when the competition for the research and development dollar becomes more fierce, then the not-for-profit corporations are more exposed to the vicissitudes of the budgetary process, the complaints of industry, and the spotlight of Congressional investigations. . . . Constraints on the size of the not-for-profit organizations are imposed by competitive pressures in industry, by Congressional responses in the way of restrictive language in committee reports and legislation, and by organizational self-discipline. . . . So long as the not-for-profits are confined to analytic studies, operations research and other technical services conducted in close collaboration with sponsoring Government agencies, industry is not necessarily a critic and indeed may become the production beneficiary of the weapon or space system which may result from these intellectual labors.[11]

As the Bell report acknowledged, the FCRCs, such as RAC, HumRRO, and SORO/CRESS, played an important role in bridging the gap between government and industry and in providing technical expertise otherwise difficult for the government to obtain.[12] Although the unique advantages of the FCRCs (their relative independence, their availability and flexibility, and their stock of expert knowledge in pertinent fields) were generally recognized, there was opposition to their continued existence. Although each of the services began to develop its own in-house ORSA capabilities in the early 1960s, as late as 1968 the Army still contracted out about 80 percent of its total ORSA effort.[13] As Elton Fay wrote in the 28 September 1968 issue of the *Armed Forces Journal*: "The Army is in the painful

process of developing its own 'in-house' capability for 'think tank' type studies now done under contract to Federal Contract Research Center organizations. However, officials feel the full development of this in-house capability is at least ten years away."[14]

Opinion, both inside and outside the Army, varied widely on the relative merits and defects of in-house versus contract ORSA studies. Most commentators agreed that contractors such as RAC had done "good and valuable work," but others denounced the use of contractors for research and development studies altogether.[15] Some decried the "proliferation of meaningless studies" done on contract and argued that the DOD and the Army would be better served if they were to "sit back and evaluate major studies that have been completed."[16] Others pointed out the value of continuity represented by a permanent in-house staff familiar with the organization's continuing problems. Speaking at the first Army Operations Research Symposium in 1962, Dr. Herbert P. Galliher, the associate director of the Operations Research Center of the Massachusetts Institute of Technology, told his audience that the Army should do its own operations research, primarily to ensure adequate coordination among the decision maker, the researcher, and those responsible for implementing any decisions made as a result of the study.[17] At the other end of the spectrum were senior military officers, such as General Chesarek, who told his oral history interviewers in 1971:

> I think one of the best things that we have ever gone into are contract studies. Here you have a different approach, new views and visions. We are less nailed to military thought. Open ourselves up to innovation, which is the hand-maiden of future success. And we shouldn't expect to get this sort of service for free. . . . I think if anything, we've been too timid in our contractual approach. . . . Let's face it, your in-house capability is largely already compromised before the study begins.[18]

General Chesarek's approval of the Army's contracting out of research and analyses was echoed by no less a figure than General Maxwell D. Taylor, who valued the FCRCs for being on the cutting edge of thinking about defense issues.[19]

In general, however, most commentators expressed the opinion that the Army needed to maintain both a contract and an in-house ORSA study capability. As DOD Comptroller Charles J. Hitch wrote in *Operations Research* in early 1963:

> The marriage of practical military experience with operations-research techniques is more easily accomplished when the analyst is a member of an "in-house" OR group . . . there is a need both for an "in-house" and an outside OR capability and that, of course, is what we now have, although we have always to keep under review the appropriate balances between them.[20]

The Army Study Advisory Committee (ASAC) also considered the advantages and disadvantages of contract versus in-house studies in their August 1966 report on Army ORSA personnel requirements.[21] Among the advantages of contract support cited by the ASAC were its flexibility, its diversity, and the freedom of contractors to say no to unsuitable projects.[22] On the other hand, the ASAC found that there were "some potential advantages that could result from having a larger part of the Contract Agency Study Program in-house," including greater continuity of effort, the greater involvement of military personnel with their special perspective on Army problems, better access to data, and the ability to use in-house ORSA analysts as temporary staff for ad hoc study groups, a practice that the comptroller general had ruled inadmissible with respect to contractor personnel.[23] The ASAC also noted that there was "no obvious reason why in-house research agencies cannot be created that preserve many of the advantages we have noted in our past use of contractors."[24] However, the ASAC found little evidence to "support a view that in-house agencies would be cheaper . . . in-house and contractor agencies must have about the same support and overhead costs."[25] The ASAC thus concluded:

> We do not believe it desirable to plan for an exclusively in-house system. One reason for this is that there may be certain infrequent specialized requirements that can most efficiently be met by contract. Another is the belief that the diversity and competition that is characteristic of the present system have been generally beneficial. A third is that in the absence of precise ways to project future need or to measure the potential value of research that cannot be done for lack of resources, there is a continuing need for contract augmentation to permit rapid expansion of research in particular areas.[26]

Nevertheless, the ASAC recommended that the Army develop plans "for transition to greater reliance on

in-house resources" and that the Army commit itself, in both policy and fact, to recognition of "the scientific and professional character of Operations Research."[27] The committee then went on to state:

> This [commitment by the Army] has two important facets. The general standards and ethics applicable to professionals must be recognized and accepted. Second, personnel policies must be formulated and research programs so managed that the jobs available are attractive to creative, highly educated specialists strongly motivated to research.[28]

By the mid-1960s, Congress began to subject the DOD contracting of research, and the FCRCs in particular, to closer scrutiny and increasing restrictions. In part, this increased interest was prompted by congressional displeasure with specific FCRC projects, such as the "strange and ultra-expensive development" of the so-called McNamara Line sensor barrier in Vietnam.[29] On the whole, however, congressional criticism focused on issues of cost; contract management; undue influence; conflicts of interest; the salaries of FCRC professional personnel; the assumption that FCRC functions could be performed equally well by in-house or other agencies; and the idea that defense funds might better be spent on the development of greater in-house capability rather than on FCRC studies. Accordingly, in 1964 Congress imposed a ceiling on FCRC funding, although it was not enforced until 1967.[30]

No doubt the Congress was spurred to criticize the FCRCs by agencies and individuals interested in preserving and expanding civil service employment and by private industry firms interested in obtaining their share of the lucrative research and development consulting budget. The Congress had long suspected that the use of contracts with not-for-profit research organizations was simply a means for the DOD to avoid the restrictions of the civil service salary scales and work rules. Such suspicions were reinforced by organizations such as the American Federation of Government Employees, which in August 1961 in a statement to the House Armed Services Committee expressed its concerns over the contracting of federal government work to private business.[31] Private business also complained about the not-for-profit research organizations. For example, the National Council of Professional Service Firms in Free Enterprise, formed in Los Angeles in the late 1960s to promote the interests of for-profit research firms, management consultants, and other private contractors, criticized not only the FCRCs but also expressed concern about the expansion of military in-house analysis capabilities rather than relying on the private sector.[32] In addition, there was also a strain of congressional distaste for ORSA in general that echoed the resistance of traditional military officers to the new emphasis on systems analysis and cost-effectiveness analysis introduced by Secretary McNamara. On 4 September 1968, a subcommittee of the House Armed Services Committee reported:

> Although the sub-committee recognizes that systems analysis can be a useful tool to aid in reaching decisions and making judgments, it is also aware that in the highly complex problem of force planning it can be extremely dangerous, if used as a substitute for subjective analysis and informal reasoning.[33]

The focal points in the Congress for such criticism of the FCRCs were the Senate Armed Services Ad Hoc Subcommittee on Research and Development chaired by Senator Thomas J. McIntyre and the House Appropriations Committee chaired by Representative George H. Mahon. Representative Mahon's committee was particularly harsh in its criticism of the FCRCs and issued repeated demands for the DOD to phase out the FCRCs, noting that

> [t]he Committee feels strongly that the time has come for the military services to begin phasing out the "think tank" operations which have been supported for more than two decades. The level of proficiency and pay in the government services is such that the government should be able to move these efforts in-house. The Committee feels the government officials responsible for national defense should be more closely involved in these efforts than they are under present procedures.[34]

Elsewhere in the same report Mahon's committee directed the Army to move toward "the establishment of an in-house capability to perform the kinds of studies and analyses which are now done under contract by RAC."[35]

On 23 January 1967, Frank A. Parker, the president of the Research Analysis Corporation, outlined for the RAC Board of Directors his view of the trends influencing nonprofit research organizations.[36] Parker

noted that the Congress, and in turn the Department of Defense, tended to lump together all of the not-for-profit analysis organizations doing work for the DOD, despite their very different structures, purposes, and goals, and that "some of these organizations have been severely criticized for alleged management mispractices and have been the targets of a variety of other complaints that primarily concern organizational direction . . . the net result has been to reduce the effectiveness generally of each of these organizations."[37] Parker went on to summarize the pressures on the FCRCs from Congress, noting that

> the primary concern of Congress is a belief that the government has abandoned its basic responsibilities by looking to outside organizations to solve its problems, make its decisions, furnish its staffs, and supply directed results that assist government agencies in developing a highly professional and accredited technical lobby.[38]

According to Parker, the specific congressional complaints included:

(1) The captive relation with the principal sponsor that may restrict the ability of these organizations to arrive at objective results.
(2) The status of these activities as pseudo-government organizations.
(3) The preferred position of these organizations with their sponsors—particularly because they are often privy to the sponsors' innermost policy secrets.
(4) Their ability to receive support each year on a non-competitive, negotiated basis amounting to a level of effort.
(5) The performance of normal government functions—this has been attributed to several of these organizations where the government sponsor appears to have become primarily a rubber stamp.
(6) The competition with Civil Service—Congress, in particular the Post Office and Civil Service Committee, has felt that each of these organizations is a threat to Civil Service, and believes that there is nothing that these organizations do that Civil Service could not do as well.
(7) The competition with industry—this is an important factor as the research-study business has grown quite large and some industries have found this type of business a lucrative way to support a part of their own technical staffs.
(8) Management mispractices and excesses—Congress has been examining these organizations in attempts to identify management mispractices and excesses.
(9) The disproportionate ratio of highly paid professional people when compared with government and average industries.[39]

He also noted that the not-for-profit research organizations were being pressured by private for-profit industry, elements of which were eager to enter the lucrative studies and analysis field.[40] The response of the Department of Defense to congressional and industry criticism was, according to Parker:

(1) Periodic management reviews.
(2) Control of overall growth and volume of these organizations, resulting in a leveling-off of support from the principal sponsors.
(3) Increased and direct involvement in the management of the nonprofits while at the same time stressing the importance of their independence.
(4) A major reduction in fees (RAC being an exception so far).
(5) Controlling the net worth of these organizations primarily through limitations of fee.
(6) Much tighter contract administration . . . which results in less flexibility to be creative and to respond effectively to the client.
(7) The development of in-house capabilities.[41]

Parker then cited the actions taken by the not-for-profits to respond to congressional and industry criticism, particularly the imposition of tighter management and administrative controls and a shift to growth through diversification, and predicted:

> Although the various actions that have been taken by the Congress, and by DOD in response, have sharpened an understanding of what these organizations are for and have perhaps brought about some limited improvements in their operations, the net result over the past 5 years reveals that these organizations have been made less effective. There is little sign that the pressures will let up. Although it is difficult to predict exactly, it is clear that the next 3 to 5 years will see a number of additional restrictions and constraints.[42]

He then laid out his prognosis that in the face of congressional and the DOD pressures, the Army would "accede on minor issues and will add new restraints each year. . . ."[43] The probable restraints foreseen by Parker included:

1. Ceilings will be imposed.
2. Funding for Armywide studies will diminish.
3. Funding from miscellaneous accounts will increase.
4. RAC may have to get its main support by competitive bidding.
5. Fees will be reduced.
6. Salaries will be controlled.

7. The Army contract at RAC will be more tightly controlled.
8. The Army will attempt to establish several government institutes for conducting studies.[44]

Parker concluded his briefing of the RAC Board of Directors by pointing to the probable impact of such trends on RAC and outlining the courses of action open to RAC for countering such trends.

In fact, as Frank Parker foresaw, congressional criticism of the FCRCs increased in the early 1970s. In Section 203 of the 1970 Military Procurement Authorization Act (Public Law 91–121), Congress directed that "None of the funds authorized to be appropriated by this Act may be used to carry out any research project or study unless such project or study has a direct or apparent relationship to a specific military function or operation."[45] Not only did the Congress express itself forcefully regarding the need for the DOD to reduce its reliance on the FCRCs, it also acted to reduce the funding requested by the DOD for contracting, and especially for the FCRCs. For example, the DOD requested $53.8 million to fund four of the twelve DOD FCRCs (RAND, RAC, IDA, and CNA) in FY 1972, but Congress slashed the request by $8.8 million, or about 13 percent, although it approved the full $219.7 million requested for the other eight FCRCs.[46] Congress also imposed ceilings on the salaries paid by the FCRCs to their professional personnel. In 1970, the FCRC salaries were capped at $45,000, with exceptions to be made only if approved by the secretary of defense and if both the House Armed Services Committee and Senate Armed Services Committee were informed.[47]

Congress also took a dim view of any attempt to expand the FCRC program. In June 1971, Army Chief of Research and Development Lt. Gen. William C. Gribble, Jr., and Assistant Secretary of the Army Robert L. Johnson appeared before Representative George H. Mahon's House Appropriations Committee, Subcommittee on Defense, to put forward a request for $5.7 million to support the establishment of a new "Institute for the Individual Soldier" at Fort Benning, Georgia, to investigate "ways and means to provide the soldier with greatly improved prestige, safety, comfort, combat effectiveness and survivability."[48] General Gribble and Assistant Secretary Johnson were grilled by members of the subcommittee, and the proposed institute died aborning when the House Appropriations Committee deleted the requested $5.7 million in its report of 11 November 1971, noting: "The committee believes that the establishment of such an institution is not necessary, and that the individual soldier's needs will be better met by continuing to fund efforts involved in development and testing of clothing, rations, and combat tools, etc. in the present organizational structure."[49]

In its July 1970 report, President Nixon's Blue Ribbon Defense Panel chaired by the chairman of the Metropolitan Life Insurance Company, Gilbert W. Fitzhugh, called for greater use to be made of DOD in-house research facilities, but also noted that the productivity of in-house laboratories and research centers had been low despite the considerable resources dedicated to them.[50] The Blue Ribbon Defense Panel found that although "those organizations who regularly provide contract studies frequently provide a transmission belt for ideas and information across the echelons of defense organizations," there was no effective control of contract studies within the DOD; "accurate information on the nature and extent of contract studies within the Department is difficult and often impossible to obtain"; and "the procedures used by the Department of Defense to contract for studies do not provide adequate safeguards to assure that the Department receives value for its expenditures."[51] With respect to the FCRCs, the Blue Ribbon Defense Panel noted that "the close ties between sponsor and FCRC often prevent the sponsor from seeking study assistance elsewhere to obtain work better suited to his immediate requirements," and thus the panel concluded:

> There is little doubt that each FCRC was, when created, the most effective or expedient means of providing certain required capabilities to the Department of Defense. However, both the needs of the Department and the character of some of the FCRCs have changed substantially. The Panel believes that this is an appropriate time to reassess the special relationship of each FCRC and its Departmental sponsor.[52]

In part, congressional criticism of the FCRCs stemmed from the perception that Congress was "ill-equipped to know or understand what the think tanks are up to in every detail, and is forced to rely on the Defense Department."[53] Congressional suspicion of the motives and actions of the DOD was reinforced by the work of commentators such as Paul Dickson, who

argued that the FCRCs had been used by the Defense Department to extend its power over the Congress.[54]

In 1962, the Bell report had recommended greater scrutiny of the fees paid to the various FCRCs as well as the creation of in-house institutes to do some studies. In 1969, the Government Accounting Office (GAO) [now the Government Accountability Office] investigated the system used for determining the fees paid to the FCRCs and concluded that there had been "insufficient follow-through" on the recommendations made in the 1962 Bell report but declined to suggest any impropriety in the fees when challenged by the Department of Defense.[55] A subsequent GAO report, "Need for Improved Review and Coordination of the Foreign Affairs Aspects of Federal Research," was also softened when the Department of Defense objected, and the GAO was forced to back down completely on a recommendation that the secretary of state establish an agency to control all federal research related to foreign policy.[56]

One of the principal criticisms of the FCRCs was that their professional staff members were too highly paid, particularly in comparison to the salaries paid to civil service employees. But as Elton Fay pointed out in 1968: "The Civil Service pay scale has not been sufficient to attract to the in-house laboratories the high-priced, high caliber Ph.D. type of person deemed necessary to perform 'think tank' work," and there were only a limited number of military personnel qualified and interested in ORSA work due to the perception that "the successful performance of systems analysis type studies appears to be incompatible with the Army's schedule of promotion and reassignment."[57] The 1966 ASAC study also addressed the competitiveness of government salaries for DA civilians in GS–015–01 (operations research analyst) positions.[58] The ASAC found that the average civil service grade was "GS–13.75" and that the average annual salary was $14,400, which compared favorably to the average annual salary of all nonsupervisory scientists in government laboratories ($11,200) and even with the average annual salary of nonsupervisory Ph.D.'s in government laboratories ($13,950).[59] It did not compare favorably with the average annual salary of supervisory personnel in government laboratories ($18,348 for Ph.D.'s and $14,828 for others), and it was not as high as the average annual salary of Ph.D. nonsupervisory scientists in industry ($15,144) but did exceed the average annual salary of all scientists in private industry ($12,000).[60] The ASAC thus concluded that "compared with the general scientific community, the Army's Operations Research Analysts are well paid."[61] The ASAC also noted that the mean annual salary for ORSA analysts employed by the Research Analysis Corporation was $15,246—about $840 per year, or 6 percent, higher than the mean for GS–015 DA civilian employees.[62]

In a 5 April 1972 statement before the Ad Hoc Subcommittee on Research and Development of the Senate Armed Services Committee, Director of Defense Research and Development Dr. John S. Foster, Jr., offered a spirited defense of DOD research contracting and the FCRCs.[63] Noting the 25 percent reduction in the DOD request for funding for four of the twelve FCRCs in FY 1972 and other restrictions imposed by the Congress on DOD-sponsored analysis organizations, Dr. Foster noted that as a result the DOD had "forced average reductions in 'think tank' personnel at the rate of 25% per year for the last six months of FY 72 (expected to total some 300 personnel) and reduced planned expenditures in the remaining FCRCs to comply with the limitations imposed."[64] This, he said, "resulted in some loss of personnel at these FCRCs. As a consequence of these reductions and the language of the congressional reports, many of the best research personnel, especially at the think tanks, have concluded that FCRCs have no future and that they should start looking for other jobs."[65]

Dr. Foster went on to inform the committee that while 65 percent of DOD RDTE research funding went to private for-profit industrial and commercial firms, 29 percent, to in-house operations, and 3 percent, to other nonprofit institutions, only 3 percent went to the twelve not-for-profit FCRCs.[66] He then recited the concerns expressed by Congress about the FCRCs, including their supposedly uncontrolled growth, their unfair influence and competitive advantage, their costly operations, and their handling of classified materials.[67] Before offering a proposal for a revised DOD policy on FCRCs and a list of the specific actions to be taken by the DOD, he noted:

> It seems that the heart of the current concerns of Congress with the FCRCs lies in the idea that the "think

> tank" FCRCs are troublesome and no longer useful or necessary in the area of studies and analyses, and that in-house military and civilian personnel should do the job. . . . I do not think it is at all feasible to have the type of studies and engineering support required from the FCRCs conducted by private companies. . . . The other alternative is to accomplish all these activities strictly "in-house" by personnel under Civil Service. In my view, we would lose by such an approach. . . . FCRC operations are no more costly than in-house operations.[68]

Congressional pressure and specific budget cuts, coupled with the general reduction in military spending promoted by the Nixon administration, led the Army to reduce the expansion of Army contractual studies. In particular, after 1969 there was a growing effort to reduce Army reliance on its principal study contractors in general and the Research Analysis Corporation in particular.

The Army-Sponsored Federal Contract Research Centers

The Research Analysis Corporation

The Research Analysis Corporation (RAC) was the largest and most important of the four Army-sponsored Federal Contract Research Centers. It was also the best documented.[69] RAC was incorporated as a not-for-profit corporation in Washington, D.C., on 6 June 1961, and on 1 September 1961, RAC assumed the assets, work program, and "special relationship" with the Army of the Operations Research Office (ORO) of Johns Hopkins University and began work under Army contract DA–44–188–ARO–1.[70] Throughout the 1960s, RAC was the Army's principal contractor for ORSA studies and analyses and made major contributions to the development of Army weapons systems, organization, doctrine, and management. After the mid-1960s, RAC expanded its client list to include other government agencies as well as a variety of civilian clients. As noted above, RAC was one of the main targets of congressional criticism of the FCRCs, and by the late 1960s the relationship of RAC and the Army became strained. As a consequence, the decision was made to dissolve RAC, and its place was taken in September 1972 by the General Research Corporation (GRC), a for-profit organization.

Mission and Responsibilities

RAC operated under the provisions of *AR 1–110*, *AR 70–20*, and other applicable *Army Regulations*.[71] *AR 70–20* prescribed that the mission of RAC was to

> conduct such studies for the Department of the Army as may be directed by the Chief of Research and Development, Department of the Army (CRD) subject to acceptance by the contractor [RAC] as to feasibility, either by utilization of scientific personnel hired specifically for this purpose or by subcontracting to universities and other organizations.[72]

The Army chief of research and development (CRD) was charged with Army Staff responsibility for overseeing the RAC contract, and the Army Operations Research Steering Committee (AORSC)—and after July 1964, the Army Study Advisory Committee (ASAC)—reviewed the annual RAC work program and advised the CRD on the scope, balance, and relative priority of studies in that program.[73] Project Advisory Groups (PAGs) were appointed for each RAC project or study in accordance with *AR 1–110*, and a number of military advisers from OCRD were assigned to duty with RAC to assist the CRD in monitoring RAC operations and to assist RAC by providing data, interpreting DA policy and procedures, advising on the military applications of RAC work, and facilitating liaison and cooperation.[74] Project officers assigned by the agency sponsoring a particular RAC research study also assisted with liaison and coordination, as did liaison officers assigned to RAC by various Army major commands and other services.[75]

Throughout RAC's corporate existence, its leaders viewed their principal mission as being "of service to the public interest, chiefly by providing the Army with services, studies, research, and counsel based on operations research and systems analysis."[76] Accordingly, RAC focused on such topics as force structure analysis and planning, logistics, military manpower, resource analysis and cost studies, military gaming and simulations, and other matters pertinent to Army interests. As time went on and RAC's relationship with the Army changed, RAC also took on, with Army encouragement, work for other federal, state, and local government agencies and private institutions in such fields as criminal justice, housing, and economic

and social development. From time to time, the RAC management team issued its own statement of RAC's mission, goals, and operating philosophy. As stated in its corporate charter, the principal business of RAC was to be the following:

> the conduct of scientific research in the public interest involving the analysis of complex operations and systems and the development of methods and techniques to solve the increasingly difficult problems of government, military operations, science, medicine, education, and other areas of human endeavor important to the public and national security.[77]

And as spelled out in an August 1965 statement, the mission of RAC with respect to the Army and as defined by its corporate leaders was

> to find more effective means of conducting ground combat, considered in its broadest context from political action, to insurgency, to limited warfare, to thermo-nuclear exchange. In order to assist the responsible authorities, RAC will seek preferred or alternative means to attain greater ground combat effectiveness, and will provide objective comments on the various plans. The utilization of advanced technology, the consideration of projected changes in national and international situations, recent developments in military organization, strategies, and tactics are vital aspects in the conduct of effective operations and will be understood and used in formulating plans and improved concepts of operation.[78]

Leadership and Management

The management structure of RAC was established by its articles of incorporation and by-laws, which provided that the corporation would be governed by a board of trustees consisting of between three and twelve trustees, each serving a term of three years.[79] The board of directors was responsible for the usual areas of corporate management, including client relationships, corporate growth and diversification, internal organization, personnel and financial policies, and the annual work program. The relationship of RAC to the Army and the negative attitude of Congress and private industry toward the FCRCs in general were areas of special interest to the RAC Board of Trustees/Directors.

The initial board of trustees was elected on 7 June 1961, and Dr. Hector R. Skifter, the president of Airborne Instruments Laboratories, was named as the first chairman of the board. Other original board members included John T. Connor (president, Merck & Company); John H. Pickering (Wilmer, Culter and Pickering); Dr. Hendrik W. Bode (vice president, Bell Telephone Laboratories); Gen. James McCormack, Jr. (USAF Ret.) (vice president, Massachusetts Institute of Technology); and General of the Army Omar T. Bradley (USA Ret.) (chairman of the board, Bulova Watch Company).[80] Dr. Skifter died on 25 July 1964, and Dr. Bode was named temporary chairman of the board on 18 September 1964 and served until 25 June 1965, when Dr. James H. Wakelin, the president of the Scientific Engineering Institute of Waltham, Massachusetts, chief scientist at Ryan Aeronautical Corporation, and a former assistant secretary of the Navy for research and development, was elected chairman.[81] Dr. Wakelin resigned in January 1971 to become assistant secretary of commerce for science and technology, and his place was taken on a temporary basis by Frank A. Parker, the RAC president. Dr. Wakelin rejoined the board in August 1972 and again served as chairman of the board from 1972 to 1975.[82]

From time to time, board members died or resigned to take up public office and were replaced by other prominent businessmen, scientists, and retired military officers. Among those prominent individuals who served at one time or another as members of the RAC Board of Directors were General of the Army Omar N. Bradley (1961–1968); former Army Chief of Staff General Harold K. Johnson (1968–1975); former Under Secretary of State for Political Affairs Ambassador Livingston T. Merchant (1965–1975); and Dr. James Earl Rudder, the president of the Texas A&M University system and former Army Ranger commander in World War II (1963–1970).[83]

The day-to-day management of RAC was entrusted to a president assisted by a number of corporate vice presidents, a secretary, and a treasurer. At the second meeting of the board of trustees on 7 July 1961, Frank A. Parker, Jr., who had served as a naval officer in World War II and was a former assistant director of defense research and engineering, was elected president. Parker served as president until RAC was sold to GRC on 1 September 1972, at which time he was replaced by Dr. James H. Wakelin, who served until 1975. John H. Pickering was secretary and general counsel from 1962

until October 1972, and Charles R. Patterson was treasurer from 1961 to 1967, when he was replaced by James A. McFadden, Jr. (vice president and treasurer, 1967–1969).[84] McFadden was replaced as vice president and treasurer by William R. Beckert, who served until 1 September 1972. On 1 September 1972, Dorothy Hoover Whitmarsh became treasurer and assistant secretary, and after 18 October 1972, she served as both treasurer and secretary until the dissolution of RAC. The number of corporate vice presidents increased over time from two, to three, and then to four (one each for operational systems; technological systems; economic, political and social sciences; and treasurer). In addition to those who served as vice president and treasurer, the vice presidents of RAC included, at various times, Hugh M. Cole, Edmond C. Hutchinson, Clive G. Whittenbury, and Fred W. Wolcott.

The presence on the RAC Board of Directors and among its corporate officers, employees, and consultants of a number of distinguished former government officials and retired senior military officers posed potential problems of conflict of interest and influence peddling, which the RAC leadership was careful to avoid. A case in point was General Thomas T. Handy (USA Ret.), who had held important Army positions during and after World War II and who had worked with ORO and then RAC following his retirement from active duty in 1954. General Handy was "well connected" in Army circles but was known for his probity and absolute refusal to use his "contacts" to give RAC an unfair competitive advantage. In an oral history interview with Dr. Wilbur B. Payne in March 1989, former RAC Vice President Hugh M. Cole recalled:

> none of the men I have mentioned would think of going over to the United States Army in the Pentagon and attempt to do anything to influence 'em, one way or another. And I got this message from Tom Handy in a very nice but a very clear-cut way. At one point [things were] really getting screwed up and I knew that Tom was a good friend, a personal friend of Harold Johnson and I went to him and said, "Look—call somebody up, up in the Chief of Staff's office, and talk to the Chief of Staff," and I told him what the problem was. And he looked and he said. . . . "When the old man retires from the store, and the boys take over and run the store, and the old man is up the street rocking on his front porch, he never gets down off that porch and walks down to that store." And I got that message, loud and clear, and I never asked anybody again, of our people, to try to interfere over there. I would ask the civilians, from time to time, who were in our kind of business, for advice and help, but I never—after Tom Handy laid that business up about don't walk down that road to the store—I got that message real clear.[85]

Organization

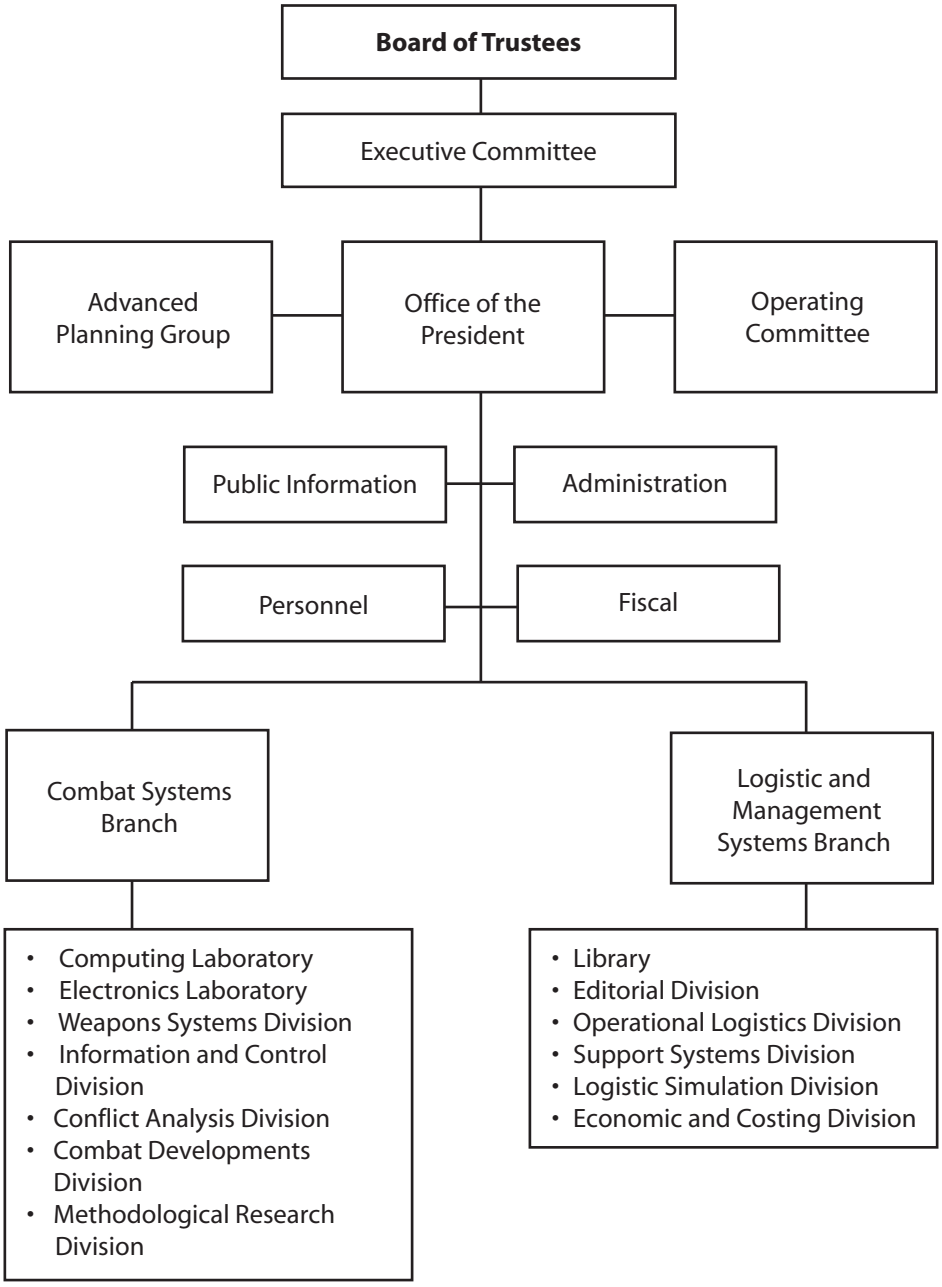
Upon taking over from ORO in September 1961, the RAC leadership made few changes in organization, but RAC subsequently underwent a number of basic organizational changes to facilitate its changing client list and work program.[86] The first major change in organization came in March 1962, when the professional staff was divided into two main branches, as shown in Figure 6–1. Dr. Lynn H. Rumbaugh was named director of the Combat Systems Branch and Dr. Hugh M. Cole was named director of the Logistic and Management Systems Branch. At the same time, an Advanced Planning Group was established under Dr. George S. Pettee and an Operating Committee was appointed, which included the president and other corporate officers, the heads of the operating divisions, and the chairman of the Advanced Planning Group.

Following a number of relatively minor organizational changes, a major reorganization of RAC was undertaken in September 1965 to reflect changes in the RAC work program and evolving missions, and in June 1969 RAC was again reorganized to reflect the growing diversity of its client list and the new areas of research being undertaken. Three major research areas were each placed under the supervision of a vice president: operational systems (Dr. Hugh M. Cole); technological systems (Fred W. Wolcott); and economic, political, and social sciences (Dr. Edmond C. Hutchinson).[87] The resulting organizational structure was as shown in Figure 6–2. With only minor changes (for example, the disbanding of the Strategic Studies Department in 1971), the organization of RAC remained much the same for the rest of its corporate history.

RAC Field Offices

During the period 1961–1972, RAC established and disestablished a number of overseas and domestic

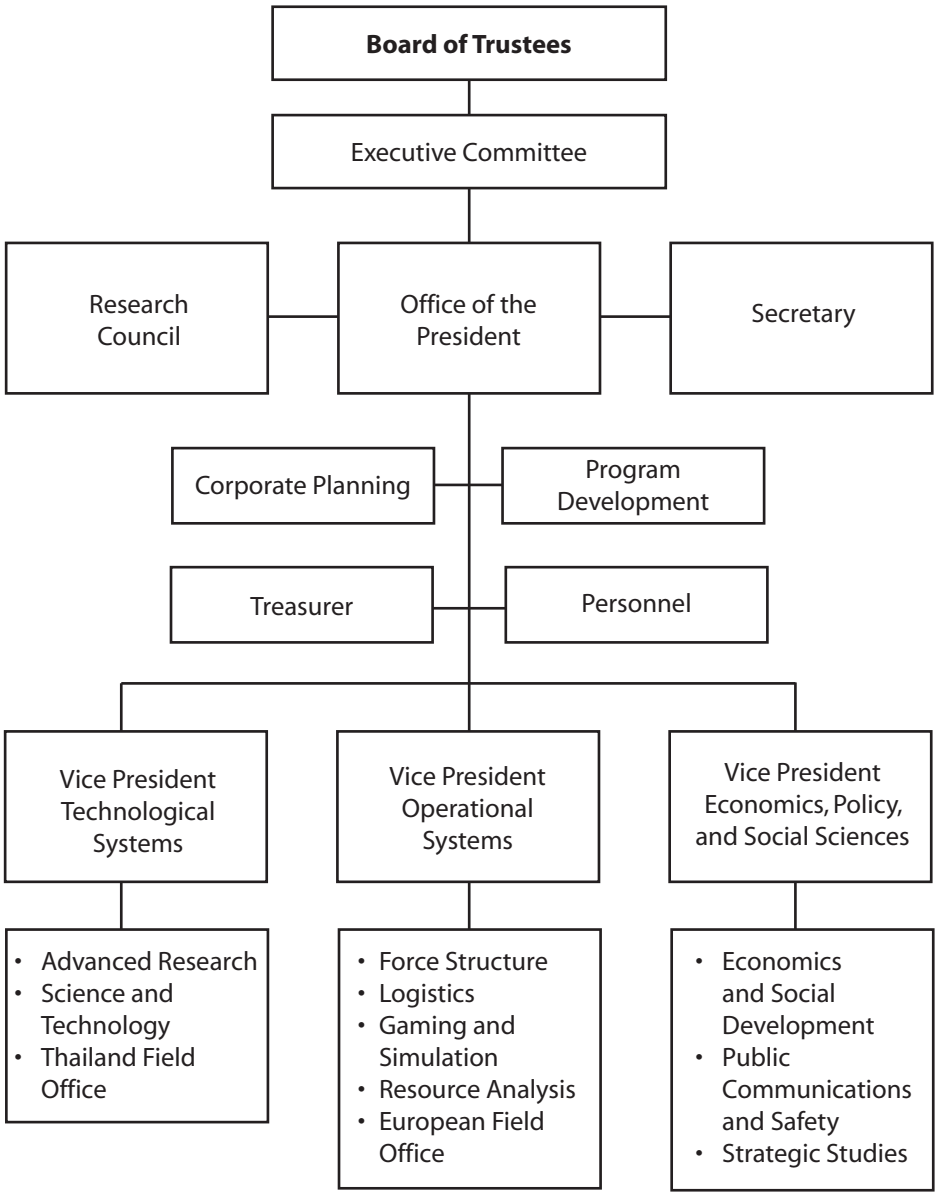
Figure 6–1—Organization of the Research Analysis Corporation, 26 March 1962



Source: Charles A. H. Thomson, *The Research Analysis Corporation: A History of a Federal Contract Research Center* (McLean, Va.: Research Analysis Corp., Jun 1975), p. 59, Chart 2.

field offices to better serve the Army and its other clients. The field offices also facilitated the collection of data that could be used by RAC to support Army-wide research requirements and served to get RAC managers and analysts out of the McLean offices and closer to "the sharp end" of the forces they served.[88] For the first time since the Korean War, teams of OR analysts served with Army troops in the field

FIGURE 6–2—ORGANIZATION OF THE RESEARCH ANALYSIS CORPORATION, 16 JUNE 1969



Source: Charles A. H. Thomson, *The Research Analysis Corporation: A History of a Federal Contract Research Center* (McLean, Va.: Research Analysis Corp., Jun 1975), p. 63, Chart 4.

applying "classic" OR techniques to the study of current problems.

ORO had maintained a field office in Heidelberg, West Germany, from 1951 to 1958. In October 1962, RAC reestablished the European field office, and attached it to the Office of the G–3 (Operations), Headquarters, Seventh United States Army, at Patch Barracks, near Stuttgart.[89] The five-man team that revived the European office was headed by Dr. Joseph E. Bruner and included analysts J. Ross Heverly, Carl Blozan, Eugene P. Visco, and Ralph Hafner and secretary Muriel Southwick.[90] The RAC Field Office Europe (RACFOE) conducted studies mutually agreed upon with Seventh Army leaders in such fields as weapons systems, training, combat intelligence, air operations, logistics, and antitank warfare. Other topics

taken up by the RACFOE included target acquisition, the prepositioned-stock problem, and war-gaming, the latter being perhaps the office's most important single activity.[91] Analysts assigned to RACFOE also participated in various maneuvers, exercises, and field experiments, including a joint Army-Air Force operational evaluation of the Pershing missile system designated Exercise Tiger Claw, conducted in southern Germany in March and April 1965.[92]

On 21 August 1964, Dr. Bruner completed his tour as director, RACFOE, and returned to the United States. The position was occupied temporarily by Dr. J. Ross Heverly until the arrival of the newly appointed director, Dr. Roland G. Ruppenthal, on 15 October 1964.[93] During Dr. Ruppenthal's time as director about 15 percent of the RACFOE analysts' time was set aside for "short term consultations on immediate field army problems," and the office's annual work program included such major studies as *Vulnerability of Seventh Army During Deployment* by Richard Lester and William Walton, *Employment of Side-Looking Airborne Radar (SLAR)* by Art Woods, and the *Seventh Army Supply System Study* by Ruppenthal and Lee Wentling.[94]

In October 1966, Ray Sumner succeeded Dr. Roland Ruppenthal as director, and in December 1966, RACFOE moved with Seventh Army headquarters to Campbell Barracks in Heidelberg.[95] Thereafter, the director of RACFOE reported to the commander in chief, Headquarters, United States Army Europe and Seventh Army (USAREUR/Seventh Army), through the deputy chief of staff for operations, and to the president of RAC through the head of the RAC Combat Analysis Department.[96] As prescribed in *USAREUR Regulation No. 70–1*, the mission of RACFOE was to undertake "analytical studies of military problems of direct interest to the Commander in Chief, USAREUR, to provide a scientific basis for decisions on action to improve military operations."[97] The specific functions performed by RACFOE were to "conduct programmed studies of problems that the Commander in Chief, USAREUR, considers to be most pertinent to the command," and to "provide advice and assistance on technical matters to the Commander in Chief, USAREUR, and his staff as required."[98] The annual RACFOE work program, carried out by the staff of five to six technical and one administrative members, was monitored by a Research Program Steering Committee composed of senior representatives of the various USAREUR headquarters staff sections, and the output of RACFOE studies were published in a variety of formats, including reports and technical memorandums. In 1966–1967, RACFOE conducted a field experiment with the side-looking airborne radar (SLAR), participated in field exercises, developed war-gaming for close air support, and did studies on analytical techniques for Seventh Army exercises, Prescribed Load Lists for spare parts, the Nike-Hercules missile, and Army air defense.[99]

In August 1962, RAC opened the Southeast Asia Field Office in Bangkok, Thailand, with a sub-office in Saigon, South Vietnam (the Saigon office subsequently became independent in April 1964).[100] Working closely with the DOD Advanced Research Projects Agency (DARPA), the RAC field offices in Thailand and Vietnam undertook a number of analyses of guerilla and antiguerrilla warfare in Vietnam, Thailand, and Laos.[101]

In April 1967, RAC opened a field office in Tehran, Iran, to support DARPA's Project AGILE.[102] The permanent staff of the Tehran field office consisted of two analysts and a secretary under the direction of George Martinez and was augmented by RAC analysts on temporary duty with the Tehran office as needed to conduct the scheduled studies. From December 1965 to March 1966, RAC had participated in a DARPA study of the Imperial Iranian Gendarmerie, and in April 1967, at the request of the director of DARPA's Middle East field office, RAC undertook two separate but interrelated projects in support of the U.S. Army Military Missions to the Imperial Iranian Gendarmerie and to the Imperial Iranian Army: a study to increase the effectiveness of the Gendarmerie and a study to determine sensor system performance characteristics with a view to their employment by Iranian forces.[103]

In 1969, RAC established a field office in California to support Operation Breakthrough, a program of the Housing and Urban Development Agency designed to demonstrate the value of mass-produced housing by construction of some 3,000 dwelling units around the country using mass production and advanced materials.[104] RAC analysts supported the program by developing methods for monitoring the program costs. The California field office was closed in 1971, at which time only the RACFOE remained in operation.

RACFOE was closed, and the RAC exchange and liaison officers elsewhere were withdrawn when RAC was sold to GRC in September 1972.

Staffing

Throughout its corporate history, RAC sought to recruit, train, and manage effectively a high-quality staff of professional ORSA analysts and qualified support personnel.[105] Every effort was made to ensure that the qualified personnel with the necessary professional skills were on board; that a proper balance was maintained between the professional analytical and management staff and the support staff; and that all personnel had competitive salaries, generous benefits, and opportunities for training and advancement, consistent with the wishes and dictates of Congress, the Army, and other RAC clients.

Inasmuch as RAC was an FCRC, the size of the RAC staff and the ratio of professional (management and technical) to support personnel was a matter of continuing interest to the Congress and consequently to RAC management. On 1 September 1961, all ORO employees who wished to join RAC were absorbed without change in status or pay. RAC thus took in some 132 analysts, fourteen research assistants, and some 284 administrative and technical support personnel as well as a roster of some 149 consultants with security clearances.[106] Subsequently, the size of the RAC staff, both technical/managerial and support personnel, grew steadily until about 1967 and then declined slowly thereafter. At the same time, the ratio of professional management and analytical to support personnel also changed, as shown in Table 6–1.

The demographics of the RAC professional (management and analytical) staff also changed in other ways. Of the professional staff members who came to RAC from ORO in 1961, 23 percent held a doctoral degree, but by 1971 that percentage had declined to only 16 percent.[107] The relative percentages of RAC professionals in various academic disciplines also shifted over time with the changes in the RAC work program. In 1961, 44 percent of the RAC professional staff held degrees in the social and life sciences and 56 percent held degrees in engineering, physical, and mathematical sciences.[108] By 1971, that

Table 6–1—RAC Staffing, 1961–1972

	Professional Staff		*Support Staff*		
Year	*Number*	*Percent*	*Number*	*Percent*	*Total*
1961	146	34	284	66	430
1962	171	39	264	61	435
1963	214	43	278	57	492
1964	243	45	304	55	547
1965	262	44	333	56	595
1966	280	46	331	54	611
1967	287	45	355	55	642
1968	251	44	321	56	572
1969	222	42	301	58	523
1970	202	45	244	55	446
1971	201	50	200	50	401
1972	142	48	151	52	293

Source: Charles A. Thomson, *The Research Analysis Corporation: A History of a Federal Contract Research Center* (McLean, Va., Research Analysis Corp., Jun 1975), p. 65, Table 1 (Staffing).

ratio had changed to 33 percent in the social and life sciences and 67 percent in the engineering, physical, and mathematical sciences, despite the greatly increased amount of work being done by RAC on economic, political, and social problems.[109] Also noteworthy is the fact that in 1961, no RAC professional staff member listed ORSA as their principal discipline, but by 1971, 9 percent of the RAC staff so identified themselves.[110] During the same period, the composition of the RAC support staff changed very little. In 1961, 20 percent of the support staff were assigned directly to the various departments, 6 percent were in the computer and electronics laboratories, and the remaining 74 percent were employed in various other capacities.[111] In 1971, the relative distribution was nearly the same: 19 percent in the departments, 7 percent in the laboratories, and 74 percent in other positions.[112]

In addition to its own employees, RAC hosted a number of liaison officers, advisers, and trainees. At any given time there were two to three foreign guest analysts at RAC plus several liaison officers. From September 1962, RAC and the British Army Operational Research Establishment (AORE) at West Byfleet, England, maintained an "exchange analyst" at each other's offices.[113] The first RAC analyst to undertake the two-year assignment with AORE was Dr. Bernard B. Watson. His counterpart, Graham Komlosy, served with RAC in its Bethesda, Maryland, offices.[114] In 1963, Dr. Kenneth L. Yudowitch served as the RAC liaison officer with the Army Research Office in Frankfurt, West Germany, and from 1 September 1964, RAC also maintained a senior analyst with the Operations Research Branch of the Supreme Headquarters Allied Powers, Europe (SHAPE) Technical Center in Versailles, France, and later at Casteau, Belgium.[115]

The most important contingent of "outsiders" at RAC were in the United States Army Operations Research and Development Advisory Group (OR&DAG), which consisted of a number of military officers assigned to duty with RAC by OCRD to assist the CRD in monitoring RAC operations and to assist RAC by providing data, interpreting DA policy and procedures, advising on the military applications of RAC work, and facilitating liaison and cooperation.[116] OR&DAG was established at ORO in July 1948, and continued to operate until 1 June 1972. In 1967, the CRD, Lt. Gen. Austin W. Betts, directed that the seven military adviser spaces allocated to RAC be moved to the newly formed Military Advisory Branch of the Studies and Analyses Division of the Army Research Office.[117] The senior military adviser and his executive officer, along with one secretary, remained at RAC and constituted the Office of Senior Military Advisor, a Class II activity under the supervision of the director of Army research, OCRD.[118] The senior military adviser during RAC's eleven-year existence was normally a colonel, and the officers who served in that position are listed in Table 6–2.

Table 6–2—Senior Military Advisers to RAC, 1961–1972

Name	*Dates*
Col. Jack M. Duncan	1961–1963
Col. LeRoy D. Brummit	1963–1965
Col. Robert W. Garrett	1965–1967
Col. Charles E. Preble, Jr.	1967–1970
Col. William S. Howe, Jr.	1970–1971
Lt. Col. Anthony Simkus	1971–1972

Source: Thomson, *The Research Analysis Corporation*, p. 105.

Also frequently seen in the RAC offices in Bethesda and later McLean were the chairmen and members of the Project Advisory Groups (PAGs) set up to monitor each ongoing study project in accordance with *AR 1–110*.[119] Thus, there was a constant flux of military officers from various specialties present at RAC and interacting with the RAC professional staff in a variety of ways, including direct participation with RAC study teams.

In March 1961, OCRD proposed that ORO (RAC's predecessor) train foreign analysts in American ORSA techniques.[120] Subsequently, a number of foreign ORSA personnel were attached to the RAC headquarters in McLean, Virginia, for training or as liaison officers. The countries represented included Argentina, France, Great Britain, Belgium, and West Germany, among others. On 1 February 1966, RAC initiated a pilot program for on-the-job training in ORSA techniques for selected Army officers in accordance with the program approved by the Army

chief of staff the previous October.[121] The first four officers completed the program in early 1967, and one of them, Lt. Col. C. A. Robertson, praised the RAC staff and the program, saying that the RAC staff, "without exception were extremely helpful in contributing to the training objectives of the program. Unquestionably, the operations research/systems analysis experience gained will be most helpful to members of our group in our new assignments."[122]

Finances

Over the years, the bulk of RAC's income, generally about 80 percent, came from Army RDTE and OMA funding, but as time went on more and more of RAC's income was derived from other sources, both DOD and other than DOD. Army funding for RAC reached its peak in FY 1967 at $9,189,000, but RAC's "best year" was FY 1968, when total sales reached $11,853,000, as shown in Table 6–3.

The Army contract with RAC was on a cost plus fixed-fee basis. The fee was set at between 4 and 5 percent of the base value of the annual contract and could be used at the discretion of RAC management for its corporate purposes. The fee income was intended to provide RAC with "financial stability, flexibility, and independence," and was used to pay for research projects of interest to RAC and to provide funds for the leasing of facilities.[123] The RAC target was "to accumulate enough funds from fee to enable it to carry on operations for six months if income failed, to explore new research perspectives and if need be, to liquidate the company in an orderly manner."[124] RAC's contract with the Army also included funding for so-called institutional research, projects of interest to the Army but initiated by RAC without prior CRD approval. The funding for "institutional research" was set at 10 percent of the value of the contract, and the funds were used by RAC to explore new areas, methods, and solutions.

Table 6–3—RAC Sales, 1962–1971

Period	*Dept/Army*	*Other DOD*	*Non-DOD*	*Total Sales*
FY 1962	$4,361,000	$0	$3,000	$4,364,000
FY 1963	6,444,000	2,000	0	6,446,000
FY 1964	7,665,000	905,000	181,000	8,751,000
FY 1965	8,268,000	1,527,000	210,000	10,005,000
FY 1966	9,071,000	1,326,000	387,000	10,784,000
FY 1967	9,189,000	2,156,000	462,000	11,807,000
FY 1968	8,922,000	2,481,000	450,000	11,853,000
Jul–Dec 1968	4,011,000	979,000	286,000	5,276,000
CY 1969	8,581,000	1,442,000	594,000	10,617,000
CY 1970	8,032,000	1,091,000	972,000	10,095,000
CY 1971	8,240,000	739,000	1,044,000	10,023,000

Source: The Research Analysis Corporation Archives, U.S. Army Military History Institute, box 336B, Table (Sales).

Note: Figures rounded to nearest $1,000. The RAC sales figures are actual billed amounts rather than appropriations or contract limit amounts.

The initial Army contract with RAC went into effect on 1 September 1961 and was for $4,576,000.[125] In its first year of operation, RAC also received from the Army an advance of $1 million to serve as an operating fund until RAC accumulated enough equity to provide its own working capital.[126] This advance was repaid in installments over the next few years as the RAC equity grew.

The amount of the fees paid by DOD to FCRCs was a matter of continuing interest to the Congress and was subject to congressional restrictions. Thus, there was considerable pressure on both the Army and RAC to keep both costs and fees low relative to the manpower employed. As shown in Table 6–4, RAC's cost per technical man-year was indeed quite low compared to other major FCRCs, such as RAND Corporation and the Institute for Defense Analyses (IDA). RAC's "costs per technical man-year" for the entire period 1962–1970 are shown in Table 6–5.

Facilities

On 1 September 1961, RAC took control of the former ORO facilities at 6935 Arlington Road and four other locations in Bethesda, Maryland. In December 1961, the assistant secretary of the Army for research and development and the Army chief of research and development met with the RAC president and chairman

Table 6–4—Comparison of Cost per Technical Man-year, 1968

FCRC	*DOD Expenditure*	*Average Technical Manpower*	*Billing Cost per Technical Man-year*
RAND Corporation	$24,900,000	525	$47,400
IDA	14,200,000	296	47,900
RAC	11,800,000	298	39,600

Source: The Research Analysis Corporation Archives, U.S. Army Military History Institute, box 337A, Slide (Cost per TMY).

Note: The difference in figures for 1968 between Table 6–4 and Table 6–5 is that Table 6–4 includes all DOD expenditures/manpower applied, whereas Table 6–5 shows only Army expenditures/manpower applied.

Table 6–5—RAC-DOD Funding versus Technical Man-year Costs, 1962–1970

Year	*Army Expenditure*	*RAC Technical Man-years*	*Average Cost per Technical Man-year*
1962	$6,000,000	162	$37,037
1963	6,600,000	206	32,039
1964	7,900,000	251	31,474
1965	8,900,000	255	34,902
1966	8,756,000	252	34,746
1967	8,708,000	244	35,689
1968	8,431,000	213	39,582
1969	8,350,000	188	44,415
1970	7,144,000	143	49,958

Source: The Research Analysis Corporation Archives, U.S. Army Military History Institute, box 337A, Slide (Funds Added vs TMY's, Army Work Program).

of the board and approved plans for the construction of a new RAC facility in what is now the Westgate Research Park area of McLean, Virginia.[127] The new $2.5 million RAC headquarters was completed and occupied in late 1963 and included a library with more than 130,000 documents, books, and maps; a 300-seat auditorium; eight conference rooms; some 192,000 square feet of floor area; and facilities for a CDC 6400 computer.[128] The facility was held on a fifteen-year leasehold (February 1964–February 1979) arrangement with the A. M. Byers Company.

The RAC Work Program

Between September 1961 and September 1972, RAC produced hundreds of studies and analyses covering a wide range of topics of interest to the Army and to RAC's other clients.[129] As the editors of *The RAConteur* noted in November 1971:

> RAC studies ranged from weapons systems design and effectiveness through air mobility and counterinsurgency and broader politico-military studies to major work in gaming, simulation, logistics, resource analysis, and force structure. In fields of civilian and domestic concern they encompassed studies of foreign aid, the development process, problems of community order, law enforcement, and juvenile delinquency.[130]

In the beginning, the RAC work program focused exclusively on Army problems, but by the mid-1960s the Army was encouraging RAC to diversify its client list, and RAC began to conduct and publish studies in a wider variety of fields. In addition to published studies, RAC analysts also contributed to many other Army, DOD, and non-government study projects, provided liaison with foreign military and domestic civilian ORSA activities, taught courses in ORSA methodology, participated actively in conferences and symposia, and wrote for publication in the professional journals. Considerations of space preclude all but the most summary discussion of the more important RAC studies completed between September 1961 and September 1972.[131] But even the small portion of the total RAC output mentioned here had a significant impact on the evolving structure, equipment, and doctrine of the Army in the 1960s and early 1970s, and in many cases constituted the standard to which analysts throughout the Department of Defense, other government agencies, and the civilian ORSA community aspired.

The annual RAC work program was negotiated by the RAC president and board of trustees/directors with the Army chief of research and development and gave first priority to studies and special projects, "the results of which have Army-wide implications or are urgently needed in connection with high level Department of the Army decisions."[132] In the early 1960s the annual RAC work program contained about forty new projects, and RAC averaged about seventy publications (individual studies) per year.[133] By agreement, a portion of the annual RAC work capacity, not to exceed 10 percent, was reserved for projects initiated and approved by RAC without prior OCRD approval.[134] The bulk of RAC study projects were recommended by various Army Staff or other Army agencies that submitted study proposals for inclusion in the annual RAC work program to the CRD or the comptroller of the Army (COA) (for management studies).[135] The CRD or COA in turn forwarded approved requests to RAC for inclusion in the proposed annual work program. Based on its capabilities, RAC prepared the proposed annual work program and submitted it to the Army Operations Research Steering Committee (later the Army Study Advisory Committee) for review. The AORSC (later ASAC) reviewed the proposed program, projects were assigned priorities, and the annual work program was approved. The sponsoring agencies then organized PAGs (later SAGs) to guide each approved project, assist RAC in obtaining necessary data, review progress, and evaluate the final study products; and RAC executed the study and published the results in one of a variety of formats.[136] Some RAC studies were classified, but many were unclassified and thus available to the public. A few were subsequently published by commercial publishers.[137]

Force planning, logistics, and manpower/personnel were traditional areas of concern to the Army, and RAC undertook major study projects in all three areas, but for most of the 1960s force planning received special emphasis. Project FOREWON was perhaps RAC's most important contribution to Army force structuring, and it was also RAC's largest single project, lasting three and a half years and involving some

ninety technical man-years of professional effort.[138] Work on Project FOREWON began under the sponsorship of the assistant vice chief of staff in mid-1967 and was completed in August 1969. By mid-1970, RAC was in the process of delivering to the Army the skills and computer programs for "a computer-assisted, largely automated planning system for determining future US requirements for Army forces and for predicting the capabilities of those forces under varying future conditions."[139] FOREWON enabled the Army to develop alternative force structures and evaluate each of them against a variety of mission parameters. Its various components could also be used to estimate costs, determine the support elements required for a given combat force, and plan deployments. Project FOREWON met both of its objectives (to advance the state of the art of force planning and to develop a "practical, credible, automated system for determining US worldwide requirements for general purpose forces and the capabilities of these forces") and was thus adopted by the Army as part of the Army Planning System.[140]

Between 1966 and 1968, RAC also addressed specifically the problems of long-range planning for the Army in the IMPACT/CALCHAS project.[141] In June 1966, a five-day planning conference (IMPACT) was held at the Naval War College in Newport, Rhode Island, and some thirty senior RAC analysts discussed the major problems they believed the Army would face in the 1980s. Some eighty major problems were discussed and subsequently boiled down to twelve main issues, which were briefed to the principals of the Army Staff in the fall of 1966. RAC was encouraged to continue examining these problems, and an in-house RAC research project, CALCHAS, was initiated to address the major problems that the Army was likely to encounter during the period 1966–1986. The results of work on the first five major problems were reported out in early 1968, but unfortunately the Army, focused on the Vietnam War and other immediate problems, failed to seriously consider the RAC recommendations and did not implement any of them.[142]

In February 1971, the Army asked RAC to undertake an assessment of "the costs and combat capabilities of alternative arrays of forces specified by the Army to be the core of its future Army in the Field" during the 1975–1985 time frame.[143] The project was named CONAF (Conceptual Design for the Army in the Field) and was still under way when RAC was sold to GRC in September 1972. The CONAF project required RAC to design new computer-assisted models and apply them to evaluate various alternative force structures and concepts. RAC also developed the measures of effectiveness and other methodological techniques needed to evaluate the various alternatives, "taking into account not only combat interactions but also the effects of materiel, logistics, command, control and communications, and intelligence."[144]

The study of Army logistics had been a forte of ORO, and RAC continued the tradition of in-depth studies of all aspects of Army logistics.[145] The focus was on three areas: logistic operations, logistic planning, and strategic mobility. RAC work on Army logistics studies ran the gamut from studies and analyses to the development of computer-assisted models and simulations. To handle the many complexities of Army logistics, RAC concentrated on the development of computer-assisted models to determine the logistics resources needed to support Army operations and the Army's capabilities in the logistical support area. One product of RAC's work in this field was the creation of a series of models known as MARS (Models of Army Supply), which dealt with the classic problems of procurement, stockage, and issue.[146] RAC also developed a more comprehensive set of logistics models known as SIGMALOG (Simulation and Gaming Methods for Analysis of Logistics).[147] Developed by the RAC Logistics Department under the leadership of Albert D. Tholen, SIGMALOG was designed for use in the simulation of military logistics at the theater level. SIGMALOG I consisted of nine models for computing the time-phased logistical requirements of a given contingency plan or study. SIGMALOG II consisted of models needed to match requirements with available resources and determine limitations on the Army's ability to support certain contingency plans. Yet another major RAC logistics model was MAWLOGS (Model of the Army Worldwide Logistic System). By combining various modules, MAWLOGS was capable of analyzing "all aspects of logistics on a worldwide basis."[148]

RAC also conducted a number of studies of a more general nature. Beginning in 1962, a RAC study group began work on a model for worldwide military

deployments involving the then-new C–5A transport aircraft.[149] The resulting study, revised several times, garnered the praise of Assistant Secretary of Defense (Systems Analysis) Alain C. Enthoven and Assistant Secretary of Defense (Comptroller) Charles J. Hitch, who stated: "The RAC linear programming model is clearly a permanent analytic tool of great value both to us, the Army, and potentially the Navy as well. Furthermore it is susceptible of refinement to provide even greater sophistication and flexibility."[150] RAC studies of maintenance, the replacement of combat vehicles, and spare parts supply also produced important and useful findings, and were characterized by Lt. Gen. Dwight E. Beach, the Army chief of research and development in 1963, as excellent examples of analyses that "can repay the Army many times over the modest amount of time and money devoted to the study."[151] Other Army and DOD logistics studies, such as the 1965 DA Board of Inquiry on the Army Logistics System chaired by Lt. Gen. Frederic J. Brown, and the 1969 board headed by Gen. Frank Besson, relied heavily on RAC data, methodologies, and studies.[152]

RAC was also quite active in the field of manpower and personnel, and RAC analysts undertook a number of important projects in those areas, particularly after the mid-1960s when the pressures of the Vietnam War heightened interest in manpower issues and the draft.[153] In 1969, the assistant secretary of the Army for manpower and Reserve affairs asked RAC to develop some models that the Army could use to evaluate various manpower policies.[154] RAC subsequently produced three models: (1) COMPLIP (Computation of Manpower Programs by Linear Programming); (2) POPP (Projection of Promotion Potential); and (3) CHAMP (Chance-Constrained Adaptive Manpower Planning).[155] COMPLIP was a powerful automated system for evaluating manpower programs for a period of three or more years and was adopted by the Army in 1970 as its principal official tool for manpower programs. CHAMP built on COMPLIP and introduced the element of chance in the manpower projection using a nonlinear programming algorithm known as SUMT (Sequential Unconstrained Minimization Technique).

Other manpower and personnel models developed by RAC included ELIM (Enlisted Loss Inventory Model), IMP (Integrated Manpower Programming), a mathematical model to "accurately project new enlistments as a function of the number of men to be drafted during any given month," and a model to predict reenlistments.[156] Using institutional research funds, RAC in the late 1960s began to investigate dissent and dissidence on Army installations. The work done by RAC was used in the Army's VOLAR-E (Volunteer Army Experiment) and, using linear programming techniques, RAC later developed an optimization model integrating data on recruitment, volunteering, reenlistment, and the associated costs.[157] A general manpower study conducted by RAC and its successor, GRC, between 1970 and 1974 successfully developed the means to forecast enlisted losses, thereby improving Army combat readiness and saving an estimated $100 million.[158]

RAC was also a leader in the fields of cost analysis, cost-effectiveness studies, and the development of the mathematical and statistical methods for determining cost factors through the life cycle of Army weapons systems and other equipment.[159] RAC conducted numerous cost analyses, including a major study of the costs of U.S. support of the armed forces of the Republic of Vietnam.[160] In 1964–1965, RAC, initially using institutional research funds, prepared a "Guide for Reviewers of Studies Containing Cost-Effectiveness Analysis," which was subsequently reproduced many times and used as a text by various Army service schools, the Army War College, the Air War College, and the Civil Service Commission.[161]

One of RAC's greatest strengths was in the war-gaming and simulations field. Between 1961 and 1972, RAC developed a number of important war games and simulations, mainly at division and theater level, including the very important CARMONETTE and Automated Force Structure Model.[162] Together, RAC and the Strategy and Tactics Analysis Group prepared and conducted some two hundred war games and simulations per year.[163] In addition to simulations and gaming integral to other specific projects, RAC developed a number of important free-standing war games and simulations, perhaps the best known of which was CARMONETTE. First developed at ORO by Richard Zimmerman in the 1950s, CARMONETTE began as a number of small games using Monte Carlo techniques to simulate small unit (battalion and lower) combat actions.[164] The CARMONETTE series was further refined at RAC and provided a "small-unit

simulator [which] can provide detail and visibility to the analysis of large-scale simulations."[165]

In the early 1960s, RAC analysts and war gamers developed a "two-handed, manually operated, computer-assisted wargame played at division tactical level of ground combat," designated TACSPIEL, to be used to evaluate combat organization and equipment.[166] TACSPIEL was subsequently developed into the so-called Division Battle Model (DBM) for the evaluation of organization and equipment at division level.[167] Limited war operations at theater level were the focus of the THEATERSPIEL game developed by RAC.[168] THEATERSPIEL led in turn to a corps battle model that could provide resolution down to battalion level and at the same time support a politico-military game known as POMEX.[169] In 1968, the Joint War Games Agency of the Joint Chiefs of Staff sponsored the development by RAC of the Theater Battle Model–68 (TBM–68), a massive collection of interrelated models and war-gaming manuals designed to cover a wide range of contingency operations.[170]

RAC also developed a number of so-called quick games, one of which, ATLAS, was included in the FOREWON system and subsequently made available to the JCS and to NATO/SHAPE.[171] At the request of the deputy under secretary of the Army for operations research, RAC began in 1970 to work on linking CARMONETTE with DBM as a means of analyzing trade-offs between various antitank systems compared with various artillery systems.[172] As Thomson noted, "The outcome was a major advance in the state of the art of gaming."[173] RAC analysts and gamers also demonstrated their imagination by attempting to measure quantitatively the value of information and intelligence in warfare in the so-called ADVICE II study that sought to assess the potential value of computer-assisted systems for providing tactical information.[174]

An important part of the annual RAC work program was devoted to studies concerning Army war-fighting doctrine. The topics of such studies ranged from full-scale nuclear war through limited war and insurgency/counterinsurgency to arms control and disarmament.[175] These topics were examined in their military, technical, political, and economic aspects. Some RAC studies in this field were as broad as the defense of the United States against nuclear attack and some were as specific as the use of atomic demolition munitions (ADMs) in Europe.[176] Other RAC studies addressed such problems as limited warfare in Europe, the role of the NIKE-X missile system, the selection and training of U.S. military advisers for service in Asia and Latin America, and arms control.[177] Many of the more important RAC studies and analyses compared alternative force structures, strategies, and tactics both in the present and in the future, with a view to determining the optimum mix of forces given the existing and projected constraints on budgets, manpower, and other resources.

RAC was also involved in a variety of politico-military studies for the Army and during the mid- to late 1960s did a number of regional strategic studies addressing possible warfare in Latin America, Asia, Africa, the Middle East, and Eastern Europe in the 1990–2000 time frame.[178] Japan, the Soviet Union, and NATO Europe were the focus of particular politico-military studies.[179] Beginning in the mid-1960s, RAC began to diversify its client list and became involved in a number of political, economic, and social sciences studies for non-DOD clients.[180] RAC performed studies and analyses for various government agencies, such as the Agency for International Development and the Overseas Private Investment Corporation, on development in the Third World, and it extended its efforts to investigations of domestic public safety, juvenile delinquency, minority rights, and environmental issues.[181]

Throughout the period 1961–1972, RAC continued to produce a large number of traditional studies and analyses of weapons systems and other military technology. Not only did RAC analysts evaluate design, performance, cost-effectiveness, and other aspects of current and proposed Army equipment, they also developed new and improved methods for such evaluations.[182] RAC scientific, technical, and engineering studies included work on the Pershing missile system, helicopters, surface-to-air missiles, battlefield surveillance, and avionics.[183] Of particular importance were the 1964–1965 STAAS (Surveillance and Target Acquisition Aircraft System) study; the 1965 ARCSA I study to determine Army aircraft requirements in Europe; and Exercise Tiger Claw, a sixty-day field test of the Pershing missile system in southern Germany in March–April 1965.[184]

RAC also maintained a vigorous program of institutional research on topics selected by RAC but of interest to the Army and funded by the 10 percent of each annual budget set aside for that purpose. A good deal of the RAC institutional research program was dedicated to so-called basic research, that is, study and development of new ORSA techniques and methodologies.[185] This effort was concentrated in RAC's Advanced Research Group, focused on improvements in linear and nonlinear programming and analytical techniques, and produced significant contributions to the advancement of the art and science of ORSA. The award-winning 1968 book on nonlinear programming by Anthony Fiacco and Garth McCormick came out of this program.[186]

In addition to the studies and analyses already mentioned, RAC managers and analysts made major contributions to various aspects of the Army's conduct of the war in Vietnam. Analysts at RAC headquarters in McLean, Virginia, as well as analysts assigned to the RAC field offices in Southeast Asia, conducted a number of important studies related to such topics as insurgency, air mobility, support of the Republic of Vietnam armed forces, and the tactics and strategy of counterinsurgency warfare. Of particular note was the participation of RAC personnel in the Howze Board study of Army requirements for tactical air mobility in 1962 and the follow-on studies of air mobility that underlay the characteristic use of helicopters in Vietnam.[187]

RAC professionals also engaged in a variety of ORSA teaching programs; organized, conducted, and participated in conferences and symposia; and contributed in many other ways to the advancement of ORSA and the spread of scientific decision making in the Army. For many years, a senior RAC analyst was assigned to the teaching staff at the Army War College.[188] RAC also presented a series of nonlinear programming courses from 1968–1971; began a training program for foreign military representatives in 1962; initiated a course on ORSA at the Industrial College of the Armed Forces and conducted a six-week course in systems analysis for the Israeli Defense Forces in 1965; initiated an on-the-job ORSA training program for Army officers in 1966; and hosted and attended innumerable conferences during the period 1961–1971.[189]

The Demise of the Research Analysis Corporation

By the mid-1960s, the close relationship between RAC and the Army had begun to deteriorate under the pressures of the Vietnam War, congressional criticism and funding restrictions on the FCRCs, and the growth of the Army's own, in-house ORSA capabilities.[190] The RAC leadership thus began to explore other avenues to continue the viability of the organization, and with Army encouragement RAC began a program of expanding its client base to include other DOD and U.S. government agencies as well as a variety of state, municipal, and private entities. A steady decline in Army interest and funding for RAC led to a decision by the RAC Board of Directors to seek relief from FCRC status and later to form a for-profit corporation that would take over RAC's business. When these efforts faltered, the board decided to liquidate the company and sell its assets to a for-profit enterprise. The successful suitor turned out to be the General Research Corporation (GRC), which assumed control of RAC assets in September 1972, thus ending a twenty-four-year special relationship between the Army and ORO/RAC.

The utter collapse of the quarter-century-old "special relationship" between the Army and ORO/RAC was signaled by the author of the 1973 *Department of the Army Annual Historical Summary*, who wrote:

> The sale of the Research Analysis Corporation (RAC) to the General Research Corporation in September 1972 ended RAC's status as a federal contract research center. Future contracts for Army studies will be awarded competitively. Procuring and monitoring contracts to support research and development studies, handled previously by the U.S. Army Research Office, has devolved upon the Harry Diamond Laboratories under the guidance of the Coordinator of Army Studies.[191]

The decision of the Army to terminate its "special relationship" with RAC was the product of a number of factors. In his corporate history of RAC, Charles Thomson offered this "quick answer" to the question of why the RAC Board of Directors chose to abandon RAC's status as an FCRC and to sell RAC:

> [B]y 1971, in the judgment of the Board, RAC could no longer hope to discharge the mission explicit in its charter and its original conception, while retaining its status and special relation to the Army. It would not have the needed stability, continuity, and sustained

> funding. More important, it could not expect to have sufficiently challenging tasks. The Army was not giving RAC opportunities to tackle fundamental, long-range problems. RAC's efforts to use institutional research funds to identify and probe such problems had gone without response. Central and corporate research funds were being used chiefly to promote diversification. But prospects for diversification of work done for other government agencies or for industry, that appeared bright in the mid-sixties, dimmed as the decade wore on. The environment for winning contracts to provide such services was growing increasingly competitive. Buyers of RAC's diversified services were not funding broad, conceptual, forward looking studies. They were seeking narrowly defined efforts to deal with specific problems with proved methods.[192]

Congressional and DOD pressure to reduce reliance on contract research, coupled with restrictions on professional salaries and other corporate prerogatives and drastic cuts in annual appropriations, played an important role in the decision of the RAC Board of Directors to terminate the company's existence. The Army's own growing in-house ORSA capability, and the Army's decision to foster it by increasing education and training in ORSA for both military and civilian personnel and the creation of the ORSA officer specialist program was another important factor. The Army's perception of its need for immediate answers to very narrowly defined problems rather than long-range projections and politico-strategic analyses played perhaps the principal role. As Carl M. Harris, himself a senior RAC employee, later wrote: "In a sense, RAC itself was a casualty of the war since its demise largely resulted from the Army's choice of guns over the less immediately useful and well-thought-out analysis which was the hallmark of RAC's product line."[193]

The Human Resources Research Organization

The HumRRO, established by the Army in July 1951 under a contract with George Washington University and headed by Dr. Meredith P. Crawford, was designated as an FCRC in 1963.[194] As an FCRC, HumRRO was subject to the same pressures during the 1960s and early 1970s as was RAC, and the "corporate history" of HumRRO in fact paralleled that of RAC in many respects.

HumRRO operated under the staff supervision of the Behavioral Sciences Division of the Army Research Office, Office of the Chief of Research and Development; and a member of the Behavioral Sciences Division staff served as military adviser to HumRRO.[195] The focus of the HumRRO work plan was human factors research on training, training devices, motivation, and leadership.[196] HumRRO operated under the provisions of *AR 70–8: RESEARCH AND DEVELOPMENT—Human Factors and Social Science Research*, which defined the purpose of human factors research as to improve Army effectiveness through training of military personnel; selection, classification, and utilization of personnel; motivation and leadership of personnel; compatibility of personnel and equipment; and influence on indigenous troops and populations of foreign areas.[197] As Eugene A. Cogan explained to attendees at the third Army Operations Research Symposium in 1964, the relationship between human factors research and operations research per se, was that:

> Both disciplines within the Army R&D program are oriented towards solving problems in Army operations. In general, their approaches to problem solving are parallel, but there are important differences. Operations Research usually produces a formal, quantitative model after analysis of a problem, while Human Factors research is more likely to produce a model that is verbal in nature and hence much less precise. The reason for this is the fuzzy human element which is typically at the center of both the problem and the solution of Human Factors research tasks, while more clearcut problems in organization, management, and assessment of alternative actions are typically the focus of Operations Research.[198]

Until the mid-1960s, HumRRO's entire work effort was devoted to the Army under a single contract. However, declining Army support led to pressures to diversify, and on 1 July 1967, the Army contract for HumRRO with George Washington University was modified by mutual agreement to allow for multiple sponsorship, and HumRRO began a modest program to attract additional clients to share its indirect costs.[199] Two years later, in 1969, HumRRO severed its connection with George Washington University and began operations as an independent nonprofit corporation. At that time, its name was changed to the Human Resources Research Organization. As sponsorship by other government agencies increased, HumRRO requested removal from the list of FCRCs, and its contractual relationship with Army ended in 1972.[200] In January 1965, HumRRO was reorganized

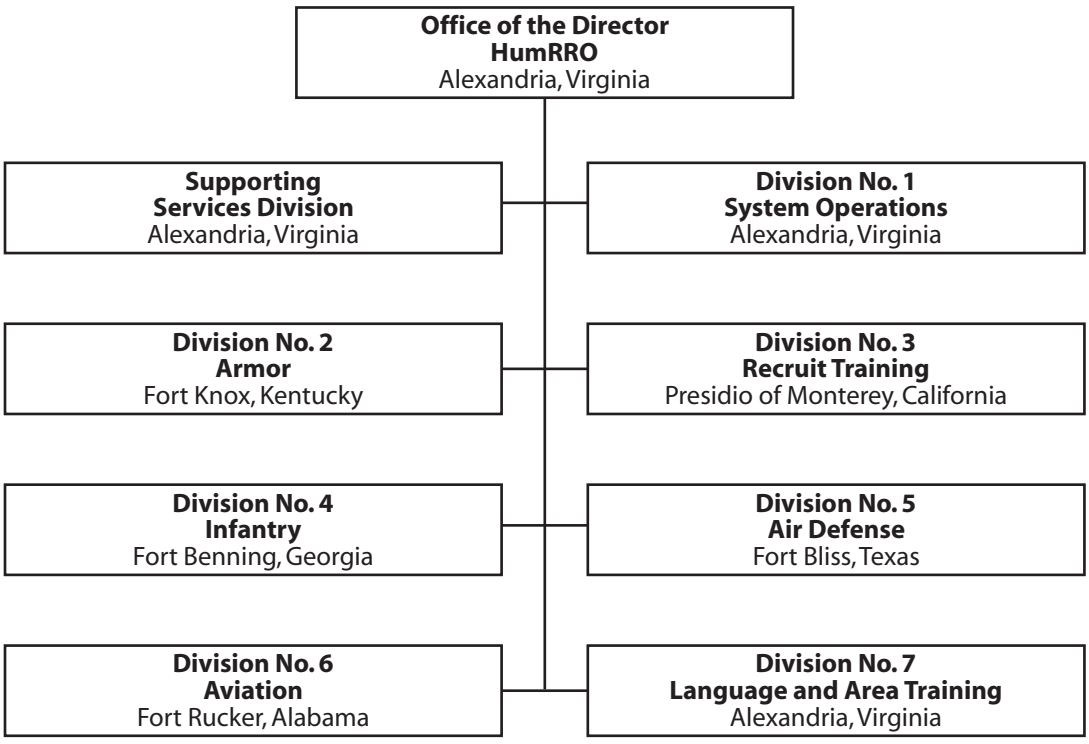
as shown in Figure 6–3. About 70 percent of the total HumRRO strength was in the seven research divisions; about 20 percent, in the Supporting Services Division; and about 6–7 percent, in the Office of the Director.[201]

HumRRO employed more than 80 percent of all psychologists in Army contract research organizations.[202] As was the case with RAC, the size of the HumRRO professional staff peaked in the mid-1960s and then began to decline, as shown in Table 6–6. By FY 1970, it had fallen to only 120, and the total FY 1970 work effort for the Army was only 1,047 man-months.[203]

Inasmuch as HumRRO was an FCRC, the salaries of professional personnel as well as overall contract funding were limited by congressional action, particularly after the mid-1960s. The bulk of HumRRO funding came from RDTE appropriations, but unlike that of RAC, HumRRO funding continued to grow throughout the period, as shown in Table 6–7.

HumRRO's annual work program was governed by *AR 70–8*, and the primary document used to disseminate the results of HumRRO research was the technical report, prepared in compliance with *AR 70–31*. The annual work program was approved by CRD and DCSPER after review by the Army Human Factors Research Advisory Committee, which met semiannually to review the HumRRO program in light of Army needs.[204] HQ CONARC also played a role in recommending and reviewing HumRRO projects and tasks.[205] The Army sponsor for each project/task monitored that project/task through the use of SAGs, as was the case with RAC.[206] Internally, key HumRRO staff members from the Director's Office and the directors of the research divisions met twice a year to establish general policy, discuss the development of

FIGURE 6–3—ORGANIZATION OF HUMRRO, JANUARY 1965



Source: Meredith P. Crawford, *A Perspective on the Development of HumRRO* (Alexandria, Va.: George Washington University Human Resources Research Office, Apr 1968), p. 7; U.S. Department of the Army, Committee to Evaluate the Army Study System, *Final Report of the Committee to Evaluate the Army Study System* (Washington, D.C.: HQDA, Sep 1969), pt. II, sec. D, passim.

Table 6–6—HumRRO Personnel Strength, FY 1960–FY 1967

End of FY	*Strength*
1960	270
1961	278
1962	286
1963	284
1964	286
1965	276
1966	269
1967	264

Source: Crawford, *A Perspective on the Development of HumRRO,* p. 6

Table 6–7—HumRRO RDTE Appropriations, Selected FYs, 1963–1972

FY	*RDTE Appropriation*
1963	$2,867,000
1964	3,080,000
1965	3,105,000
1969	3,190,000
1972	3,600,000

So*urce*: Fay, "Army Evaluates FCRCs against In-House Programs," p. 13; *Hearings on DOD Appropriations for 1965* (Washington, D.C.: Government Printing Office, 1964), p. 42; U.S. Senate, Committee on Appropriations, 92d Congress, 1st sess., *Senate Report No. 92–498: DOD Appropriations Bill, 1972* (Washington, D.C.: Government Printing Office, 1971); ASAC *Main Report*, an. B, an. 3, Incl.

Note: In FY 1972, HumRRO also held OMA contracts worth some $1,150,000.

procedures, plan the annual work program, and conduct long-range planning. From 1965, this group was known as the HumRRO Policy Council.

In FY 1962, HumRRO produced some ninety-three separate items, including eight technical reports, two research reports, one research bulletin, twenty research memorandums, twenty-eight journal articles (plus one reported elsewhere), thirty presentations (including seven reported elsewhere), and four other items.[207] In general, HumRRO averaged around thirty tasks and produced around twenty publications per year.[208] From the beginning of FY 1963, the work program was organized into functional areas, of which there were six in FY 1967: individual training and performance; unit training and performance; training for leadership, command, and control; language and area training; training technology; and training management.[209]

The Special Operations Research Office

The Special Operations Research Office (SORO) was established in 1956 under an Army contract with American University in Washington, D.C., to support the Army by conducting research in insurgency/counterinsurgency, unconventional warfare, psychological operations, and military assistance programs.[210] The scope of SORO research included political, economic, social, and cultural trends; the causes and nature of insurgency and tactics for combating it; the psychological vulnerabilities of foreign populations and the means of exploiting them; and the problems of providing military assistance to foreign countries.[211]

As of March 1962, SORO was organized with the usual supervisory, administrative, and support elements and two technical divisions—the Research Division and the Foreign Area Studies Division—each of which was governed by a separate contract and reported to a different agency of the Army Staff. The Research Division was organized with a director, two branch chiefs, and six interdisciplinary research teams and was responsible for conducting research on a broad range of topics, including psychological operations and guerrilla/counterguerrilla warfare.[212] By March 1964, the Research Division had been split into two divisions: an Operations Application Research Division and a Basic Research Division. The activities of the Research Division were overseen by the Army's chief of research and development in accordance with *AR 70–32: Special Warfare Non-Materiel Research*. The Foreign Area Studies Division (FASD) was organized with a division chief, two deputy chiefs, and four interdisciplinary research teams plus several historians and geographers and an editorial staff, and it was responsible for the preparation of country and regional studies that included material on political, economic, sociological, and military matters.[213] FASD activities were overseen by the chief of psychological warfare (later the chief of special warfare, and after 1958, the director of special warfare in ODCSOPS).

With the publication of *AR 70–8: Human Factors and Non-Materiel Special Operations Research* in August 1963, responsibility for overseeing SORO was transferred to the chief, human factors and operations research division, Army Research Office (ARO), OCRD. The area studies portion of program was funded by OMA and was centrally managed by the DCSOPS; and the remainder of the SORO program was funded by RDTE funds and was managed by the CRD. Project Advisory Groups (PAGs) were established for most SORO projects and operated in the same way as they did for RAC or HumRRO projects.

During the period 1963–1966, SORO underwent a series of reorganizations, including the establishment of several field offices to better serve Army forces in the field and to provide essential data for studies conducted in the SORO Washington office. Field offices were established at Fort Bragg, North Carolina, in March 1963, and in the Panama Canal Zone in February 1964, to conduct "social science research on problems of understanding affecting or supporting foreign peoples and societies, especially in Latin America, who were involved in or threatened by insurgency and subversion."[214] Another SORO field office was established in Seoul, South Korea, in February 1964, and was co-located with the field offices of RAC and HumRRO. The Korean field office had the mission of satisfying "the Army's operational needs in the fields of cross-cultural communications, military assistance and community relations."[215]

On 26 March 1964, Maj. Gen. James D. Alger, the assistant deputy chief of staff for military operations (ADCSOPS), telephoned Army Chief of Military History (COMH) Brig. Gen. Hal C. Pattison to suggest that the COMH might assume responsibility for SORO's Foreign Area Studies Division.[216] General Alger expressed concern about the degree to which the Department of the Army was able to assess the quality of SORO studies and uneasiness over the fact that a civilian contract organization was producing Army field manuals and technical manuals. The question was studied internally by the Office of the Chief of Military History (OCMH), and on 9 April 1964, General Pattison wrote to General Alger to "urgently recommend some other solution" to the problem.[217] The proposed transfer did not take place.

In July 1966, the SORO mission was transferred to a new organization, the American University Center for Research in Social Systems (CRESS), consisting of two component institutes designed to "bring specialized professional talent to bear on specific social science research, development, study and service problems in the international and public affairs fields."[218] The Social Science Research Institute (SSRI) conducted social science research to support DA missions in the fields of counterinsurgency, unconventional warfare, psychological operations, military assistance programs, and studies and evaluations of foreign cultures. A Counterinsurgency Information Analysis Center (CINFAC) was also established to meet requirements identified by the 1962 Joint DOD/CIA Committee on Counterinsurgency Research and Development for "a rapid response system which can effectively store and retrieve raw data as well as completed studies on counterinsurgency."[219] CINFAC supported the Army and other DOD agencies by collecting, storing, retrieving, and analyzing "information on peoples and cultures of the world as they apply to insurgency settings."[220] SORO also established a Scientific Advisory Service to provide immediate advice to the Army, including "brief studies outside the programmed work of SORO, assistance in implementing SORO research findings and assistance in the preparation for social science information oriented reports."[221]

The changes instituted in 1966 resulted in a redefinition of the mission of the new organization, CRESS, and made it responsible for "non-materiel research in support of Department of the Army's missions in such fields as counterinsurgency, unconventional warfare, psychological operations and military assistance programs."[222] Within the scope of this mission, CRESS was assigned three specific tasks:

1) To develop recommendations for doctrinal guidance in the conduct of various counterinsurgency operations.
2) To provide basic educational materials appropriate to these recommendations when approved.
3) To develop specific area/country guide books in support of Army overseas operations.[223]

SORO/CRESS employed more than two-thirds of the political scientists in the Army contract research organizations.[224] In March 1964, there were 119 full-

time and nineteen part-time SORO employees, all of whom were considered American University staff members and thus participated in American University's insurance, pension, and medical programs.[225] Twenty SORO researchers (out of a total of seventy) held faculty rank as assistant, associate, or full professor in research.[226] Budget cuts in the late 1960s caused CRESS to decrease its staff, but in FY 1970 CRESS had a professional staff of sixty-two and produced 756 man-months of research for the Army.[227]

SORO's Research Division was supported by RDTE funds that amounted to $400,000 in FY 1960, $350,000 in FY 1961, $435,000 in FY 1962, and $450,000 (projected) in FY 1963.[228] Funding for the Foreign Area Studies Division was provided from OMA funds that amounted to $400,000 in FY 1960, $420,000 in FY 1961, $420,000 in FY 1962, $540,000 in FY 1963, and $620,000 in FY 1964.[229] Overall, RDTE appropriations for SORO amounted to $947,000 in FY 1963, $920,000 in FY 1964, $979,000 in FY 1965, and $1,960,000 in FY 1969.[230]

The annual SORO work program was developed by SORO in draft and then coordinated with the Army Staff by OCRD. It was then approved by the CRD, published by SORO, and monitored by DCSOPS.[231] The SORO work program was divided into two major areas: social science operational applications research and social science research and development technology.[232] The Research Division work program was based on requirements submitted by DA agencies and approved by the CRD (later by the director, ARO); and by 1964, the Research Division had produced some fifty research reports as well as a wide range of "quick response" studies and advisory services.[233] The Foreign Area Studies Division goal was to produce six to eight new or revised area handbooks each year, and as of 1 March 1962, FASD had completed forty-seven Special Warfare Area Handbooks.[234]

In all, SORO produced about twenty publications per year, and between 1957 and 1964, SORO produced about 120 publications.[235] In addition to original studies, SORO produced periodic bibliographies listing the studies produced under five main headings: general, counterinsurgency, psychological operations, unconventional warfare, and Foreign Area Studies Handbooks.[236] In FY 1963–1964, the SORO work program included some seventeen projects, including SYGIDE (Psychological Operations Guide); TACO (Tactics in Counterguerrilla Operations); CULTORG (Cultural Factors in Organization Design); MACI (Effects of Military Assistance Counterinsurgency Training); REVOLT (Revolutions as Instruments of Socio-Political Change); and EXPLOIT (Psychological Operations Vulnerabilities of the Communist Bloc).[237]

As an Army FCRC, SORO was subject to the same congressional scrutiny and restrictions as RAC and HumRRO, but the story of SORO reflects yet another factor that led to a deemphasis on Army research contracts with outside agencies in the mid- to late 1960s: the growing unrest on American university campuses over the Vietnam War that made the operations of research agencies connected with the Army first difficult and then all but impossible.[238] The nature of the research conducted by SORO, dealing as it did with the means and methods of counterinsurgency and the manipulation of foreign nations, was inherently controversial. As a result, SORO frequently found itself involved in public arguments over American foreign and military policy, particularly after 1963, when the United States became deeply involved in Vietnam and SORO began to focus its efforts on counterinsurgency. The Special Warfare Area Handbooks produced by FASD were a particular focus of controversy in that they were usually classified and were seen by some as blueprints for the conduct of psychological warfare in various nations.[239]

In 1965, controversy erupted over a SORO study dealing with Chile, part of a larger SORO research project (Project CAMELOT) dealing with the causes of revolution and insurgency in underdeveloped nations and methods for dealing with "political instability."[240] Project CAMELOT was conceived in the early 1960s and was funded at some $2 million a year for three to four years, thereby more than doubling the SORO budget.[241] It was intended that Project CAMELOT would investigate conditions in a number of countries in Asia, Africa, the Middle East, and Latin America, but Chile was chosen as the first country to be studied, primarily because Chile was relatively stable and it was thought that it would provide a "safe training ground" for researchers.[242] A sociology professor from the University of Pittsburgh, Dr. Hugo Nuttini, himself a former Chilean citizen, went to Chile to drum up support for the project

among academic colleagues there, but the role of the U.S. government in sponsoring the project was revealed by a Norwegian sociologist and spread by the news media.[243] It thus became a cause célèbre in Chilean political and academic circles and eventually in the United States and elsewhere, in part because many Chileans believed it to be a plan to support right-wing military dictatorships in Latin America to counterbalance Castro's support of Communist revolution in the region.[244]

The resulting flap was a great embarrassment to the White House, the Pentagon, and the State Department. Protests and investigations by the Chilean government led to State Department complaints about Army meddling in foreign policy, and the furor over the matter resulted in the cancellation of Project CAMELOT in 1966. Other ongoing projects were quietly completed or terminated, and thenceforth SORO was required to obtain State Department approval of its studies. Nevertheless, Congress confirmed the validity of foreign policy research by the military as an essential part of its mission, and other SORO projects, such as Project AGILE, continued to investigate counterinsurgency in depth.

Project CAMELOT focused the attention of antiwar activists on American college campuses on the fact that many universities were assisting the military in research.[245] Consequently, professors and offices engaged in DOD research were attacked, and protests reached a level where universities began to divest themselves of any connection with DOD research efforts, no matter how innocuous or far removed from the war in Vietnam.

The Project CAMELOT controversy precipitated the renaming of SORO as CRESS in 1966. CRESS continued to operate under Army contracts with American University until 1969, when the relationship was terminated due to protests over the role of CRESS and other DOD research organizations in the Vietnam War and perceived meddling in the affairs of other nations experiencing insurgencies.[246] CRESS was subsequently taken over by the American Institutes for Research, a Pittsburgh-based independent, nonprofit research organization with offices in Pittsburgh, Washington, D.C., Palo Alto, and Bangkok.[247]

The Army Mathematics Research Center

The fourth and smallest Army FCRC was the Army Mathematics Research Center (AMRC) at the University of Wisconsin in Madison. Established in the mid-1950s, the AMRC engaged primarily in basic mathematic research but also undertook some ORSA-type work. In FY 1970, the AMRC was funded at $1,350,000 and had a staff of about thirty-five.[248] On 24 August 1970, the AMRC was the target of one of the most infamous terrorist acts of the Vietnam War period, when four radical antiwar activists detonated a large ANFO (ammonium nitrate-fuel oil) bomb near Sterling Hall, the location of the AMRC and the university's physics and astronomy departments.[249] The explosion caused substantial damage and killed one physics researcher, Robert Fassnacht. Three of the four bombers were eventually caught and convicted, and the AMRC was phased out as an FCRC at the end of FY 1970.

Other ORSA Contractors

There were more than forty private contractors providing ORSA studies and analyses to the Army in the 1960s.[250] The Army Staff, Class II ORSA activities, and the major commands all used contractors to augment their in-house ORSA capabilities. The four largest of these contractors were Technical Operations, Inc. (TOI); the Stanford Research Institute (SRI); Booz-Allen Applied Research, Inc.; and Operations Research, Inc. (ORI). Total Army payments for contract ORSA services amounted to more than $21.9 million in FY 1965. Army payments to the four contractors just mentioned during the period FY 1964–FY 1966 are shown in Table 6–8.

The Combat Operations Research Group

In terms of its direct impact on Army organization and doctrine, the most important of the "other" Army ORSA contractors was the Combat Operations Research Group (CORG), which had been created in the Office of the Chief of Army Field Forces at Fort Monroe, Virginia, as an Operations Research Office field office in the fall of 1952 and had operated at HQ CONARC under contract by Technical Operations, Inc. (TOI), of Boston, Massachusetts, since the fall of 1955.

As part of the consolidation of combat developments activities under HQ CDC in 1962, CORG was transferred from HQ CONARC to the control of HQ CDC and after reorganization was made a part of the HQ CDC Operations Research and Experimentation Division without change of mission or workload.[251] CORG was then organized as shown in Figure 6–4.

After its transfer to HQ CDC, CORG continued to operate at Fort Belvoir under a sole-source contract with TOI. It was somewhat of an anomaly in that while it was in fact a contracted operation, it functioned for all intents and purposes as the in-house ORSA element for HQ CDC. The value of the CDC support contract, paid from RDTE funds, was $1.4 million in

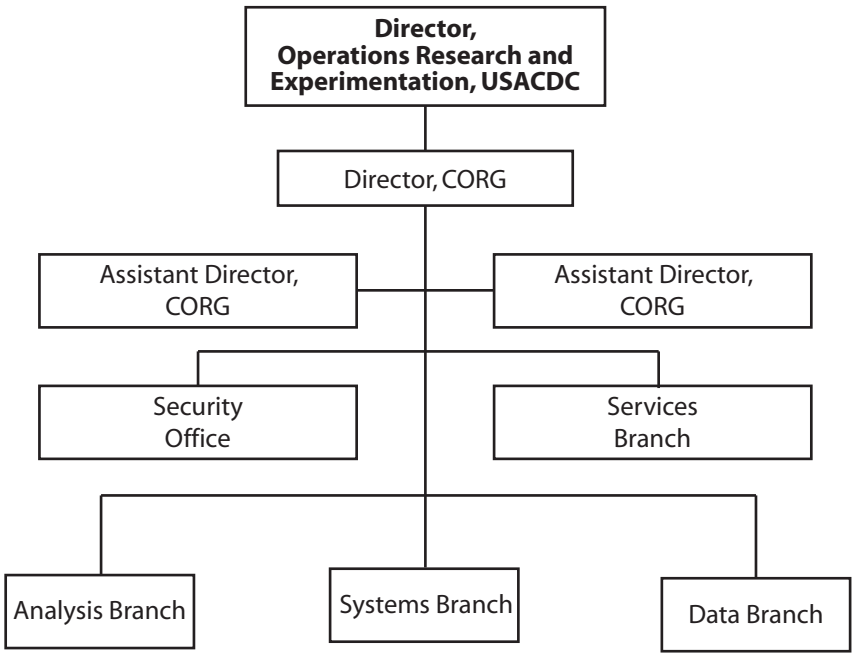
Table 6–8—Army Payments for ORSA Contract Work, Selected Contractors, FY 1964–FY 1966

Company	*FY 1964*	*FY 1965*	*FY 1966*
Stanford Research Institute	$3,579,381	$4,749,057	$4,834,000
Technical Operations, Inc.	1,584,000	2,625,000	2,595,000
Booz-Allen Applied Research, Inc.	983,132	729,852	1,021,238
Operations Research, Inc.	763,391	358,520	349,403

Source: ASAC *Main Report*, an. B, an. 3, Incl.

Note: Figures include both RDTE and OMA funds. Stanford Research Institute provided services to the U.S. Army Combat Developments Experimentation Command and several other Army and DOD agencies. Technical Operations, Inc. worked primarily for the U.S. Army Combat Developments Command as the primary contractor for the Combat Operations Research Group. Booz-Allen Applied Research and Operations Research, Inc. performed a variety of services for various Army agencies.

Figure 6–4—Organization of CORG, 1 January 1963



Source: Headquarters, U.S. Army Combat Developments Command, *Staff Directory*, Fort Belvoir, Va., 1 Jan 1963.

FY 1964, $2.1 million in FY 1965, and $2.5 million in FY 1966.[252]

CORG provided scientific advice and assistance to HQ CDC through a preplanned program of ORSA-oriented studies on a variety of scientific and technical military problems.[253] CORG also provided limited war-gaming support to HQ CDC.[254] It played a particularly important role in the series of tests of Army airmobility and the airmobile division concept in the mid-1960s and participated actively in ORSA studies dealing with the war in Vietnam, sending two teams to Vietnam, in 1966 and 1967 to conduct detailed analyses of Army combat operations: Army Combat Operations in Vietnam (ARCOV) and Mechanized and Armored Combat Operations in Vietnam (MACOV).[255] Before its demise in 1970, CORG produced a number of important studies and analyses.[256] Of particular interest to military historians and students of Army organization and force structuring are the series of studies done by Virgil Ney that include studies of the evolution of Army units from the rifle squad to the theater of operations headquarters.[257]

The Stanford Research Institute

The Stanford Research Institute (SRI) of Menlo Park, California, founded in 1946, was the principal ORSA contractor for the United States Army Combat Developments Command Experimentation Command (CDCEC) and provided ORSA services to a variety of other Army agencies.[258] In terms of annual sales, SRI was the largest Army ORSA contractor other than the four FCRCs (RAC, HumRRO, SORO/CRESS, and AMRC). By 1971, SRI had annual sales (all customers) of about $60 million and a staff of around 3,000.[259] Although the federal government provided about 75 percent of its income in the mid-1960s, SRI never became an FCRC, although it was subject to many of the same pressures, including congressional scrutiny and antiwar protests.[260] In 1970, SRI's connection with Stanford University was severed when it was sold by the university trustees to its directors for $25 million, and in 1977 the name of the organization was changed officially from the Stanford Research Institute to SRI International.[261]

The Combat Developments Experimentation Center (CDEC) was established under HQ CONARC in October 1956 at Fort Ord, California, and its twenty-person research office, initially designated the Research Office of the CDEC Test and Experimentation Center, was operated originally by Technical Operations, Inc., under TOI's existing contract with HQ CONARC; but the contract for scientific services soon shifted to the Stanford Research Institute.[262] On 1 July 1962, CDEC, including its Research Office and the contract with SRI, was transferred to CDC, and renamed the Combat Developments Command Experimentation Center (CDCEC) without change in organization, function, or workload.[263]

CDCEC was responsible for performing "scientific field evaluations of new concepts, doctrine, and organizations."[264] The "scientific field evaluations" conducted by CDCEC took the form of formal field experiments and were supported by a tactical simulation center, computer simulations, and instrumentation. CDCEC conducted about ten formal field experiments per year. The experiments were designed by HQ CDCEC and were carried out by assigned troop test units under carefully designed and controlled conditions.[265] The CDCEC Research Office, manned under contract by SRI, assisted CDCEC in planning and conducting the field tests and experiments, applying ORSA and other forms of mathematical analysis, determining evaluation methods and criteria, collecting and analyzing data, and deriving conclusions from the collected data.[266]

The support provided to CDEC by SRI was on a continuing sole-source contract basis and was funded by OMA funds that amounted to $1,728,000 in FY 1964, $2,242,057 in FY 1965, and $2,794,000 in FY 1966.[267] In the late 1960s, as part of the growing opposition in Congress to the FCRCs and to the contracting out of research studies in general, SRI was forced to bid on the contract for supporting CDEC and lost to Litton Industries. Frank Parker, the president of RAC, noted that "the competition was determined strictly on a cost basis—not on demonstrated capability," a trend that he saw growing throughout the Army analytical community.[268]

In addition to providing direct support to CDEC, SRI provided studies and analyses to the Army on a broad range of topics in accordance with *AR 1–110* and under the staff supervision of the Army's chief of research and development (through the Army Research Office [ARO]) often in coordination with the

ACSFOR.[269] Some of SRI's work for the military was funded separately and monitored by the chief signal officer, DARPA, and the defense comptroller.[270] The principal focus of SRI's other work for the Army was on the implications of advancing technology on long-range planning and strategy and on national economic capabilities, air and missile defense of the continental United States and armies in the field, and command, control, and communications (C^3).[271] SRI published about twenty-five studies for the Army each year.[272]

Other Contract Elements

There were a sizeable number of other Army ORSA contractors active in the 1960s and early 1970s, and although they were not as large, as well-known, or as well-documented as RAC, CORG, or SRI, they made their own distinct and valuable contributions to the overall Army ORSA effort. The Combat Developments Command alone employed at least nine ORSA contractors to support its various subordinate elements. In addition to TOI (CORG) and SRI, contractors included Booz-Allen Applied Research, Inc., Operations Research, Inc., Cornell Aeronautical Laboratory, the American Research Corporation, Northrop Corporation, IBM Corporation, and Planning Research Corporation.[273] Typically, these ORSA contractors held contracts with more than one Army organization. Booz-Allen Applied Research, Inc., for example, provided technical support and facilities for the Strategy and Tactics Analysis Group, technical support for the Army Concept Team in Vietnam, and technical support for the CDC Combined Arms Group at Fort Leavenworth, Kansas.

Cutbacks in Army ORSA Contracting

All of the Army's ORSA contractors prospered during the expansion of Army ORSA activity in the early 1960s but all of them also suffered from the general funding cutbacks of the Nixon administration after 1969. The larger ORSA contracting firms with sufficient capitalization and a diversified client list were able to survive quite well until conditions improved, but many smaller ORSA contractors went under. E. B. Vandiver III, the current director of the United States Army Center for Army Analysis, recalled in an oral history interview how he left government service in 1967 to form a small ORSA firm, CVA, in Alexandria, Virginia, with William Carswell.[274] CVA managed to obtain contracts with CDC and HQDA, mostly for cost-effectiveness studies and studies of Army automation architecture. The small firm "peaked" in 1968 with a staff of six to eight employees and revenues of $200,000, which Vandiver considered "quite good." However, CVA income plummeted in 1969, and by the summer of 1970 Vandiver and Carswell were forced to close the company altogether. The same fate befell many other small ORSA contractors after January 1969.

Conclusion

During the early and middle 1960s, the Army expanded and refined its use of ORSA studies and analyses. The Army Study System itself was reviewed and improved, and until the Nixon administration took office in January 1969, the funding for Army studies and analyses grew steadily. Although the Army was committed to improving its in-house ORSA capabilities, the FCRCs and other Army research contractors shared in the general expansion of the McNamara era. However, by the late 1960s, RAC and the other Army ORSA contractors were under increasing pressure from Congress and from the Army itself. Congressional criticism and restrictions forced the Army's ORSA contractors to diversify their client lists and seek other means of compensating for the general reduction in funding available for contract studies. Nevertheless, RAC, HumRRO, SORO/CRESS, and the other contracting agencies continued to make major contributions to the solution of ongoing problems and the design of the Army of the future as well as to the art and science of ORSA. Even so, by the early 1970s the tide was running against them as the Army focused on ending the Vietnam War, coped with budget cutbacks, improved its in-house ORSA capabilities, and severed its traditional relationships with nonprofit research organizations. The Army would continue to contract out some of its study and analysis work, but over a decade would pass before the tide again turned and the Department of Defense and the Army revived their interest in contracting as a means of meeting their needs for high-quality, in-depth research.

CHAPTER SIX NOTES

[1] For a general discussion of the FCRCs and the criticism to which they were subjected, see U.S. Congress, Office of Technology Assessment, *A History of the Department of Defense Federally Funded Research and Development Centers*, Background Paper OTA–BP–ISS–157 (Washington, D.C.: Government Printing Office, Jul 1995).

[2] The Bell report was reproduced in U.S. Senate, 87th Congress, 2d sess., *Senate Document No. 94: Report to the President on Government Contracting for Research and Development* (Washington, D.C.: Government Printing Office, 1962). On the Bell report, see U.S. House of Representatives, Committee on Science and Astronautics, 87th Congress 2d sess., *Staff Study: Independent Nonprofit Federal Research Contractors* (Washington, D.C.: Government Printing Office, 1963). The staff study was conducted by Spencer M. Beresford and is cited hereafter as the Beresford Memo. See also Herbert Roback, "The Not-for-Profit Corporation in Defense Contracting: Problems and Perspectives," *Federal Bar Journal* 25, no. 2 (Spring 1965), pp. 195–206; and *A History of the Department of Defense Federally Funded Research and Development Centers*, pp. 29–30.

[3] Beresford Memo, p. 1.

[4] Roback, "The Not-for-Profit Corporation in Defense Contracting," p. 201; Beresford Memo, p. 7; James Hessman and *The Journal* Staff, "Federal Contract Research Centers: DoD's Cerebral Reserve," *Armed Forces Journal* 106, no. 4 (28 September 1968), pp. 6–7.

[5] Roback, "The Not-for-Profit Corporation in Defense Contracting," p. 196.

[6] Quoted in *A History of the Department of Defense Federally Funded Research and Development Centers*, p. 30.

[7] Beresford Memo, p. 6.

[8] U.S. Department of Defense, Office of the Secretary of Defense, "Annual Report of the Secretary of Defense for Fiscal Year 1963," in U.S. Department of Defense, *Annual Report of the Secretary of Defense and the Annual Reports of the Secretary of the Army, Secretary of the Navy, Secretary of the Air Force, for Fiscal Year 1963* (Washington, D.C.: Government Printing Office, 1964), p. 37.

[9] Ibid., pp. 37–38.

[10] Roback, "The Not-for-Profit Corporation in Defense Contracting," p. 201.

[11] Ibid., pp. 197–198; Beresford Memo, p. 2.

[12] Roback, "The Not-for-Profit Corporation in Defense Contracting," p. 196. A general overview of the role of contractors in the Army Study System in the early 1970s can be found in Robert McQuie, "Contracted Studies and the Studies System," *Army Management Views* XVI (1971), pp. 144–52.

[13] Robert J. Weeks, *The Army's Operations Research Training Program*, student essay (Carlisle Barracks, Pa.: U.S. Army War College, 2 Dec 1968), p. 4.

[14] Elton Fay, "Army Evaluates FCRCs against In-House Programs," *Armed Forces Journal* 106, no. 4 (28 September 1968), p. 12.

[15] Ibid., p. 13.

[16] Ibid.

[17] Herbert P. Galliher, "Role of Operations Research in Decision Making," in *Proceedings of the [First] United States Army Operations Research Symposium, 27, 28, 29 March 1962, Durham, North Carolina, Part I—Proceedings* (Durham, N.C.: U.S. Army Research Office-Durham, 1962), p. 5.

[18] Gen Ferdinand J. Chesarek (USA Ret.), *Oral History Interviews with Gen. Ferdinand J. Chesarek by Lt. Col. Richard Lawrence and Lt. Col. James Agnew*, Senior Officer Oral History Program (Carlisle Barracks, Pa.: U.S. Army Military History Institute/U.S. Army War College, 1971), vol. II, Interv no. 2 (23 April 1971), pp. 56–57. General Chesarek was the assistant vice chief of staff from July 1967 to March 1969 and later commanding general, Army Materiel Command.

[19] John Maffre, "Defense Report/Congress presses Pentagon to phase out 'think tanks,' shift emphasis to in-house R and D," *National Journal* (12 November 1971), p. 2425. General Taylor was Army chief of staff (1955–1959), chairman of the Joint Chiefs of Staff (1962–1964), ambassador to South Vietnam (1964–1965), and subsequently director of the Institute for Defense Analyses.

[20] Charles J. Hitch, "Plans, Programs, and Budgets in the Department of Defense," *Operations Research* 11, no. 1 (January–February 1963), p. 2.

[21] U.S. Department of the Army Study Advisory Committee (ASAC), *Main Report: Army Study Advisory Committee Examination of the Army's Operations Research/Systems Analysis Personnel Requirements* (Washington, D.C.: Office of the Director of Special Studies, Office of the Chief of Staff, HQDA, 30 Aug 1966) (cited hereafter as ASAC *Main Report*), an. B (Operations Research in and for the Army), an. 2 (Management Principles and Organizational Alternatives for Operations Research in and for the Army), and an. 4, Incl 2 (Data on In-House and Contractual Operations Research).

[22] ASAC *Main Report*, an. B, an. 2, p. 15.

[23] Ibid., pp. 17–18.

[24] Ibid., p. 16.

[25] Ibid., pp. 16–17.

[26] Ibid., p. 18.

[27] Ibid., pp. 18–19.

[28] Ibid., p. 19.

[29] Hessman and others, "Federal Contract Research Centers: DoD's Cerebral Reserve," p. 7.

[30] *A History of the Department of Defense Federally Funded Research and Development Centers*, p. 31.

[31] Ibid., p. 30.

[32] Maffre, "Defense Report/Congress presses Pentagon to phase out 'think tanks,' shift emphasis to in-house R and D," p. 2430.

[33] Quoted in Gerald Regis Wetzel, *Analysis of Balance: An Allocation of Officer Resources to Maximize Efficiency of Operations Research in the Army*, MBA thesis (Washington, D.C.: George Washington University, 30 Sep 1969), p. 84.

[34] U.S. House of Representatives, Committee on Appropriations, 92d Congress, 1st sess., *House Report No. 92–666: DOD Appropriations Bill, 1972* (Washington, D.C.: Government Printing Office, 1971), quoted in Maffre, "Defense Report/Congress presses Pentagon to phase out 'think tanks,' shift emphasis to in-house R and D," p. 2420; and in U.S. Department of Defense, Office of the Director of Defense Research and Engineering, *Statement by the Director of Defense Research and Engineering, Dr. John S. Foster, Jr., on the Federal Contract Research Centers before the Ad Hoc Subcommittee on Research and Development of the Senate Armed Services Committee, 92nd Congress, 5 April 1972* (Washington, D.C.: Directorate of Defense Research and Development, U.S. Department of Defense, 1972), pp. 1–2.

[35] *House Report No. 92–666: DOD Appropriations Bill, 1972*, p. 106.

[36] Frank A. Parker, *Trends Influencing the Nonprofits: Remarks by Frank A. Parker Before the Board of Trustees of the Research Analysis*

Corporation, 23 January 1967 (McLean, Va.: Research Analysis Corp., 1967).

[37] Ibid., p. 1.

[38] Ibid., p. 2.

[39] Ibid., pp. 2–3.

[40] Ibid., pp. 3–4.

[41] Ibid., pp. 4–5.

[42] Ibid., p. 6.

[43] Ibid.

[44] Ibid., pp. 6–7.

[45] U.S. Army Center of Military History, *Department of the Army Historical Summary, Fiscal Year 1972*, William Gardner Bell, ed. (Washington, D.C.: U.S. Army Center of Military History, 1974), p. 123.

[46] Maffre, "Defense Report/Congress presses Pentagon to phase out 'think tanks,' shift emphasis to in-house R and D," p. 2420. The twelve DOD-sponsored FCRCs were the Applied Physics Laboratory of Johns Hopkins University; Ordnance Research Laboratory at Penn State University; Applied Physics Laboratory at the University of Wisconsin; Lincoln Laboratory at the Massachusetts Institute of Technology; MITRE Corporation; Aerospace Corporation; Institute for Defense Analyses (IDA); Center for Naval Analyses (CNA); RAND Corporation; Analytic Services, Inc. (ANSER); Research Analysis Corporation (RAC); and Human Resources Research Organization (HumRRO).

[47] Ibid., pp. 2423–24.

[48] Quoted in Maffre, "Defense Report/Congress presses Pentagon to phase out 'think tanks,' shift emphasis to in-house R and D," p. 2423.

[49] Ibid.

[50] Maffre, "Defense Report/Congress presses Pentagon to phase out 'think tanks,' shift emphasis to in-house R and D," p. 2425. See U.S. Blue Ribbon Defense Panel, *Report to the President and the Secretary of Defense on the Department of Defense* (Washington, D.C.: U.S. Department of Defense, 1 Jul 1970) (cited hereafter as Blue Ribbon Defense Panel Rpt).

[51] Blue Ribbon Defense Panel Rpt, p. 158.

[52] Ibid., p. 159.

[53] Maffre, "Defense Report/Congress presses Pentagon to phase out 'think tanks,' shift emphasis to in-house R and D," p. 2427.

[54] Paul Dickson, *Think Tanks* (New York: Atheneum, 1971), cited in Maffre, "Defense Report/Congress presses Pentagon to phase out 'think tanks,' shift emphasis to in-house R and D," p. 2420.

[55] Maffre, "Defense Report/Congress presses Pentagon to phase out 'think tanks,' shift emphasis to in-house R and D," p. 2424.

[56] Ibid.

[57] Fay, "Army Evaluates FCRCs against In-House Programs," p. 12.

[58] ASAC *Main Report*, an. B, an. 5 (Competitiveness of Government Salaries). The ASAC noted that it had "not undertaken a comprehensive survey to generate new data on an Army-wide basis," but that "the conclusions we can draw are adequate for general management purposes but not a sound basis for detailed management." See also ASAC *Main Report*, app. 35 (Special Pay Rates for DAC Operations Research Personnel).

[59] Ibid., p. 3.

[60] Ibid., pp. 3–4.

[61] Ibid., p. 4.

[62] Ibid. The average annual salary for analysts employed by the five research companies doing work for the Combat Developments Command was found to be $16,092, or about 6 percent higher than the average at RAC.

[63] See *Statement by the Director of Defense Research and Engineering, Dr. John S. Foster, Jr., on the Federal Contract Research Centers*.

[64] Ibid., p. 2.

[65] Ibid.

[66] Ibid., pp. 3–4. In the mid-1960s, the bulk of federal expenditures on research and development contracts—about 67 percent—went to private industry; 20 percent, to government agencies; and the remaining 13 percent, to contracts or grants to universities and other nonprofit organizations. The dollar amounts that went to the not-for-profit FCRCs, on which Congress and other critics focused, was less than 3 percent of the total federal outlay (see Roback, "The Not-for-Profit Corporation in Defense Contracting," pp. 195–96).

[67] Ibid., pp. 12–15.

[68] Ibid., pp. 15–16.

[69] The following abridged account of the history of RAC from August 1961 to September 1972 is based on the excellent corporate history by Charles Alexander Holmes Thomson, *The Research Analysis Corporation: A History of a Federal Contract Research Center* (McLean, Va.: Research Analysis Corp., Jun 1975) as well as other primary and secondary materials. A portion of the RAC office files, long thought to have been lost or destroyed in their entirety, were recently discovered by the author at the U.S. Army Military History Institute (MHI) at Carlisle Barracks, Pa. It appears that in 1982, the Office of the Chief of Research and Development transferred to the MHI approximately eighty-seven boxes containing a portion of the surviving RAC office files, including backup materials for the Thomson history, the RAC president's correspondence files, and other items. The remaining RAC files were transferred to the Washington National Records Center and destroyed in accordance with existing *Army Regulations* for the disposal of official records. Of the eighty-seven boxes that were apparently transferred to MHI, only ten boxes can now be found. A search for the remaining seventy-seven boxes is ongoing. The RAC in-house newsletter, *The RAConteur*, published from June 1962 to January 1972, is also a useful source of information on RAC organizational history and the RAC work program. I am indebted to Eugene P. Visco for the loan of his complete run of *The RAConteur*.

[70] The demise of ORO, the creation of RAC, and RAC's subsequent takeover from ORO are covered in vol. I, ch. 3, of this history. See also U.S. Department of the Army, Office of the Secretary of the Army, "Annual Report of the Secretary of the Army for Fiscal Year 1961," in U.S. Department of Defense, *Annual Report of the Secretary of Defense and the Annual Reports of the Secretary of the Army, Secretary of the Navy, Secretary of the Air Force, for Fiscal Year 1961* (Washington, D.C.: Government Printing Office, 1962), p. 144. RAC took over ORO's physical assets and contractual obligations, most of the ORO staff of more than 300 technical and 135 administrative personnel, and ORO's working relationships with other agencies (see Thomson, *The Research Analysis Corporation*, pp. 19 and 22).

[71] See U.S. Department of the Army, *Army Regulations No. 1–110: ADMINISTRATION—Contracting for Management Advisory Services and Operations Research Studies and Projects* (Washington, D.C.: HQDA, 28 Jun 1961, with subsequent changes and revisions); and *Army Regulations No. 70–20: RESEARCH AND DEVELOPMENT—Operations Research Projects and Studies Conducted by Research Analysis Corporation* (Washington, D.C.: HQDA, 27 Aug 1962).

[72] *AR 70–20*, par. 2.

[73] Ibid., par. 3a–3b.

[74] Ibid., pars. 3c and 3e. The OCRD officers assigned to RAC constituted the U.S. Army Research and Development Operations Research Advisory Group (USAR&DORAG), later referred to simply as the Office of the Senior Military Advisor.

[75] Ibid., pars. 3d and 3f.

[76] Thomson, *The Research Analysis Corporation*, p. 25.

[77] Research Analysis Corporation, *Missions, Operational Philosophy, and Strategic Goals* (McLean, Va.: Research Analysis Corp., 23 Jan 1968), p. 1.

[78] Research Analysis Corporation, *Purposes, Mission, and Operational Concept of the Research Analysis Corporation* (McLean, Va.: Research Analysis Corp., 3 Aug 1965), p. 1.

[79] Thomson, *The Research Analysis Corporation*, p. 75. The RAC articles of incorporation remained essentially unchanged throughout RAC's corporate existence except for an important amendment in October 1967 that broadened the RAC charter so as to permit RAC to serve clients other than the federal government. At the same time, the members of the board were redesignated as directors rather than trustees.

[80] Ibid.; "Navy Veteran Heads Army Research Office; General Bradley Serves on the Board," *Army-Navy-Air Force Journal* 99 (9 September 1961), p. 26.

[81] Thomson, *The Research Analysis Corporation*, p. 75; "Wakelin Named Chairman of RAC Board of Trustees," *The RAConteur* 1, no. 8 (July 1965), pp. 1–2.

[82] Thomson, *The Research Analysis Corporation*, p. 76. Dr. Wakelin's second term as chairman coincided with the sale of RAC to the General Research Corp. in September 1972 and the subsequent period until RAC was formally dissolved in 1975.

[83] The complete listing of those who served on the RAC Board of Directors and in other key leadership positions is given in Thomson, *The Research Analysis Corporation*, pp. 103–08.

[84] The identification of RAC corporate officers and their terms of office are given in Thomson, *The Research Analysis Corporation*, p. 105.

[85] Oral history interview with Dr. Hugh M. Cole by Dr. Wilbur B. Payne, 8 March 1989, conducted as part of the Office of the Deputy Under Secretary of the Army for Operations Research Oral History Project, pp. 10–11.

[86] Unless otherwise noted, the following discussion of RAC organization is based directly on Thomson, *The Research Analysis Corporation*, ch. IX: "Organization and Personnel," and various issues of *The RAConteur*.

[87] In the fall of 1969, William R. Beckert was named vice president and treasurer, and Dr. Clive G. Whittenbury replaced Fred W. Wolcott as vice president for technological systems (see "RAC Appoints Department Heads," *The RAConteur* 5, no. 12 [1 October 1969], pp. 2–3).

[88] Maj. F. L. Smith, *A History of the U. S. Army in Operations Research*, MMAS thesis (Fort Leavenworth, Kans.: U.S. Army Command and General Staff College, 22 May 1967), p. 82.

[89] "RAC Opens New Field Office in Germany," *The RAConteur* I (Old Series), no. 3 (September–October 1962), pp. 1 and 18; "RAC Highlights, 1961–1971," *The RAConteur* (Tenth Anniversary Issue) 7, no. 11 (November 1971), p. 6; U.S. Department of the Army, Office of the Secretary of the Army, "Annual Report of the Secretary of the Army for Fiscal Year 1963," in *Annual Report of the Secretary of Defense and the Annual Reports of the Secretary of the Army, Secretary of the Navy, Secretary of the Air Force, for Fiscal Year 1963*, p. 158.

[90] Eugene P. Visco, personal communication with the author, 24 Jul 2005.

[91] "RAC Goes Global," p. 5.

[92] "RAC Highlights, 1961–1971," p. 6.

[93] "Ruppenthal Appointed Director RACFO Europe," *The RAConteur* III (Old Series), no. 4 (July–August 1964), p. 16. Having earned a Ph.D. in history from the University of Wisconsin in 1939, Dr. Ruppenthal served during World War II as the historian of the U.S. VII Corps. He subsequently worked in the Office of the Chief of Military History from 1946 until joining the ORO staff in 1953. An expert on Army logistical operations, Dr. Ruppenthal had previously served in the ORO European field office in 1954–1955.

[94] "Ruppenthal Visits RAC Home Office," *The RAConteur* 2, no. 4 (15 February 1966), p. 2.

[95] "Ray Sumner Appointed Director RAC FOE," *The RAConteur* 2, no. 23 (15 December 1966), p. 3. Sumner served as director, RACFOE, until 1968, when he was replaced by Roderick C. Dennehy. In July 1969, Dennehy was replaced in turn by Dr. Harrison N. Hoppes (see "Harry Hoppes New RACFOE Director," *The RAConteur* 5, no. 10 [15 July 1969], p. 3).

[96] "RAC in Europe—Report from Heidelberg," *The RAConteur* 3, no. 7 (1 April 1967), p. 4.

[97] Quoted in "RAC in Europe—Report from Heidelberg," p. 4.

[98] Ibid.

[99] Ibid., p. 6.

[100] "RAC Opens Far East Field Office," *The RAConteur* I (Old Series), no. 1 (May–June 1962), p. 4; Raymond E. Bailey, Jr., "Thailand—Research Analysis Corporation," *The RAConteur* 2, no. 23 (15 December 1966), p. 5; "RACSEAFO Split into Two Independent Offices," *The RAConteur* III (Old Series), no. 3 (May–June 1964), p. 1; and "RAC Highlights, 1961–1971," p. 6.

[101] "RAC Opens Far East Field Office," p. 4. The organization and work program of the Bangkok and Saigon field offices are discussed in greater detail in ch. 9.

[102] "RAC Establishes Field Office in Iran," *The RAConteur* 3, no. 8 (15 April 1967), p. 4; "RAC Highlights, 1961–1971," p. 11.

[103] Ibid., pp. 4–6.

[104] Thomson, *The Research Analysis Corporation*, pp. 53–54.

[105] Unless otherwise indicated, the following discussion of RAC personnel status and policies is based directly on Thomson, *The Research Analysis Corporation*, pp. 62–72.

[106] Thomson, *The Research Analysis Corporation*, p. 19.

[107] Ibid., p. 66, Figure 1 (Professional Staff—By Degree).

[108] Ibid., pp. 62, 67, Table 2 (Professional Staff by Degree/Discipline), and p. 69, Figure 2 (Professional Staff—By Discipline).

[109] Ibid.

[110] Ibid.

[111] Ibid., p. 68.

[112] Ibid.

[113] "Dr. Bernard B. Watson Reports on Two-Year Tour of Duty in London as Exchange Analyst," *The RAConteur* III (Old Series), no. 5 (November–December 1964), pp. 15–16; and "RAC Celebrates Fifth Anniversary," *The RAConteur* (Fifth Anniversary Issue) 2, no. 17 (15 September 1966), p. 4.

[114] "Dr. Bernard B. Watson Reports on Two-Year Tour of Duty in London as Exchange Analyst," p. 15. Watson assumed Komlosy's position as superintendent for weapons and tactics at West Byfleet.

[115] "RAC Highlights, 1961–1971," p. 7. The RAC liaison officer at SHAPE in 1967 was Ed Girard (see "Girard Reports from Paris," *The RAConteur* 3, no. 6 [15 March 1967], pp. 4–6). The SHAPE Technical Center moved from Versailles to Casteau in March 1967 in accordance with orders of French President Charles DeGaulle that NATO facilities be moved out of France.

[116] Thomson, *The Research Analysis Corporation*, p. 68.

[117] "ARO Establishes Military Advisory Branch," *The RAConteur* 3, no. 8 (15 April 1967), p. 3.

[118] "Meet . . . Our Senior Military Advisors," *The RAConteur* 6, no. 9 (September 1970), p. 3.

[119] The 22 January 1968 version of *AR 1–110* renamed the Project Advisory Groups (PAGs) as Study Advisory Groups (SAGs).

[120] "RAC Moves into the International Field," *The RAConteur* I (Old Series), no. 4 (November–December 1962), pp. 1 and 18; "RAC Highlights, 1961–1971," p. 6.

[121] "Speaking of the Military—," *The RAConteur* 2, no. 4 (15 February 1966), p. 2; Allen W. Wiegand, "Military Participation in Systems Analyses," *Signal* 21, no. 4 (December 1966), p. 10; "Student Analysis: Chapter II," *The RAConteur* 3, no. 18 (1 October 1967), p. 3.

[122] "Military Analysts Complete First Year Research Training," *The RAConteur* 3, no. 8 (15 April 1967), p. 3. The other members of the original contingent were Lt. Col. R. D. Moore, Lt. Col. L. P. Monahan, and Lt. Col. Paul F. Lawrence.

[123] Thomson, *The Research Analysis Corporation*, pp. 20–21 and 79.

[124] Ibid., p. 21.

[125] U.S. Department of Defense, Office of Public Affairs, *News Release No. 893–61: Army Announces Contract Award to R. A. C.—Army Today Awarded $4.576 Million Contract for Operations Research to R. A. C., Bethesda, Maryland* (Washington, D.C.: Office of Public Affairs, U.S. Department of Defense, 1 Sep 1961).

[126] Thomson, *The Research Analysis Corporation*, p. 20.

[127] Col Charles B. Hazeltine, "Organization for Operations Research within the Army," in *Proceedings of the [First] United States Army Operations Research Symposium, 27, 28, 29 March 1962, Durham, North Carolina, Part I—Proceedings*, p. 15.

[128] The Research Analysis Corporation Archives, U.S. Army Military History Institute, box 337A, Slide (Facility at McLean, Va.).

[129] A listing of ORO/RAC publications through December 1971 can be found in Research Analysis Corporation, *RAC Publications List* (McLean, Va.: Research Analysis Corp., Feb 1972). A final report is in J. Ross Heverly, *Final RAC Publications* (McLean, Va.: Research Analysis Corp., Mar 1973).

[130] "RAC Highlights, 1961–1971," p. 2. The following account of RAC products relies heavily on Thomson, *The Research Analysis Corporation*, chs. V–VIII. Ch. V covers force planning, logistics, manpower, and personnel studies; ch. VI covers cost analyses, war-gaming, and war studies (i.e., strategic and politico-military studies); ch. VII covers basic research, science, technology, and engineering studies; and ch. VIII covers economic, political, and social studies and special studies.

[131] Thomson, *The Research Analysis Corporation*, app. C, pp. 113–16, lists some of the most noteworthy unclassified reports. "RAC Highlights, 1961–1971," passim, also cites the more important RAC studies.

[132] *AR 70–20*, par. 4c.

[133] U.S. Department of the Army, Office of the Chief of Staff, Director of Special Studies, *The Army Study System: A Staff Study by the Director of Special Studies, Office of the Chief of Staff, United States Army* (Washington, D.C.: Director of Special Studies, Office of the Chief of Staff, HQDA, May 1964) (cited hereafter as Bonesteel Study), an. C, Incl 1 (Nature of Army Study Effort), p. 40.

[134] Ibid. This was the so-called institutional research element.

[135] The process is described in Bonesteel Study, an. C, Incl 2 (Management and Control), pp. 46–47.

[136] RAC formats included reports (R), technical memorandums (TM), staff papers (SP), technical papers (TP), client reports (CR), papers (P), and numbered drafts (see Thomson, *The Research Analysis Corporation*, app. C, pp. 111–13). Some of the work produced by RAC in its field offices appeared in the form of field reports, some of which were incorporated in more comprehensive technical papers. The report was the most comprehensive and formal format and covered one or more phases of a study, survey, or analysis. Some 200 RAC reports were published.

[137] Thomson, *The Research Analysis Corporation*, app. C, p. 113. Among the most prominent were Anthony Fiacco and Garth McCormick, *Nonlinear Programming: Sequential Unconstrained Minimization Techniques* (New York: John Wiley and Sons, 1968), awarded the Lanchester Prize in operations research in 1968; Alfred H. Hausrath, *Simulation and Security in War and Peace: The Role of War Gaming* (New York: McGraw-Hill, 1971); and Jerome Bracken and Garth P. McCormick, *Selected Applications of Non-linear Programming* (New York: John Wiley and Sons, 1968).

[138] On Project FOREWON, see Thomson, *The Research Analysis Corporation*, pp. 27–29; "RAC Highlights, 1961–1971," p. 11.

[139] Thomson, *The Research Analysis Corporation*, p. 27; "Magazine Outlines RAC Army Contract," *The RAConteur* 6, no. 3 (March 1970), p. 4. The FOREWON study was published as J. T. Newman and others, *The FOREWON Force-Planning System*, RAC R–86 (McLean, Va.: Research Analysis Corp., 1969–1971).

[140] Thomson, *The Research Analysis Corporation*, p. 27. Following the 1973 STEADFAST reorganization, the new U.S. Army Concepts Analysis Agency assumed responsibility for FOREWON.

[141] Ibid., pp. 54–55; "RAC Highlights, 1961–1971," p. 10. IMPACT/CALCHAS was underwritten by RAC's institutional research funds.

[142] Thomson, *The Research Analysis Corporation*, p. 55.

[143] Ibid., p. 29; "RAC Highlights, 1961–1971," p. 18.

[144] Thomson, *The Research Analysis Corporation*, p. 29.

[145] On RAC's logistical studies, see Thomson, *The Research Analysis Corporation*, pp. 29–32. RAC's work in Army logistics was reviewed in a fourteen-page draft paper titled "Logistics Research at RAC," dated 19 January 1971 (copy in Research Analysis Corporation Papers, U.S. Army Military History Institute). Selected titles from among the many RAC logistics studies include (N.B.: All titles published by Research Analysis Corporation, McLean, Va., unless otherwise noted): Fletcher L. Bartolomew and others, *A Logistic-Gaming and -Simulation System: General Concept,* RAC TP–179 (1966); Robert W. Bluehdorn and others, *An Analysis of User Unit-Direct Support Unit Supply Operations in Seventh Army*, RAC R–27 (1968); John R. Bossenga and others, *An Analysis of Alternative Procedures for Developing Prescribed Load Lists (PLLs)*, 2 vols., RAC R–31 (1968); Charles A. Allen, John R. Bossenga, and Jacob N. Johnson, *Simulation Model for Vehicle Operations*, RAC T–475 (1966); L. N. Karadbil and others, *Logistics of a Combat Division,* TP–292 (1968); and Charles A. Allen and others, *Analysis of Opportunities for the Reduction of Tactical Vehicle Requirements through Pooling,* RAC TP–420 (1971).

[146] Thomson, *The Research Analysis Corporation*, p. 30.

[147] On SIGMALOG, see Thomson, *The Research Analysis Corporation*, p. 31; "RAC Highlights, 1961–1971," p. 8; "SIGMALOG," *The RAConteur* 2, no. 11 (1 June 1966), pp. 4–5. See also Thomas B. Roelofs and Albert D. Tholen, *Simulation and Gaming Methods for Analysis of Logistics (SIGMALOG): General Description,* RAC TP–264 (1967); and Richard C. Robinson, Eugene C. McDowell, and Jeanne W. Rowan, *Simulation and Gaming Methods for Analysis of Logistics II (SIGMALOG II): Capability Analysis System*, RAC TP–432 (1971).

[148] On MAWLOGS, see Thomson, *The Research Analysis Corporation*, pp. 31–32. See also "RAC Highlights, 1961–1971," p. 13.

[149] "RAC Model Views Global Deployment," *The RAConteur* 2, no. 5 (1 March 1966), pp. 4–5. See Lawrence G. Regan and others, *Economic Use of Military Airlift and Sealift for Overseas Shipments in Peacetime*, 2 vols., RAC R–64 (1969).

[150] Ibid., p. 5.

[151] Lt Gen Dwight E. Beach, "The Need for Operations Research," in *Proceedings of the [Second] United States Army Operations Research Symposium, 26, 27, 28 March 1963, Durham, North Carolina, Part I* (Durham, N.C.: Operations Research Technical Assistance Group, U.S. Army Research Office-Durham, 1963), p. 3.

[152] Thomson, *The Research Analysis Corporation*, p. 32. On RAC and the Brown Board, see "RAC Studies Division Logistical Problems," *The RAConteur* 3, no. 4 (15 February 1967), pp. 4–6.

[153] See Thomson, *The Research Analysis Corporation*, pp. 33–35.

[154] Ibid.; "RAC Highlights, 1961-1971," pp. 14-16.

[155] See Betty W. Holz, John J. Emberger, Michael J. Maloney, and Philip D. Roberts, *Manpower Planning Models: COMPLIP and CHAMP,* RAC TP–440 (McLean, Va.: Research Analysis Corp., 1972).

[156] Thomson, *The Research Analysis Corporation*, p. 34. See, *inter alia*, Betty W. Holz and Paul D. Phillips, *Improved Models to Measure Army Personnel Readiness,* RAC TP–381 (1969); William A. Lindsay, Doris C. Berger, and Gregory T. Mormile, *Simple Regression Models for Estimating Future Enlistments and Reenlistments in Army Manpower Planning,* RAC TP–402 (1970); and Philip H. Lowry and others, *General Purpose Forces, Army 1973–1980*, 2 vols., RAC R–135 (1971).

[157] Ibid., p. 35; "RAC Highlights, 1961–1971," pp. 17–18.

[158] Lorna Jaffe, *Quantitative Analysis and Army Decision Making* (Alexandria, Va.: U.S. Army Materiel Development and Readiness Command Historical Office, Dec 1984), p. 22.

[159] Thomson, *The Research Analysis Corporation*, pp. 36–37.

[160] Ibid., p. 37; "RAC Highlights, 1961–1971," p. 9. The Vietnam project began in 1965 with a study of the total historical resource allocations for the support of the Republic of Vietnam (RVN) Army, Regional Forces, and Popular Forces; and two follow-on contracts, one for study of the RVN Navy and another for study of the RVN Air Force, were awarded to RAC by the Office of the Secretary of Defense in 1969. See Irving Heymont, *Resource Allocations for the Republic of Vietnam Army, Regional Forces, and Popular Forces: FY 1969,* RAC TP–401 (1970); Irving Heymont and others, *Republic of Vietnam Navy Historical Allocations and Cost Model,* 2 vols., TP–405 (1970); and Irving Heymont and others, *Republic of Vietnam Air Force Historical Allocations and Cost Model,* 2 vols., TP–406 (1970). Other RAC cost analyses included Robert A. Booth and others, *Cost Analysis of Supersonic Transport in Airline Operations,* 2 vols., RAC R–20 (1966); Ray M. Clarke and others, *Selection of Items for Air Shipment on an Economic Basis,* RAC R–116 (1971); and Irving Heymont, *The Threat Factor in Cost Effectiveness Analyses,* RAC TP–222 (1966).

[161] Thomson, *The Research Analysis Corporation*, p. 37; "RAC Highlights, 1961–1971," p. 7. See Irving Heymont and others, *Guide for Reviewers of Studies Containing Cost-Effectiveness Analysis* (1965).

[162] On RAC war-gaming and simulations, see Thomson, *The Research Analysis Corporation*, pp. 37–39. See also *inter alia*, Richard E. Zimmerman and others, *SANDWAR I and II: A Theater Level War Game in Iran,* RAC TP–47 (1961); Robert G. Hendrickson, *Pros and Cons of War Gaming and Simulation,* RAC TP–49 (1961); William H. Sutherland, *Some Basic Problems in War Gaming of Ground Combat,* RAC TP–153 (1965); Robert G. Hendrickson, Concept Paper: *Computer-Assisted War Games,* RAC TP–192 (1965); and Alfred H. Hausrath, *Simulation and Security in War and Peace: The Role of War Gaming* (1968).

[163] ASAC *Main Report*, an. B, an. 4, app. 3 (Summary of Current Army Data Generating Activity).

[164] Thomson, *The Research Analysis Corporation*, pp. 37–38. Zimmerman won the Lanchester Prize of the Operations Research Society of America in 1956 for his work on Monte Carlo simulations.

[165] Ibid., p. 38. See "New Data for CARMONETTE III," *The RAConteur* 3, no. 11 (1 June 1967), pp. 4–5. See, *inter alia*, William C. Suhler, *An Editing and Analysis Routine for the CARMONETTE Small Unit Simulation,* RAC TP–34 (1961); and Walter Eckhardt and others, *CARMONETTE III Documentation,* 3 vols., RAC R–28 (1967–1968).

[166] Ibid.; "TACSPIEL: Do-It-Yourself History," *The RAConteur* 2, no. 13 (1 July 1966), pp. 4–6. See, *inter alia*, Edward W. Girard and others, *TACSPIEL War Game—Procedures and Rules of Play,* RAC TP–111 (1963); and L. J. Dondero and others, *TACSPIEL War Game—Procedures and Rules of Play for Guerrilla/Counterguerrilla Operations,* RAC TP–223 (1966).

[167] Thomson, *The Research Analysis Corporation*, p. 38.

[168] "THEATERSPIEL—War Game at the Theater Level," *The RAConteur* 3, no. 2 (15 January 1967), pp. 4–6. See also *The THEATERSPIEL Model,* RAC TP–366 (1969).

[169] Thomson, *The Research Analysis Corporation*, p. 38. See William H. Sutherland and others, *POMEX I—An Experiment in Computer Assessment and Political Inputs in a Theater War Game,* RAC TP–67 (1962).

[170] "Military Gaming Completes TBM–68," *The RAConteur* 5, no. 9 (15 June 1969), p. 9. See *Theater Battle Model (TBM–68),* 7 vols., RAC R–36 (1968–1969).

[171] Thomson, *The Research Analysis Corporation*, p. 38; "Military Gaming Completes TBM–68," p. 9. See also Edward P. Kerlin and Robert H. Cole, *ATLAS: A Tactical, Logistical, and Air Simulation: Documentation and User's Guide,* RAC TP–338 (1969); James W. Johnson and Richard E. Zimmerman, *Quick Gaming,* RAC TP–76 (1963); Eugene P. Visco, *SCHNELLSPIEL: A Quick Game for Seventh Army*, RAC TP–145 (1965); and Edward P. Kerlin, Donald W. Mader, and Dudley H. Edwards, *Computerized QUICK-GAME: A Theater-Level Combat Simulation,* RAC TP–266 (1969).

[172] Ibid.; "RAC Highlights, 1961–1971," p. 17.

[173] Thomson, *The Research Analysis Corporation*, p. 38.

[174] Ibid., pp. 38–39; "RAC Highlights, 1961–1971," pp. 9–10.

[175] Thomson, *The Research Analysis Corporation*, pp. 39–42. Typical RAC studies in this field include Irving H. Siegel, *Allocation of Resources: Problems of Strategic Posture and Readiness,* RAC TP–106 (1963); Roland V. Tiede, *A Formulation of Ground Combat Missions in Mathematical Programming Form*, RAC TP–265 (1967); J. A. Bruner and others, *A Technique for Evaluating the Structure of US Army Forces in an Area Domination Role,* RAC TP–412 (1970); and Ronald L. Arms and others, *Description of a Family of Strategic Weapons Exchange Models,* RAC TP–422 (1971).

[176] The RAC study of ADM in NATO Europe was undertaken in 1966 at the request of the director of defense research and engineering (see "RAC Highlights, 1961–1971," p. 11, and J. J. Muccio and C. G. Whittenbury, *Atomic Demolitions in NATO Europe,* RAC T–494 [1967]).

[177] During 1967–1969, RAC acted as the analytical support contractor for Field Test–15, Exercise FIRST LOOK, an exercise held in Britain in the summer of 1968 to field test inspection techniques pertinent to international arms limitation treaties regarding ground and general purpose air forces (see "RAC Highlights, 1961–1971," p. 12).

[178] Thomson, *The Research Analysis Corporation*, pp. 41–42.

[179] See, for example, John P. Hardt and others, *Selected Studies in Soviet Economic Trends, Structure and Institutions,* RAC R–30 (1968); Young C. Kim, *Major Issues in Japan Security Policy Debate*, RAC R–72 (1969); John P. Hardt, *Economic Insights on Current Soviet Policy and Strategy,* RAC R–92 (1969); Young C. Kim, *Japan's Security Policy Toward Communist China*, RAC R–97 (1970); and Harold C. Hinton,

Chinese Views of Sino-Soviet Relations: An Analysis of Operative Factors, RAC R–123 (1971).

[180] Thomson, *The Research Analysis Corporation*, pp. 50–53.

[181] Ibid., pp. 11 and 13. See, *inter alia*, Ronald E. Kirkpatrick and Richard C. Stevens, *A Comprehensive Research Program in Crime Prevention,* RAC R–78 (1969); Irving A. Wallach, *The Police Function in a Negro Community,* 2 vols., RAC CR-19 (1970); Irving A. Wallach and Colette C. Carter, *Perceptions of the Police in a Black Community,* 2 vols., RAC CR–25 (1971); R. J. Butchers, *Civil Disorder Gaming,* RAC TP–334 (1968); and *Report of the Working Conference to Develop an Integrated Approach to the Prevention and Control of Juvenile Delinquency,* 2 vols. (1969).

[182] Thomson, *The Research Analysis Corporation*, pp. 45–49. One of the more significant methodological advances made by RAC analysts was the development of Optimal Planning Over Time (OPT), used to show "when, and how much, improved hardware should be introduced to maintain the most cost-effective family of systems through a time period reaching into the future as long as twenty years" (see Thomson, *The Research Analysis Corporation*, p. 47).

[183] "RAC Highlights, 1961–1971," pp. 7–8. Representative studies and publications included Emil M. Szten and others, *Engine-Transmission Power Plants for Tactical Vehicles*, RAC R–26 (1967); Ray M. Clarke, Walter P. Maiersperger, and Wilbur O. Miller, *An Evaluation of a Heavy-Lift Helicopter in the Logistical Role*, RAC R–48 (1968); Charles A. Allen and others, *A Method for Determining Candidate Families of Army Aircraft with an Application to 1980–85*, TP–350 (1969); J. Ross Heverly, G. B. Litchford, and J. H. Moon, *A 5-Year Accelerated Basic Avionics Program,* RAC R–53 (1968); Charles A. Allen and others, *Family of Army Aircraft Study: Time Frame 1970–85 (FASS–85): Supplemental Effort,* RAC R–99 (1970); Norris E. Mitchell and others, *Operational Effectiveness of SAM-D,* 2 vols., RAC R–115 (1971); and Norris E. Mitchell and others, *Analysis of Fire Support Systems in Ground Combat*, 3 vols., RAC R–125 (1971).

[184] Ibid. See also STASS Project Staff, *Concept for and Analysis of the Surveillance and Target Acquisition Aircraft System,* RAC T488 (1966); and Military Gaming Division, *Employment of Army Aviation in Support of Division Operations: European Theater,* RAC TP–208 (1966).

[185] Thomson, *The Research Analysis Corporation*, pp. 44–45.

[186] Anthony Fiacco and Garth McCormick, *Nonlinear Programming: Sequential Unconstrained Minimization Techniques* (New York: John Wiley and Sons, 1968), won the 1968 Lanchester Prize of the Operations Research Society of America.

[187] Thomson, *The Research Analysis Corporation*, p. 53; "RAC Highlights, 1961–1971," pp. 6–7. RAC involvement in the Vietnam War, and the RAC contribution to the Howze Board in particular, are discussed in greater detail in chs. 8 and 9, below.

[188] "RAC Highlights, 1961–1971," p. 7.

[189] Ibid., passim; "RAC Staff Members to Teach First Operations Research Course at Industrial College of the Armed Forces," *The RAConteur* 1, no. 6 (May 1965), pp. 1 and 7.

[190] The story of RAC's deteriorating relationship with the Army and the consequent sale of RAC to GRC in September 1972 is ably told by Thomson, *The Research Analysis Corporation*, ch. XI.

[191] U.S. Army Center of Military History, *Department of the Army Historical Summary, Fiscal Year 1973,* William Gardner Bell and Karl E. Cocke, eds. (Washington, D.C.: U.S. Army Center of Military History, 1977), p. 161.

[192] Thomson, *The Research Analysis Corporation*, p. 87 and ch. XII.

[193] Carl M. Harris, "Roots of OR–The Research Analysis Corporation: From ORO to RAC," *OR/MS Today* (June 1994), p. 47.

[194] The origins of HumRRO and its operations in the 1950s are discussed in vol. I, ch. 3, of this history. The history of HumRRO through 1967 is covered in Meredith P. Crawford, *A Perspective on the Development of HumRRO* (Alexandria, Va.: George Washington University Human Resources Research Office, Apr 1968).

[195] Crawford, *A Perspective on the Development of HumRRO*, p. 4.

[196] Fay, "Army Evaluates FCRCs against In-House Programs," p. 15; Bonesteel Study, I, an. B, p. 112.

[197] Cited in Eugene A. Cogan, "Interfaces between Operations Research and Human Factors Research," in *Proceedings of the [Third] United States Army Operations Research Symposium, 25, 26, 27 May 1964, Rock Island, Illinois, Part I—Unclassified Papers* (Durham, N.C.: Operations Research Technical Assistance Group, U.S. Army Research Office-Durham, 1964), p. 51. HumRRO was one of four Army human factors research and development organizations, the others being the Army Personnel Research Office, which focused on the selection, classification, and utilization of personnel; the Human Engineering Laboratory, which focused on the compatibility of men and equipment; and the Special Operations Research Office, which focused on the influence on indigenous personnel in foreign areas.

[198] Cogan, "Interfaces between Operations Research and Human Factors Research," p. 51.

[199] Joseph Zeidner and Arthur J. Drucker, *Behavioral Science in the Army: A Corporate History of the Army Research Institute* (Washington, D.C.: U.S. Army Research Institute for the Behavioral and Social Sciences, Jun 1988), pp. 46–47.

[200] *A History of the Department of Defense Federally Funded Research and Development Centers*, p. 32. HumRRO continues to operate as a private research corporation.

[201] Crawford, *A Perspective on the Development of HumRRO*, p. 6.

[202] Smith, *A History of the U. S. Army in Operations Research*, p. 86.

[203] Final Report of the Committee to Evaluate the Army Study System (ETASS), pt. II, sec. D, passim.

[204] Crawford, *A Perspective on the Development of HumRRO*, pp. 13–14; Bonesteel Study, I, an. C, Incl 2, Table (Management and Control), p. 47.

[205] Bonesteel Study, I, an. C, Incl 2, p. 47.

[206] Ibid., and Incl 3, atch. no. 11 (HumRRO Work Program), p. 77.

[207] Crawford, *A Perspective on the Development of HumRRO*, p. 19.

[208] Bonesteel Study, I, an. C, Incl 1, Table (Nature of Army Study Effort), p. 40, and Incl 3, atch. no. 11, p. 77.

[209] Crawford, *A Perspective on the Development of HumRRO*, p. 14. HumRRO also sent teams to Vietnam to study training and operational needs for use of night vision devices (see Fay, "Army Evaluates FCRCs against In-House Programs," p. 15).

[210] The early history of SORO is discussed in vol. I, ch. 3, of this history. Its development is summarized in a thirteen-page staff study inclosed with Memorandum, Col George S. Blanchard (director of special warfare) to Maj Gen James D. Alger (assistant deputy chief of staff for military operations, HQDA), Washington, D.C., 10 Mar 1964, subj: Special Operations Research Office [SORO] (cited hereafter as SORO Staff Study); and American University, Special Operations Research Office, *Fact Sheet on Special Operations Research Office (SORO)* (Washington, D.C.: Special Operations Research Office, American University, 1 Mar 1962) (cited hereafter as SORO Fact Sheet). Both may be found in U.S. Army Center of Military History Historical Research Collection "400.112 SORO (General)."

[211] Bonesteel Study, I, an. C, Incl 1, p. 41, and an. B, p. 112. Although the principal methods used by SORO researchers were those

of history and the social sciences, SORO analysts also employed OR techniques, and thus SORO is included as a bona fide member of the "Army analytical community."

[212] SORO Fact Sheet, p. 1.

[213] Ibid., p. 2.

[214] Smith, *A History of the U.S. Army in Operations Research*, pp. 88–89.

[215] Ibid., p. 89.

[216] Memo of Call, Maj Gen James D. Alger (ADCSOPS) to Brig Gen Hal C. Pattison (COMH), 26 Mar 1964, sub: SORO (copy in CMH HRC "400.112 SORO [General]").

[217] Memo, Brig Gen Hal C. Pattison (COMH) to Maj Gen James D. Alger (ADCSOPS), Washington, D.C., 9 Apr 1964, sub: Possible Assumption by OCMH of Responsibility for FASD of SORO (copy in CMH HRC "400.112 SORO [General]"). See also the notes prepared by Stetson Conn (Chief Historian, OCMH), 28 Mar 1964, sub: Some Observations and Conclusions Concerning the Suggested Assignment of SORO's Special Area Studies Division to the Office of the Chief of Military History (copy in CMH HRC "400.112 SORO [General]").

[218] Smith, *A History of the U.S. Army in Operations Research*, p. 90 (based on Special Operations Research Office, *Work Program Fiscal Year 1967* [Washington, D.C.: Center for Research in Social Systems, American University, 1 Aug 1966], pp. iii–iv).

[219] Ibid., p. 88 (quoting Special Operations Research Office, *SORO R&D Work Program, FY 65* [Washington, D.C.: SORO, American University, 1 Jul 1964], pp. ii–iii).

[220] Ibid.

[221] Ibid., pp. 95.

[222] Smith, *A History of the U. S. Army in Operations Research*, p. 89 (quoting Special Operations Research Office, *SORO R&D Work Program, FY 65* [Washington, D.C.: SORO, American University, 1 Jul 1964], pp. ii–iii).

[223] Ibid.

[224] Ibid., p. 86.

[225] SORO Staff Study, p. 12; SORO Fact Sheet, p. 2.

[226] Ibid.

[227] *A History of the Department of Defense Federally Funded Research and Development Centers*, p. 32; ETASS, II–D–8.

[228] SORO Fact Sheet, p. 3.

[229] Ibid.; Notes prepared by Stetson Conn (chief historian, CMH), 28 Mar 1964, sub: Some Observations and Conclusions Concerning the Suggested Assignment of SORO's Special Area Studies Division to the Office of the Chief of Military History (copy in CMH HRC "400.112 SORO [General]").

[230] Fay, "Army Evaluates FCRCs against In-House Programs," p. 13; *Hearings on DOD Appropriations for 1965*, p. 42; *Senate Report No. 92–498: DOD Appropriations Bill, 1972*; ASAC *Main Report*, an. B, an. 3, Incl.

[231] Bonesteel Study, an. C, Incl 3, atch. 5 (Special Operations Research Office [SORO] Work Program and Bibliography), p. 63.

[232] Ibid., p. 62.

[233] SORO Staff Study, p. 11.

[234] SORO Fact Sheet, p. 2

[235] Bonesteel Study, I, an. C, Incl 1, p. 41, and Incl 3, atch. 5, p. 63.

[236] Ibid., an. C, Incl 3, atch. 5, p. 63.

[237] Ibid.

[238] *A History of the Department of Defense Federally Funded Research and Development Centers*, p. 28. This trend affected all DOD FCRCs. In June 1968, ten out of the sixteen DOD FCRCs were administered by universities. As of FY 1995, only two out of ten, both labs, were administered by universities.

[239] Dickson, *Think Tanks*, p. 135.

[240] The Chilean controversy is summarized in Dickson, *Think Tanks*, pp. 134–35; and in Frank M. Tims, "Project Camelot and the U.S. Army," *Cold War Times: The Internet Newsletter for the Cold War Museum and Cold War Veterans Association* 4, no. 1 (March–April 2004), pp. 16–17, at www.coldwar.org/text_files/march _april_04, downloaded 10 April 2005; copy in possession of the author. *See also* Irving Louis Horowitz, ed., *The Rise and Fall of Project Camelot* (Cambridge, Mass.: M.I.T. Press, 1967).

[241] Tims, "Project Camelot and the U.S. Army," p. 16.

[242] Ibid.

[243] Ibid.

[244] Ibid.

[245] Tims, "Project Camelot and the U.S. Army," p. 17.

[246] Dickson, *Think Tanks*, p. 136. The status of CRESS as a FCRC was terminated at the end of FY 1970.

[247] Tims, "Project Camelot and the U.S. Army," p. 17; Dickson, *Think Tanks*, p. 136.; Maffre, "Defense Report/Congress presses Pentagon to phase out 'think tanks,' shift emphasis to in-house R and D," p. 2430.

[248] Fay, "Army Evaluates FCRCs against In-House Programs," p. 13.

[249] On the bombing and its aftermath, see Leemark Communications, "The Bombing of Sterling Hall" (2000) at www.leemark.com/featuredcontent/sterling/sterling.html, downloaded 20 March 2005; copy in possession of the author; and Tom Bates, *Rads: The 1970 Bombing of the Army Math Center at the University of Wisconsin and Its Aftermath* (New York: HarperCollins, 1992).

[250] See Table 5–3, above. The forty-five contractors listed in ASAC *Main Report*, an. B, an. 3, Incl, were by no means the only companies doing ORSA work for the Army. For example, in FY 1967, the U.S. Army Strategy and Tactics Analysis Group (STAG) had contracts for modeling and simulation support with Mathematica, Inc.; Information Dynamics, Inc.; Midwest Research Institute (MRI); and Computer Applications, Inc., none of which were listed in the 1966 ASAC study (see U.S. Army Strategy and Tactics Analysis Group, *United States Army Strategy and Tactics Analysis Group Historical Summary Fiscal Year 1967* [Bethesda, Md.: U.S. Army Strategy and Tactics Analysis Group, 1967], p. 5).

[251] The origins of CORG and its operations under HQ CONARC are discussed in vol. I, ch. 4, of this history. See also Lynn H. Rumbaugh, *A Look at US Army Operations Research-Past and Present*, RAC–TP–102 (McLean, Va.: Research Analysis Corp., Apr 1964), p. 6.

[252] ASAC *Main Report*, an. B, an. 3, Incl.

[253] Ibid., an. B, an. 4, app. 6, atch. 1.

[254] Bonesteel Study, I, an. B, pp. 114–15.

[255] For CORG participation in counterinsurgency studies and airmobility test and evaluation activities in the 1960s, see ch. 8. For CORG participation in the study of combat operations in Vietnam, see ch. 9.

[256] See Technical Operations, Inc., Combat Operations Research Group, *Final List of CORG Publications* (Alexandria, Va.: Combat Operations Research Group, Technical Operations, Inc., for Headquarters, U.S. Army Combat Developments Command, Jun 1970).

[257] See, for example, Virgil Ney, *Organization and Equipment of the Infantry Rifle Squad: From Valley Forge to ROAD*, CORG–M–194 (1965); *Evolution of the U.S. Army Infantry Battalion, 1939–1968*, CORG–M–343 (1968); *Evolution of the US Army Division, 1939–1968*, CORG–M–365 (1969); and *Evolution of a Theater of Operations Headquarters, 1941–1967*, CORG–M–318 (1967), all published at Fort Belvoir, Va., by Combat Operations Research Group, Technical Operations, Inc.

[258] The history of SRI is described in, *inter alia*, Weldon B. Gibson, *Stanford Research Institute: A Story of Scientific Service to Business, Industry, and Government* (n.p.: Newcomen Society in North America, 1968); and Donald L. Nielson, *A Heritage of Innovation: SRI's First Half Century* ([Menlo Park, Calif.]: [SRI International], 1986). See also "History of SRI International" at www.sri.com/about/history, downloaded 5 September 2005; copy in possession of the author.

[259] Dickson, *Think Tanks*, p. 204 (see also pp. 204–09).

[260] Ibid., pp. 207–08.

[261] Ibid., p. 208. The presidents of SRI during the period under consideration were Karl A. Folkers (1963–1968) and Charles A. Anderson (1968–1979).

[262] U. S. Army Combat Developments Experimentation Command, *Developing Tomorrow's Army Today* (Fort Ord, Calif.: U.S. Army Combat Developments Experimentation Command, 1 Dec 1958), p. 11. On the early history of CDEC, see vol. I, ch. 4, of this history.

[263] The Combat Developments Command Experimentation Center (CDCEC) was subsequently renamed the Combat Developments Command Experimentation Command without change of the acronym.

[264] Lt Gen Dwight E. Beach, "The Combat Developments Command Program," *Army Management Views* IX, pt. I (1963–1964), p. 142.

[265] ASAC *Main Report*, an. B, an. 4, app. 3.

[266] Ibid., an. B, an. 4, app. 6, atch. 2 (Three Selected CDC Field Agencies, Analytically Oriented).

[267] Ibid., an. B, an. 3, Incl.

[268] Parker, *Trends Influencing the Nonprofits*, pp. 3–4.

[269] Bonesteel Study, I, an. C, Incl 2, p. 47. SRI developed an annual work program with guidance from a Study Advisory Committee (SAG) chaired by the ACSFOR. The SAG subsequently monitored the work and reviewed and evaluated the study product.

[270] Ibid., I, an. C, Incl 3, atch. 8 (Stanford Research Institute Defense Analysis Center Bibliography and Abstracts), p. 69.

[271] Ibid., I, an. C, Incl 1, p. 40.

[272] Ibid., I, an. C, Incl 3, atch. 8, p. 69. Between August 1956 and July 1963, SRI produced about 200 studies.

[273] ASAC *Main Report*, an. B, an. 3, Incl.

[274] Edgar B. Vandiver III, oral history interview with Dr. Charles R. Shrader, Fort Belvoir, Va., 23–24 Aug 2004, in "The Origins of US Army Operations Research" Project, USAWC/USAMHI Senior Officer Oral History Program (Carlisle Barracks, Pa.: U.S. Army War College/U.S. Army Military History Institute, 2005), pp. 44–48.

Robert S. McNamara, Secretary of Defense

Charles J. Hitch, DOD Comptroller

Alain C. Enthoven, Assistant Secretary of Defense (Systems Analysis)

Wilbur B. Payne, Deputy Secretary of the Army (Operations Research) from January 1968 to November 1975

Lt. Gen. Ferdinand J. Chesarek, Assistant Vice Chief of Staff of the Army from February 1967 to March 1969, later commanded the U.S. Army Materiel Command.

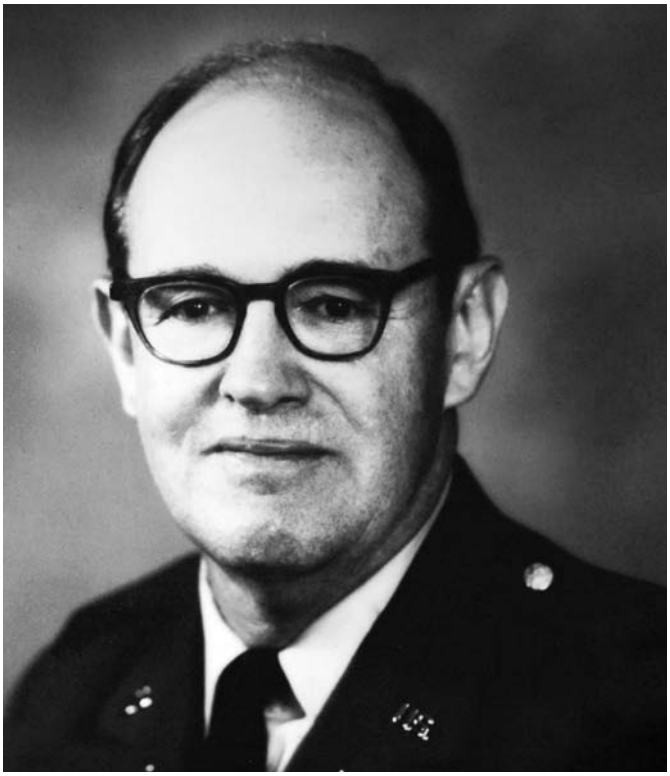
Lt. Gen. William E. DePuy, Assistant Vice Chief of Staff of the Army from March 1969 to March 1973, later commanded the U.S. Army Training and Doctrine Command.

Maj. Gen. Julian J. Ewell, Commanding General of the 9th Infantry Division, Vietnam

Maj. Gen. Ira A. Hunt Jr., 9th Infantry Division Chief of Staff, Vietnam

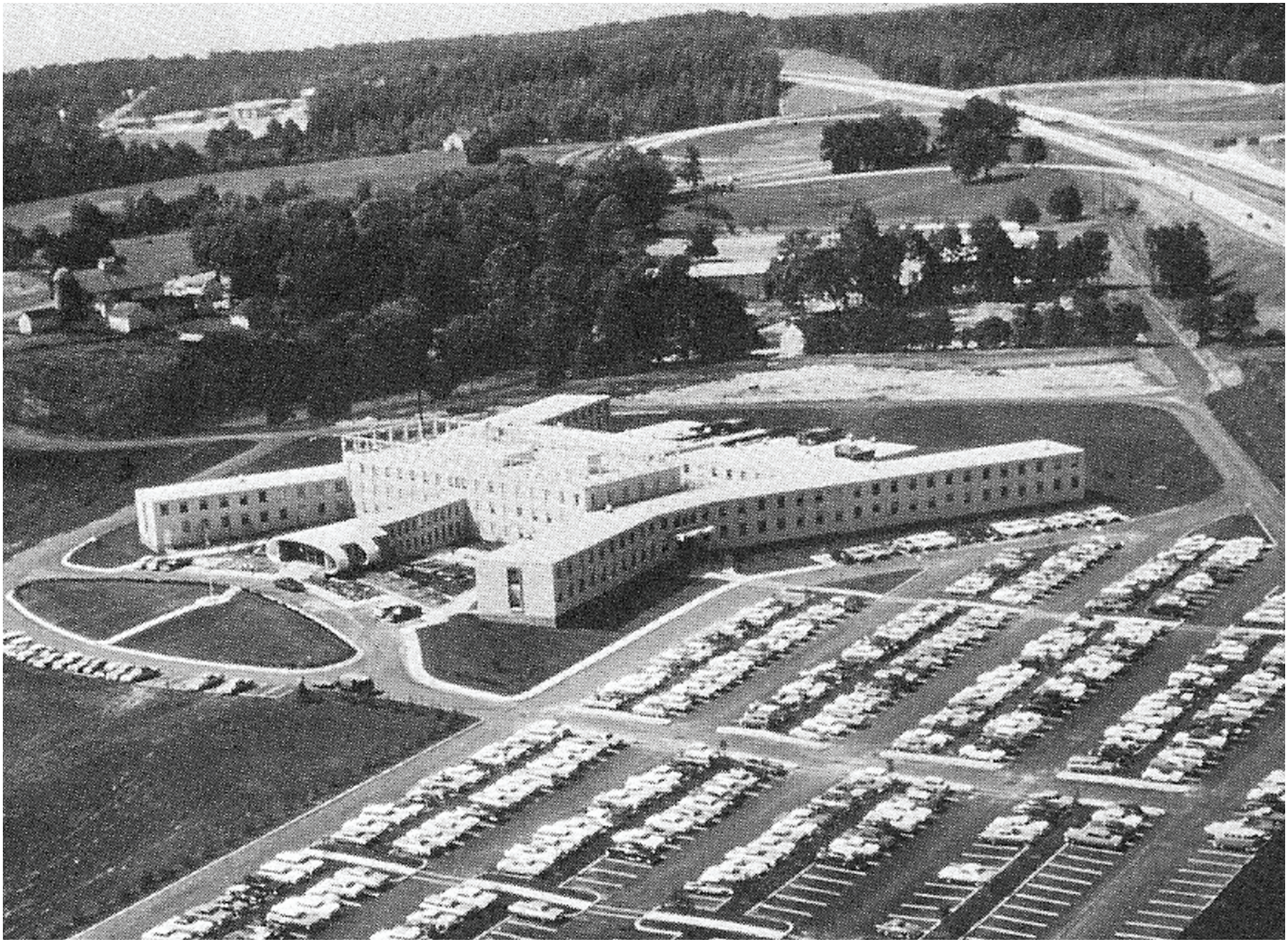
Cyrus R. Vance, Secretary of the Army

Maj. Gen. H. W. O. Kinnard commanded the 11th Air Assault Division (Test) during air mobility tests in the early 1960s and the 1st Cavalry Division (Airmobile) in Vietnam.

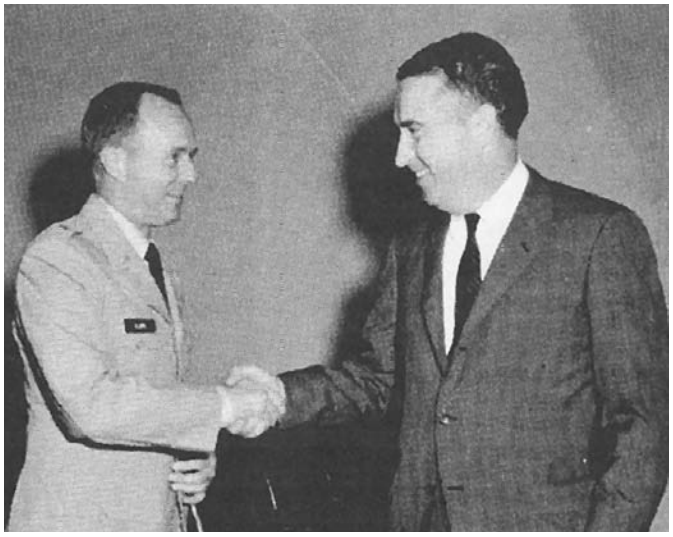


Col. H. K. Roach was the last chief of the Strategy and Tactics Analysis Group (STAG) and served from April 1972 to January 1973.

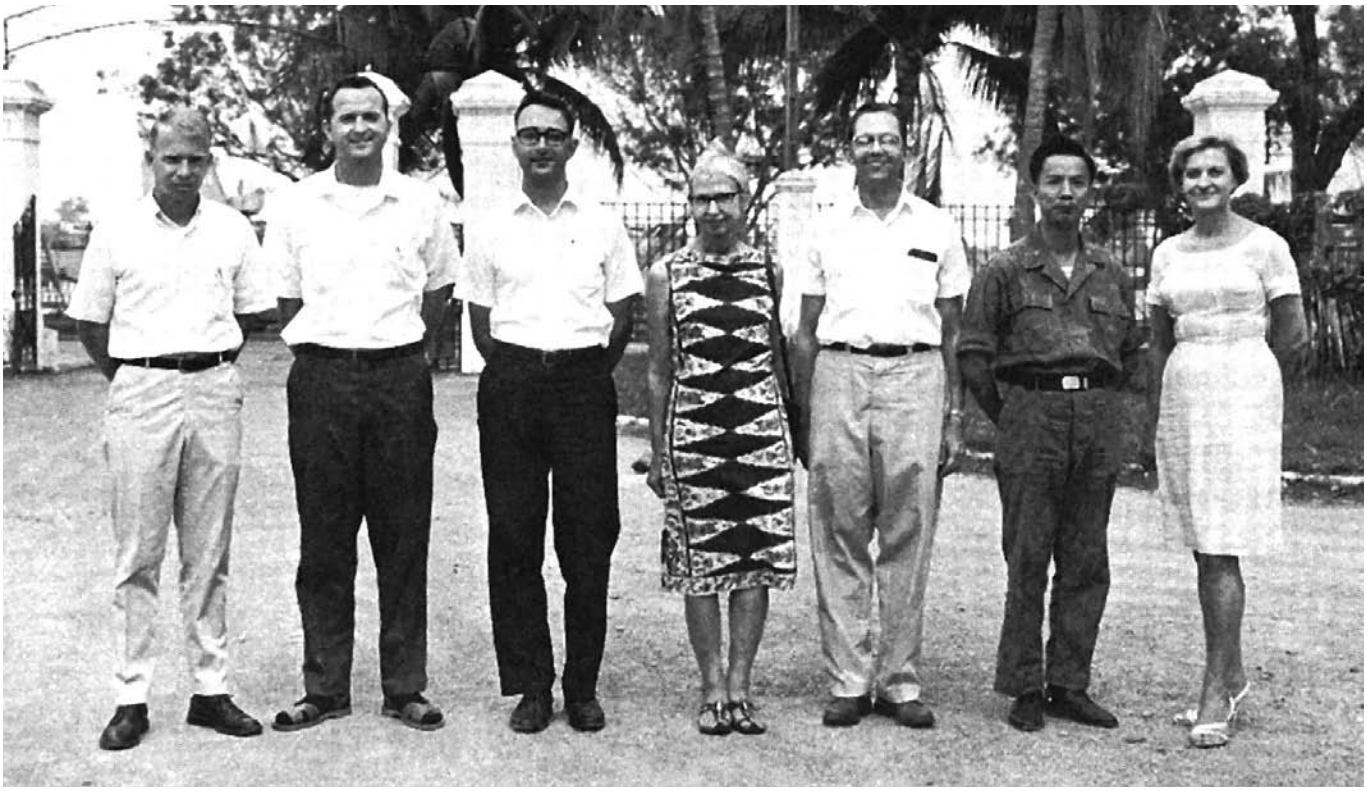
Richard E. Zimmerman, Research Analysis Corporation



Research Analysis Corporation Headquarters in McLean, Virginia, 1964



(Left to right) Brig. Gen. Chester W. Clark, Director of Army Research, is greeted by Frank A. Parker, President of Research Analysis Corporation, May 1962.



Members of the Inland Waterway Project, RAC Field Office, Saigon, May 1966 (left to right): Glen Vanderwerker, David Bowie, Chuck Wyman, Dorothy Clark, Harry Handler, Maj. Thuan of ARVN Development Test Center, and Eileen Clark.

ARCOV team members in the field in Vietnam (left to right): Bill Brown, E. B. Vandiver III, and Bill Carswell.

ACTIV Compound in Saigon housed both the ACTIV and ARCOV Study Teams.

The Rugby Building in Bethesda, Maryland, was the home of the Concepts Analysis Agency from 1973–1975.

CHAPTER SEVEN

The Army Analytical Community, 1961–1973 Part III: ORSA in Class II Activities and Major Commands

The majority of Army funds for operations research and systems analysis (ORSA) studies during the period 1961–1973 went to the Army-sponsored Federal Contract Research Centers (FCRCs) and other ORSA contractors, but the emphasis placed by the Army on improving its in-house ORSA capabilities ensured the substantial growth of Army Class II activities and organizations in the Army major commands involved in the production of studies and analyses and other ORSA work. Class II activities under the direction of the Army Staff, such as the Army Research Office-Durham (ARO-D) and the Strategy and Tactics Analysis Group, prospered, and ORSA elements in the major commands also increased in size, scope, and level of production. The February 1962 reorganization of the Army created two commands that were to be major "users" of ORSA: the United States Army Materiel Command (AMC) and the United States Army Combat Developments Command (CDC). AMC and CDC absorbed the remnants of the small operations research groups in the Technical Services when the Technical Services were abolished in 1962 and went on to create active ORSA elements in both their headquarters and in their subordinate commands. By 1973, there were many new Army ORSA organizations, both large and small, at home and abroad.

Class II ORSA Activities

By the mid-1960s, there were at least nine Army Class II activities engaged in ORSA-type studies and analyses. Each of those agencies reported to and was monitored by an element of the Army Staff. Some conducted all of their work in-house and others used a combination of in-house and contract effort. The most prominent of the Class II ORSA activities was the United States Army Strategy and Tactics Analysis Group, monitored by the deputy chief of staff for military operations (DCSOPS). Other Class II ORSA activities were monitored by the deputy chief of staff for personnel (DCSPER), the assistant chief of staff for intelligence (ACSI), the deputy chief of staff for logistics (DCSLOG), the assistant chief of staff for force development (ACSFOR), the comptroller of the Army, and the chief of engineers.

The Strategy and Tactics Analysis Group

The United States Army Strategy and Tactics Analysis Group (STAG) was established as a Class II field activity under the staff supervision of the DCSOPS in August 1960.[1] The mission of STAG as prescribed in *AR 15–14* was "to support Department of the Army operational planning and evaluation activities by war gaming and allied techniques."[2] STAG, which was responsible for the test and evaluation of operational plans, concepts, and attendant force structures and formal computer-supported war-gaming and simulation, focused on theater-level war-gaming but also conducted some other ORSA-type studies.[3] By 1972, the specific tasks assigned to STAG included:

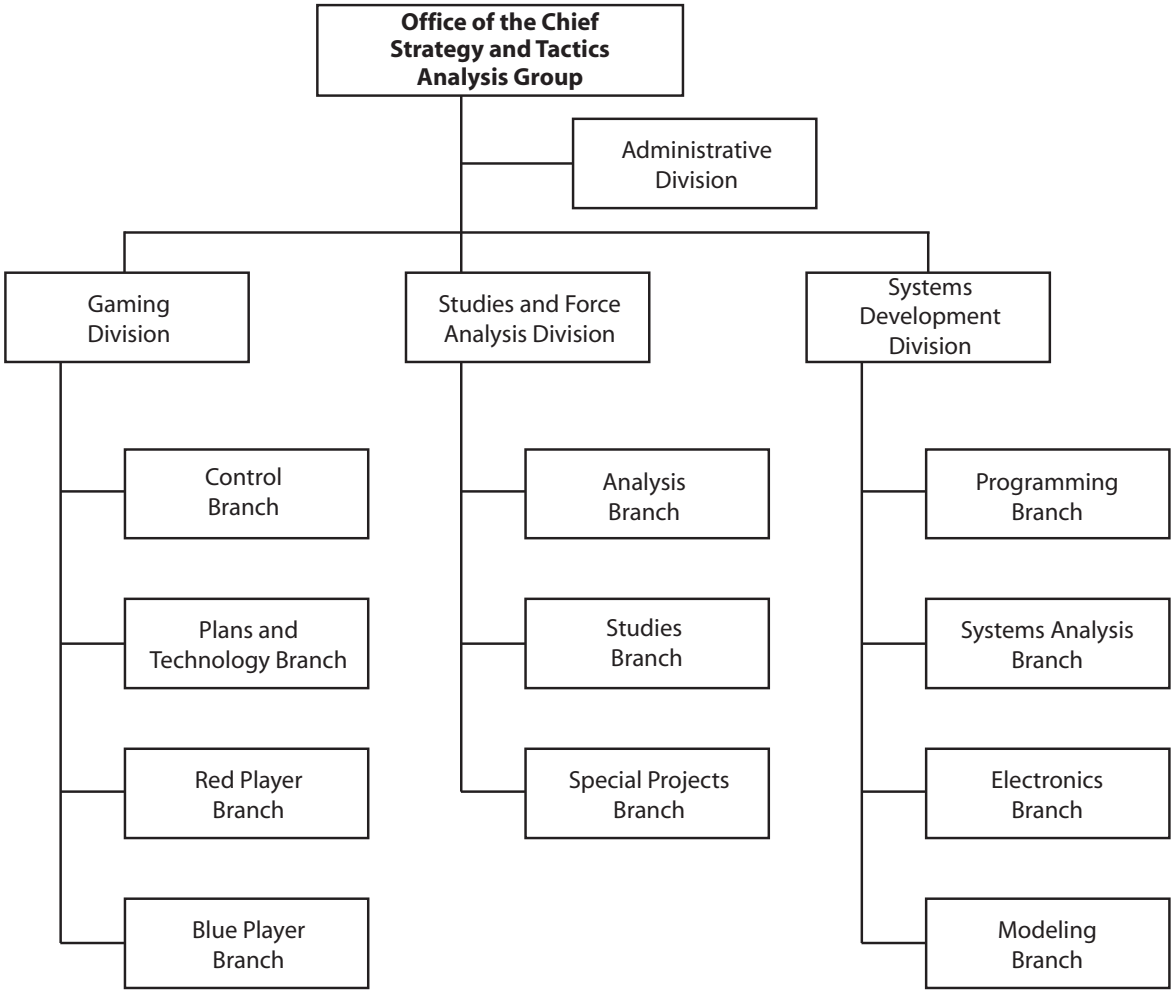
a. Conduct manual, computer-assisted, and computerized war games at various command levels and various environments to assist in evaluating

operational plans and in analyzing strategic, tactical, and organizational concepts and develop models necessary to the conduct of games only when appropriate models are not already available from other sources.

b. Conduct studies, evaluations, analyses, and tests using war gaming and appropriate allied techniques.
c. Provide technical assistance to Department of the Army agencies in preparing for and conducting war games, as directed.
d. Provide Department of the Army representation in preparing for and conducting joint war games, as directed.[4]

STAG was initially organized with a Staff Management Office and four divisions (Plans and Analysis, Gaming, Land Warfare, and Systems).[5] Several minor organizational changes were made before 5 August 1966, when the chief of STAG submitted a plan for reorganization that proposed the dissolution of the then-existing Modeling Division to form a Modeling Branch in the Systems Development Division and a Special Projects Branch in the Studies and Force Analysis Division.[6] The intention was to increase STAG's in-house capabilities in systems analysis, programming, and study efforts. The proposed reorganization was approved by the DCSOPS on 13 August 1966, and the resulting organization of STAG was as shown in Figure 7–1.

FIGURE 7–1—ORGANIZATION OF STAG, FY 1967



Source: Memo for Chief, STAG, from DCSOPS, Washington, D.C., 13 Aug 1966, sub: Reorganization of STAG (reproduced in STAG, *Historical Summary—FY 1967*, an. B); STAG, *Historical Summary—FY 1967*, p. 2, Figure 1 (Organization Chart).

Note: The Administrative Division was organized with three branches: Administration, Support, and Security.

The organization of STAG remained essentially the same as shown in Figure 7–1 until STAG became the Concepts Analysis Agency in January 1973, except that the Studies and Force Analysis Division was reorganized as the Force Analysis Division with four branches (General Purpose Forces, Strategic Forces, Strategic Mobility, and Support Forces) and the Systems Development Division was renamed the Data Automation Division with five branches (Analysis, Application Programming, Computer Operations, Modeling, and Systems Programming).[7]

The first chief of STAG was Col. Alfred W. DeQuoy. The officers who held that position subsequently are listed, with beginning and end dates, in Table 7–1.

STAG was initially authorized a strength of seventy-four personnel (thirty-five military and thirty-nine civilians).[8] The subsequent fluctuations in STAG's authorized personnel levels from FY 1961 through 14 January 1973 are shown in Table 7–2. The bulk of the civilians employed by STAG were professional ORSA analysts or mathematicians, and many of the assigned military personnel were also qualified ORSA "specialists" or "executives." The 1966 ASAC study of Army ORSA personnel requirements established a goal for STAG of six military and thirty-five civilian ORSA specialists and three military ORSA executives by the summer of 1970.[9] Technical support and physical facilities for

Table 7–1—STAG Commanders, 1960–1973

Name	*Dates*	
Col. Alfred W. DeQuoy	1 August 1960	15 November 1963
Col. Paul G. Guthrie	16 November 1963	31 December 1964
Col. Harold C. Brown	1 January 1965	30 June 1966
Col. Frederick G. White	1 July 1966	31 May 1967
Col. Irvin F. Carpenter	1 June 1967	31 March 1972
Col. H. K. Roach	1 April 1972	14 January 1973

Source: Based on hallway display at U.S. Army Center for Army Analysis, Fort Belvoir, Va., 2004.

Table 7–2—STAG Authorized Strength, Selected Dates, FY 1961–14 January 1973

Date	*Military Personnel*	*Civilian Personnel*	*Total Personnel*
FY 1961	35	39	74
FY 1962	62	66	128
FY 1963	74	88	162
FY 1965	77	85	162
FY 1967	79	84	163
FY 1969	77	54	131
FY 1972	77	66	143
14 Jan 1973	77	78	155

Source: Memo, Chief, STAG, to Lt Col Fisher and others, 14 Sep 1961, sub: Proposed Reorganization for FY 63–67; STAG O & F Manual, p. 1–1; *Fact Sheet-U. S. Army Strategy and Tactics Analysis Group*; ASAC *Main Report*, an. B, an. 3 (Expenditures for Army Operations Research), pp. 1–2; STAG, *Historical Summary—Fiscal Year 1967*, p. 2, Figure 1 (Organization Chart); Russell D. McGovern, "Management of Operations Research and Systems Analysis Studies," *Army Management Views XIII*, no. 2 (December 1968), p. 30; STAG Information Brochure, p. 7; STAG, *Historical Summary, 1 July 1972–15 January 1973*, p. 1 and an. A.

STAG were provided under a contract with Booz-Allen Applied Research, Inc.[10]

In FY 1963, about half of the DCSOPS studies contracting budget of $823,000 went for studies supporting STAG, as did $1,000,000 of the DCSOPS budget of $1,625,000 for in-house study activities.[11] Army OMA funding for STAG amounted to some $2,536,745 in FY 1964, $1,657,979 in FY 1965, and $1,601,569 in FY 1966.[12] The FY 1967 STAG budget amounted to some $1,604,402, of which $1,437,492 was expended, the major portion going for civilian pay ($736,431) and equipment maintenance and other services ($347,318).[13] The STAG budget for FY 1973 was $1,954,000 plus a $225,798 supplement for civilian personnel compensation and benefits for a total of $2,179,798.[14] Again, the most significant expenditure ($1,155,960) was for civilian personnel costs.

Each year STAG developed and conducted a number of war games, primarily at the theater level, as well as a number of ORSA-type studies covering a variety of topics of interest to the Army. The annual work program was developed in coordination with the DCSOPS and other Army agencies. Representative STAG projects during FY 1967 included an air assessment study for DCSOPS; an air reconnaissance study for ACSI; several regional force planning studies; analysis and computer support of the ACSFOR in the preparation of force structures; a European war game (CAPEUR-69); an analysis of planning factors for nuclear weapons requirements in support of a ground war in Asia (PACNUC); a study of requirements for Army general-purpose forces in northeast Asia in 1972; a theater-level air battle model (CASCADE II); the Experimental Air Ground Logistics Evaluation (EAGLE) Model; a large-scale model for simulation of land forces (TARTARUS IV Revised); a survey and comparative evaluation of all existing models for their utility to STAG; and document retrieval projects for intelligence and Table of Organization and Equipment (TOE) data.[15]

Similarly, some thirty significant STAG projects were under way during FY 1973, including FOREWON Army Strategic Operations Plan Exercise-1972; support of the Joint Strategic Capabilities Plans, 1972–1973 and 1974; a Joint OSD/DA NATO Land Forces Requirements and Methodology Review (FOREM); the development of nuclear options concepts (NOC II); work on Mutual and Balanced Force Reduction (MBFR); a study of weapons effectiveness indicators/weighted unit values (WEI/WUV); user testing of the AFFORD System; a review of ongoing studies and projects; and continuing review and improvement of in-house methodology, war-gaming techniques, and databases.[16]

The Army Research Office-Durham and the Operations Research Technical Assistance Group

Although it did not conduct studies and analyses, the Army Research Office-Durham (ARO-D), established on the Duke University campus in Durham, North Carolina, as the United States Army Office of Ordnance Research in June 1951, was an important part of the Army analytical community.[17] ARO-D was responsible, under the direction of the Army's chief of research and development (CRD), for monitoring Army contracts for research (including ORSA research), coordinating Army scientific research programs, and maintaining contact with the scientific community. ARO-D also supervised the activities of the Operations Research Technical Assistance Group (ORTAG), created by the CRD on 20 June 1962 to provide scientific and technical assistance to the various Army commands on their ORSA programs and projects. ORTAG, a committee formed of representatives from various Army commands and agencies and chaired by the commander of ARO-D, also planned, managed, and issued reports on the annual Army Operations Research Symposia, the objectives of which were to:

a. Emphasize the role of operations research in the improvement of military operations.
b. Acquaint key personnel of the Army with in-house capabilities.
c. Provide a forum for presentation and discussion of Army problems.
d. Inform participants of new technological developments.
e. Increase applicability of results obtained in O.R. studies.
f. Further personal acquaintances of operations analysts.[18]

ARO-D, ORTAG, and the annual Army Operations Research Symposia contributed a great deal to the advancement of ORSA in the Army during the period 1961–1973. Although they produced no studies or ORSA analyses of their own, they significantly

augmented the efforts of the Army's analytical community, established standards, provided a forum for the exchange of ideas, and assisted other Army ORSA elements in a number of useful ways.

Other Class II ORSA Activities

A number of other Army Class II activities were engaged in ORSA-type studies and analyses during the 1960s and early 1970s. Perhaps the most prominent of them was the United States Army Personnel Research Office (USAPRO), which published ten to twenty reports per year, many of which involved the use of ORSA techniques.[19] USAPRO operated in accordance with *AR 70–8*, and its annual work program was supported principally by Research, Development, Test, and Evaluation (RDTE) funds and was managed for the Army by the CRD in close coordination with the DCSPER. The annual program was approved by the CRD after review by the Army Human Factors Research Advisory Committee and focused on personnel measurement and the optimal employment of personnel.[20] Topics addressed in the annual USAPRO work program included military personnel selection and classification procedures, behavioral evaluation research, man-machine relationships, surveillance systems and imagery interpretation, stress, and predictions of officer and NCO performance. The DCSPER also had an interest in the United States Army Behavioral Sciences Research Laboratory (BSRL) located in Arlington, Virginia.[21] The BSRL was also monitored by the CRD and carried out research on manned systems, human performance, and military personnel selection. In FY 1970, the BSRL was authorized eighty professionals with sixty-six on hand and provided the Army with some 828 man-months of effort.[22]

Other Army Staff elements also supervised the work of Class II activities engaged in ORSA-type work. The United States Army Intelligence Threat Analysis Group (ITAG), located at Arlington Hall Station, Virginia, operated under the supervision of the ACSI and focused on long-range trend analyses with an emphasis on Soviet and Communist Chinese capabilities. As of FY 1970, the ITAG was authorized thirty-five professional personnel, had thirty-five professionals on hand, and produced some 240 man-months of ORSA effort for the Army.[23] The Army DCSLOG oversaw the operations of the United States Army Logistics Doctrine, Systems, and Readiness Agency (LDSRA), located at the New Cumberland Army Depot in Pennsylvania. The LDSRA dealt with logistics systems concepts, and in FY 1970 it was authorized 137 professionals with 131 on hand and provided the Army with 396 man-months of ORSA effort.[24] The United States Army Field Operating Cost Agency (FOCA) in Alexandria, Virginia, operated under the supervision of the COA and conducted cost research. In FY 1970, the FOCA was authorized thirty-three professional personnel and had thirty-three on hand who produced some 373 man-months of ORSA effort for the Army.[25]

The Army's chief of engineers was responsible for two Class II activities that conducted some ORSA-type studies. The Engineer Strategic Study Group (ESSG) in Washington, D.C., studied the engineering implications of various strategic and logistical studies, nuclear weapons, and other engineering topics.[26] As of December 1965, ESSG had an authorized strength of thirteen officers and fifty civilians.[27] By FY 1970, the ESSG was authorized sixty-five professionals, had fifty-seven on hand, and produced some 570 man-months of ORSA effort for the Army.[28] The ESSG was funded primarily by Operations and Maintenance, Army (OMA) funds that amounted to $556,000 in FY 1964, $560,000 in FY 1965, and $590,000 in FY 1966.[29]

The Engineer Agency for Resources Inventories (EARI) in Washington, D.C., oversaw resources, inventories, data management, planning, and engineering services for the Army. In FY 1970, the EARI was authorized forty-one professionals, had twenty-nine on hand, and produced some 348 man-months of ORSA effort for the Army.[30]

ORSA in the Major Commands

The 1962 reorganization of the Army brought about fundamental changes in the way the Army's primary functions were assigned and consequently in the organization of ORSA activities within the Army's major commands.[31] The Army's mission was defined by four principal functions—develop doctrine, manage personnel, equip the Army, and train the troops—and each of those functions was assigned to one of the new or existing commands. The new Office

of Personnel Operations (OPO) in Washington was made responsible for personnel management; the new Army Materiel Command (AMC), for equipping the Army; the new Combat Developments Command (CDC), for developing doctrine and how the Army should be organized, equipped, and employed; and the existing Continental Army Command (CONARC), for training individuals and units and preparing them for combat.[32] The Army's research and development efforts were thus consolidated in two new major commands—AMC and CDC—that subsequently provided the bulk of the Army's in-house ORSA capability. AMC and CDC absorbed most of the ORSA elements of the organizations from which they were formed and went on to consolidate their ORSA activities. For example, AMC took over many of the ORSA elements of the seven former Technical Services, including the Chemical Corps Operations Research Group at Edgewood Arsenal, Maryland; and HQ CDC assumed control of the Combat Operations Research Group (CORG) from HQ CONARC. At the same time, the overall number and size of the Army's in-house ORSA activities grew rapidly, and the new commands developed new organizations and procedures for handling the growing number of ORSA organizations and the studies they produced. The same was true for the other Army major commands, almost all of which developed some type of ORSA study and analysis capability, either in-house or contract or a combination of the two.

The United States Army Materiel Command

The United States Army Materiel Command (AMC) was created in July 1962 and "centralized, consolidated and integrated the individual programs of the technical services [including their ORSA programs] to improve efficiency in materiel procurement, testing and evaluation."[33] The official mission of AMC was to:

1) Direct, integrate, and improve performance of the wholesale materiel activities of the Army.
2) Furnish timely and effective supply support and maintenance support to the Army, to the Army elements of unified and specified commands, and to other customers, as authorized.
3) Assist in the formulation of the Army materiel program, and implement the approved program in accordance with policy established by the Department of the Army.[34]

The size and scope of the new command were enormous. In 1963, AMC had annual expenditures of some $9 billion, a materiel inventory of more than $18 billion, some 186,000 personnel (of which some 20,000 were military), and some 235 installations and activities, including one in Alaska and one in the Panama Canal Zone.[35] By 1970, the annual AMC budget had increased to about $14 billion and its inventory to about $21 billion, and AMC was then the third-largest U.S. "corporation" after General Motors and the U.S. Air Force.[36]

To manage its large enterprise, AMC was initially organized with five commodity-oriented development and production commands (Electronics, Missile, Mobility, Munitions, and Weapons), a Test and Evaluation Command, and a Supply and Maintenance Command. The director of research and development at HQ AMC also oversaw the operations of eight research laboratories and agencies as shown in Figure 7–2.

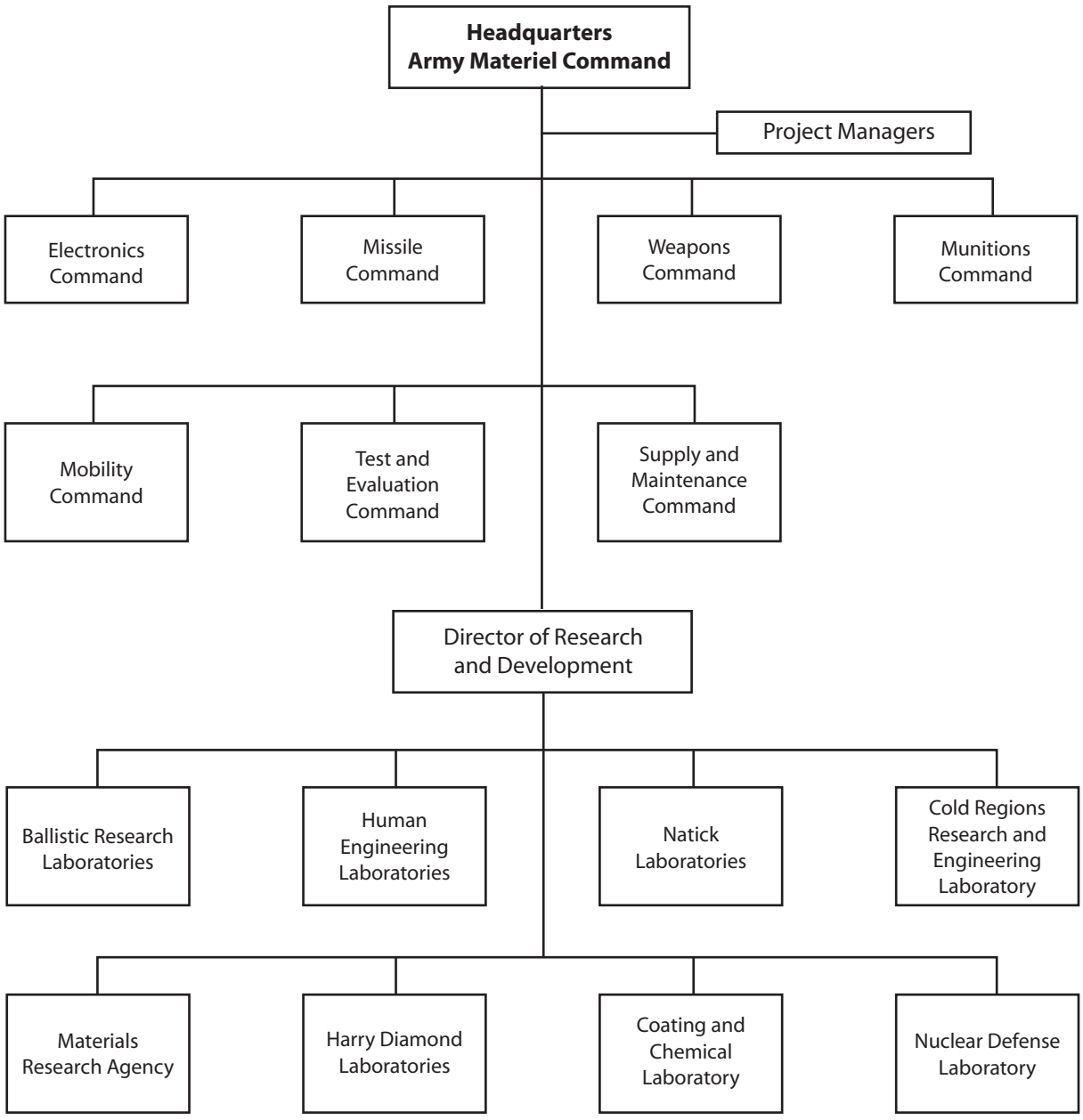
From the beginning, the leaders of AMC acknowledged the value of ORSA and sought to make it an integral part of the new command's collection of tools. The first AMC commander, General Frank S. Besson, Jr., stated that "OR is one of the keys to the thing that is most important in military life, and that is the ability to make a decision," and that "there must be a very close alliance between the military and the civilian scientists."[37] Lt. Gen. William B. Bunker, then deputy commanding general of AMC, told students at the Army Management School in May 1968:

> [T]here is no question but that the technique (discipline, fad, or what have you) of systems analysis has become of primary importance to all of us in the military over the past several years. It has gotten to the point that we cannot make even the most simple recommendation without supporting it with an elaborate cost effectiveness study.
>
> Some knowledge of the tools of systems analysis and a reasonable proficiency in their use have therefore become essential for a modern military executive. The essential thing to do is to maintain a balanced perspective in regard to the matter—somewhere between the starry-eyed enthusiasm of the true believer and the pragmatic distrust of the old soldier.[38]

By virtue of its decentralized organization, the task of identifying those elements of AMC doing ORSA work during the period 1962–1973 is "nearly impossible."[39] At the time of the activation of AMC in July 1962, the only AMC office with a specific ORSA program was the Management Science Office (MSO), the mission

of which was to evaluate and integrate "existing technical service management techniques" and to develop "improved methods and techniques."[40] However, as the Army Study Advisory Committee (ASAC) noted in its 1966 study of Army ORSA personnel requirements, "a large number of elements of AMC engage in analysis . . . most of the 42 agencies . . . do some in-house analysis and occasionally resort to contract support. The decentralized nature of the AMC operation makes it difficult to identify all agencies doing analytical work."[41]

Figure 7–2—Organization of the Army Materiel Command, 1963



Source: "Annual Report of the Secretary of the Army for Fiscal Year 1962," p. 192; U.S. Department of the Army, Office of the Secretary of the Army, "Annual Report of the Secretary of the Army for Fiscal Year 1963," in U.S. Department of Defense, *Annual Report of the Secretary of Defense and the Annual Reports of the Secretary of the Army, Secretary of the Navy, Secretary of the Air Force, for Fiscal Year 1963* (Washington, D.C.: Government Printing Office, 1964), p. 121; Besson, "Research and Development Within the U.S. Army Materiel Command," p. 206, Figure 5, and p. 208, Figure 9.

The Bonesteel study in 1964 identified some seventeen AMC elements conducting significant studies and analyses.[42] And in its 1966 study, the ASAC was able to identify six elements in HQ AMC; two elements each in the Electronics, Missile, and Weapons commands; four elements in the Mobility Command; six elements in the Munitions Command, six elements in the Supply and Maintenance Command; a number of elements in the Test and Evaluation Command; and eleven out of some thirty-five other separate activities and laboratories reporting to HQ AMC—in all some forty-two agencies—that were "known to produce a significant number of studies, evaluative reports, and analyses in support of a variety of Army programs and requirements statements."[43]

The purpose of AMC study efforts was to determine "necessary and desirable changes in the Army wholesale logistics system as dictated by new military organizations, strategy, tactics and weapon technology."[44] The scope of AMC studies and analyses was quite broad and included such topical areas as the acquisition, storage, movement, distribution, maintenance, evacuation, and disposition of materiel; the movement, evacuation, and hospitalization of personnel; the acquisition, construction, maintenance, operation, and disposition of facilities; and the acquisition and furnishing of services.

The AMC study program was conducted under *AMC Regulation No. 700–10* and responsibility for the initiation, conduct, and review of studies and analyses was decentralized to the commanders of the subordinate AMC commands and agencies.[45] The subordinate AMC commanders were responsible for both in-house and contract studies, and HQ AMC sought to integrate those efforts into a formal Logistics Studies Program that was coordinated and developed by the Army Logistics Management Center at Fort Lee, Virginia. HQ AMC approved in-house studies, and the Army chief of research and development approved contract studies. The Management Science Office in HQ AMC approved and supervised the execution of the annual study program that was aimed at attaining the Long-Range Logistics Objectives established by the MSO. An AMC board set general logistics policy and objectives, and Study Advisory Groups (SAGs) were formed to manage contract studies. The AMC study program included about sixty active studies per year, thirty of which were new studies and thirty of which were completed during the year.[46] In addition, AMC produced some 3,000 technical reports per year, including the results of tests and evaluations as well as statements of design parameters describing desired performance characteristics of equipment and weapons and compilations of test data.[47]

The total number of trained ORSA personnel involved in the AMC study program is not known, but the 1966 ASAC study of Army ORSA personnel requirements established the AMC requirement for the summer of 1970 to be ten military and eighty civilian ORSA specialists and ninety-three military ORSA executives, for a total of 183 trained ORSA personnel.[48]

Between 1963 and 1970, AMC expenditures on ORSA studies and analyses rose steadily, with dramatic increases in FY 1966 and FY 1967, as shown in Table 7–3. During that period, contract expenditures increased sevenfold, but in-house expenditures increased by more than twice that amount. In FY 1963, AMC spent about $1,511,000 on its in-house ORSA work and only $840,000 for ORSA contracts.[49] By FY 1970, about $23.2 million of the overall AMC budget of around $14 billion went to support AMC in-house ORSA organizations and contracting. The sums expended by AMC on ORSA-type studies and analyses were not inconsiderable. In May 1968, Lt. Gen. William B. Bunker, the deputy commanding general of AMC, told students at the Army Management School:

> As far as our major programs are concerned, the amount of money we are spending in the systems analysis area runs into the millions of dollars. To cite one example, we are currently launching a study costing over 4 1/2 million dollars on a main battle tank; this study seems to be primarily aimed at assuring that such a tank weigh only 46 tons. Four and a half million dollars to determine whether that is feasible seems rather expensive.[50]

ORSA in Headquarters, United States Army Materiel Command

Although the bulk of AMC ORSA work was done in the subordinate commands and agencies, a considerable amount of activity also took place at HQ

Table 7–3—Army Materiel Command ORSA Expenditures, FY 1963–FY 1970

Fiscal Year	*Contract Expenditures*	*In-House Expenditures*	*Total Expenditures*
1963	$840,000	$1,511,000	$2,351,000
1964	1,336,989	3,432,116	4,769,105
1965	1,577,193	4,275,630	5,852,823
1966	5,000,000	7,000,000	12,000,000
1967	5,900,000	12,800,000	18,700,000
1968	6,100,000	14,500,000	20,600,000
1969	6,700,000	15,500,000	22,200,000
1970	6,900,000	16,300,000	23,200,000

Source: ASAC, *Main Report*, an. B, an. 1, Figure 1, and an. B, an. 3, Incl. The latter reference cited the total AMC contract expenditures in FY 1966 as only $1,681,858 rather than $5,000,000, and ASAC *Main Report*, an. B, an. 3, p. 2, gives the total AMC in-house expenditures for FY 1966 as $4,579,297 rather than $7,000,000 (for a total FY 1966 expenditure of only $6,261,155 rather than $12,000,000). Presumably the more finite FY 1966 figures are more accurate.

AMC. The 1966 ASAC study identified six HQ AMC staff elements engaged in some form of ORSA activity.[51] The HQ AMC director of research and development played a central role in AMC ORSA activities inasmuch as he was responsible for:

a) Formulation of the overall AMC research and development program.
b) Direct supervision and control of assigned laboratories.
c) Supervision of research and development activities of subordinate commands.
d) Supervision of assigned test facilities.
e) Quantitative and Qualitative review of performance of all these activities.
f) Monitor the development activities in Special Warfare.[52]

Among the elements of the HQ AMC Research and Development Directorate involved in ORSA-type work, the Concept Analysis Branch of the Technical Service Division did R&D technical planning studies and comparative analyses.

The HQ AMC comptroller/director of programs also played an important role by virtue of his responsibilities with respect to quantitative review of AMC programs and reports to higher headquarters.[53] The Statistics and Data Base Branch of the Systems and Cost Analysis Division was established on 1 August 1968 to give greater emphasis to the systematic and regular collection of data within AMC.[54] As of May 1969, the branch had seven full-time employees and another six on a part-time basis.[55] The Statistics and Data Base Branch was responsible for identifying needed AMC databases, providing guidance for their development and maintenance, and preparing technical reports and general guidance for all AMC elements on the use of statistical data and procedures. The Evaluation Branch, Program Control Division, also conducted or supervised a variety of cost and cost-effectiveness analyses. The AMC comptroller was responsible for publishing the bimonthly *Cost Analysis Monthly Exchange*, which was a means of disseminating information concerning ongoing or recently completed studies on cost and cost-effectiveness analysis.[56] The comptroller also developed a database consisting of study abstracts of all AMC cost-effectiveness studies.

Other HQ AMC elements involved in ORSA work were the Office of the Special Assistant for Project Management, which supervised contract ORSA work dealing with management analysis of project manager offices. The Materiel Readiness Directorate also provided supervision and review of several RAC projects dealing with techniques for measuring equipment readiness. The Technical Data Office conducted research and analysis of technical data systems to support equipment

systems developed by the commodity commands. The Systems Research Division, Data Systems Office, was data systems–oriented and conducted ORSA studies on logistics management systems.

A new element, the Plans and Analysis Coordinating Office, was established in 1970, and the AMC Planning Board at Aberdeen Proving Ground was moved to HQ AMC to provide the nucleus of a central AMC planning activity. As AMC Comptroller Brig. Gen. James G. Kalergis told students at the Army Management School in October 1969, the purpose of the new office was to address two management areas:

> 1. The creation of overall plans specifying roles and objectives; and 2. Coordination of the use of systems analysis techniques in all facets of the decision-making process. . . . In the systems analysis area this office will set policies and procedures on the use of systems analysis techniques throughout the AMC structure. Techniques addressing materiel systems problems, as well as alternatives and related trade-offs in a decision-making process, will be developed. Concurrently, the systems analysis capability will provide the Commanding General with an in-house capability to address problems whose solutions can be attained by use of systems analysis techniques.[57]

ORSA in Separate Army Materiel Command Agencies

There were a number of independent agencies subordinate to HQ AMC that conducted a variety of ORSA-type activities ranging from full-scale ORSA studies and analyses to the use of ORSA techniques as a supplement to other methodologies.[58] Perhaps the most important of these independent agencies was the United States Army Logistics Management Center (ALMC) at Fort Lee, Virginia, which was responsible for coordinating the AMC logistics study program. ALMC conducted logistics research, developed advanced inventory models, and prepared a variety of other ORSA-type studies and analyses. In FY 1970, ALMC was authorized thirty-nine ORSA professionals, had twenty-one on hand, and conducted some 468 man-months of self-initiated ORSA studies.[59] ALMC's Logistical Research and Doctrine Department also conducted studies and analyses dealing with logistics doctrine and broad logistics concepts. ALMC also operated the Defense Logistics Studies Information Exchange (DLSIE) located at Fort Lee. DLSIE was created by *DOD Instruction 5154.19*, dated 3 July 1962, and was implemented by *AR 1–12*, dated 10 September 1962.[60] The mission of DLSIE was to collect, store, and disseminate information about logistics studies and related material of interest to DOD agencies. DLSIE served about 300 agencies by providing quarterly and annual bibliographies covering both classified and unclassified studies. Studies were catalogued according to sponsor/author and an index showed which of them were prepared by contractors. A subject index was also provided.

The Weapons System Laboratory (WSL) of the Ballistic Research Laboratories (BRL) at Aberdeen Proving Ground, Maryland, was the first Army agency created to do weapons systems analysis as a primary mission.[61] Created in 1946, the WSL conducted ORSA studies on the evaluation of weapons systems. In the 1950s, BRL expanded its analysis activities to include more ORSA-type studies. BRL received RDTE funding for ORSA-type work of $2,490,000 in FY 1964, $3,005,000 in FY 1965, and $3,245,000 in FY 1966; in 1966 BRL was authorized twelve military and 189 civilian ORSA professionals.[62] Even after one of its divisions was spun off in 1966 to form the Army Materiel Systems Analysis Center (AMSAC), BRL continued to perform a variety of ORSA studies and analyses pertaining to the development of weapons systems.

By the summer of 1966, AMC was in the late stages of preparing a proposal to significantly expand and reorganize its study agencies. The subsequent establishment of the Army Materiel Systems Analysis Center at Aberdeen Proving Ground provided AMC with a significant enhancement of its in-house ORSA capabilities.[63] The mission of AMSAC, or the Army Materiel Systems Analysis Agency (AMSAA), as it was later renamed, was to:

- Serve as the AMC's lead activity for systems analysis;
- Conduct cost and operations effectiveness analyses;
- Conduct studies of survivability;
- Conduct studies of reliability, availability, and maintainability methodology;
- Perform test design and independent evaluation for decisions on all major Army materiel systems such as tanks, trucks, missiles, radios, aircraft, etc.;

- Perform logistics and readiness related analysis;
- Provide systems analysis support to the Army.[64]

AMSAA's role in the materiel acquisition process was to ensure compliance with DOD and DA policy and doctrine as it pertained to the acquisition, testing, support, and deployment of equipment. Under the direction of Dr. Joseph Sperazza, AMSAA also conducted materiel-oriented systems analyses, prepared dynamic modeling of vehicle system availability, and developed conceptual methodological frameworks for tactical and logistical vehicle evaluations. AMSAA also maintained oversight of the performance of fielded equipment through participation in materiel readiness reviews, sample data-collection efforts, field exercise data-collection efforts, and special field surveys and visits.[65] The 1966 ASAC study of Army ORSA personnel requirements established the summer 1970 requirement for AMSAA to be sixty-eight civilian ORSA specialists.[66] In fact, in FY 1970, AMSAA was authorized 209 professionals, had 196 on hand, and initiated some 2,508 man-months of ORSA work.[67]

The Department of Management Planning, United States Army Management Engineering Training Agency (AMETA), another independent AMC activity in Rock Island, Illinois, conducted systems studies and studies of management techniques and applied management science techniques to a variety of AMC-wide problems, particularly management systems. AMETA projects included the preparation of *DA Pam 1–50: Work Measurement in the Army* and studies of productivity assurance techniques, standard time-reporting systems, and personnel fatigue and rest factors.[68] In FY 1970, AMETA was authorized sixty ORSA professionals, had fifty-seven on hand, and performed 720 self-initiated man-months of ORSA work.[69]

ORSA in the AMC Subordinate Commands and Other AMC Agencies

Each of the seven commands and many of the other agencies subordinate to HQ AMC contained elements that performed some type of ORSA activity.[70] In some cases, ORSA sections, identified as such, conducted full-blown ORSA studies and analyses. In others, ORSA techniques were applied to augment other study methodologies. All of the elements in the AMC subordinate commands and other agencies that were involved in ORSA work are shown in Table 7–4.

Perhaps the most significant ORSA activity in any of the subordinate AMC commands was in the United States Army Weapons Command (WECOM) at Rock Island, Illinois. The predecessor of WECOM, the Ordnance Weapons Command, was established in 1955 and had an important ORSA element.[71] As the

Table 7–4—Analytical Elements in AMC Subordinate Commands and Other Agencies

Organization	*Location*	*Principal Activity*
U.S. Army Weapons Command, Rock Island, Illinois		
Weapons Operations Research Division, HQ WECOM	Rock Island, Ill.	Studies and operational analyses of weapons, production, quality control, and facilities
Management Science and Data Systems Office, HQ WECOM	Rock Island, Ill.	Analyses and recommendations regarding the adoption of technical data systems to support weapons development and sustainment
U.S. Army Electronics Command, Fort Monmouth, New Jersey		
Logistic Engineering Division, Directorate of Materiel Readiness, HQ ECOM	Fort Monmouth, N.J.	Field studies and evaluations of modularized equipment repair alternatives

Table 7–4—Analytical Elements in AMC Subordinate Commands and Other Agencies—Continued

Organization	*Location*	*Principal Activity*
Electronics Logistic Research Office	Philadelphia, Pa.	Studies on supply and maintenance support of electronic materiel
U.S. Army Missile Command, Redstone Arsenal, Alabama		
Weapons Analysis and Requirements Branch, Future Missile Systems Division, R&D Directorate, HQ MICOM[a]	Redstone Arsenal, Ala.	Simulations and parametric analyses of air defense and surface-to-surface missiles
Redstone Scientific Information Center	Redstone Arsenal, Ala.	Research, analysis, and execution of techniques of information, storage, processing, and retrieval pertaining to missile and rocket systems
U.S. Army Munitions Command, Dover, New Jersey		
Office of the Chief, Supply and Maintenance Group, Frankford Arsenal	Frankford Arsenal, Pa.	Operations analysis of munitions supply and maintenance activities
Objectives Analysis Office, Mathematics Branch, Physics Laboratory, Institute for Research, Frankford Arsenal	Frankford Arsenal, Pa.	Studies of research and development design and weapons systems analyses
Operations Research Branch, Management Science and Data Systems Division, Frankford Arsenal	Frankford Arsenal, Pa.	Mathematical models for supply control and requirements forecasting
Operations Research Division, U.S. Army Ammunition Procurement and Supply Agency	Joliet, Ill.	Value engineering, and OR concerned with the logistical support of special weapons
Operations Research Group, Edgewood Arsenal[b]	Edgewood Arsenal, Md.	Operations research in the CBR field
Picatinny Arsenal	Dover, N.J.	Some ORSA work dealing with supply systems for ammunition items, ammunition safety studies, value engineering, and documentation
U.S. Army Mobility Command, Warren, Michigan		
Special Purpose Vehicle Division, Maintenance Directorate, U.S. Army Tank Automotive Center[c]	Warren, Mich.	Studies on operational performance of tanks and armored personnel carriers
Operations Research Division, Management Science and Systems Office, U.S. Army Aviation Materiel Command[d]	St. Louis, Mo.	Application of OR techniques to inventory and management problems
Special Review and Inspection Evaluation Office, U.S. Army Aviation Materiel Command	St. Louis, Mo.	Studies of maintenance and operations costs for Army aircraft; most work on a contract basis
Aeronautical Systems Advanced Design Group, U.S. Army Transportation Research Command	Fort Eustis, Va.	Aeronautical engineering studies and concept development

Table 7–4—Analytical Elements in AMC Subordinate Commands and Other Agencies—Continued

Organization	*Location*	*Principal Activity*
Data Systems Office, Plans Office, U.S. Army Terminal Command, Atlantic	Brooklyn, N.Y.	Research, analyses, and development of computer-supported movement planning systems
United States Army Maintenance Board[e]	Fort Knox, Ky.	Studies of equipment maintenance management and accounting
U.S. Army Supply and Maintenance Command, Washington, DC		
Directorate of Maintenance, HQ SMC	Washington, D.C.	Studies and analyses of supply and maintenance aspects of airmobility; most work done on contract
Management Office, SMC Support Center[f]	Letterkenny Army Depot, Pa.	Research and analysis on depot level maintenance systems and development of an SMC Operating Manual
Savanna Army Depot	Savanna, Ill.	Studies of economic feasibility and readiness benefits of controlled-humidity storage
Systems Control and Evaluation Division, SMC Logistics Data Center, Lexington Army Depot	Lexington, Ky.	Mathematical procedures for determining optimal distribution patterns for Army commodities (less ammunition)
U.S. Army Test and Evaluation Command, Aberdeen Proving Ground, Maryland		
The subordinate elements of TECOM conducted a variety of ORSA-type activities. Among those elements were Aberdeen Proving Ground, Md.; the Airborne Electronic and Special Warfare Board, Fort Bragg, N.C.; the Air Defense Board, Fort Bliss, Tex.; the Arctic Test Center, Fort Greely, Ark.; the Armor Board, Fort Knox, Ky.; the Army Electronic Proving Ground, Fort Huachuca, Ariz.; the Artillery Board, Fort Sill, Okla.; the Aviation Test Activity, Edwards AFB, Calif.; Dugway Proving Ground, Utah; Erie Proving Ground, Pa.; the General Equipment Test Activity, Fort Lee, Va.; the Infantry Board, Fort Benning, Ga.; Jefferson Proving Ground, Ind.; the Tropic Test Center, Fort Clayton, PCZ; White Sands Missile Range, N.Mex.; and Yuma Proving Ground, Ariz.[g]		
Independent AMC Commands and Agencies		
Project Manager Overseer[h]	Washington, D.C.	Project 58A
Natick Laboratories	Natick, Mass.	Studies of packaging, delivery, and salvage systems
Coordination Group, Major Items and Data Agency (MIDA)	Chambersburg, Pa.	Studies on materiel readiness of specific major items of Army equipment and on unit equipment status
Cold Regions Research and Engineering Laboratories	Hanover, N.H.	Analyses of factors involved in cold-weather operations
Harry Diamond Laboratories	Washington, D.C.	Research and analysis of fuzing systems and data-retrieval systems

Table 7–4—Analytical Elements in AMC Subordinate Commands and Other Agencies—Continued

Organization	*Location*	*Principal Activity*
Foreign Science and Technology Center	Washington, D.C.	Syntheses and analyses of data on foreign military systems
United States Army Materiel Command Board	Aberdeen Proving Ground, Md.	Basic long-range conceptual studies

Source: The principal sources for this table are the Bonesteel Study, I, an. B, pp. 112–14; and the attachments to ASAC *Main Report*, an. B, an. 4, app. 7.

[a]The OR Branch, Future Missile Systems Div, received RDTE funding of $450,000 in FY 1964, $500,000 in FY 1965, and $600,000 in FY 1966, and in 1966 the branch was authorized fourteen civilian ORSA professionals (see ASAC *Main Report*, an. B, an. 3, pp. 1–2).

[b]The OR Group, Edgewood Arsenal, received RDTE funding for ORSA studies in the amount of $309,000 in FY 1964, $464,000 in FY 1965, and $451,000 in FY 1966, and in 1966 the group was authorized five military and twenty-three civilian ORSA professionals (see ASAC *Main Report*, an. B, an. 3, pp. 1–2).

[c]As of 1971, the U.S. Army Tank-Automotive Command OR cell had seven professionals (see Discussion, Session IV [Challenge of Military Operations Research], in U.S. Army Research Office-Durham, *Proceedings of the [Tenth] United States Army Operations Research Symposium: "The Next Decade," 26–28 May 1971, Durham, North Carolina* [Durham, N.C.: U.S. Army Research Office-Durham, 1971], p. 181).

[d]Earlier known as the Materiel Management Studies Division, Management Office, U.S. Army Aviation and Surface Command. The Army Aviation Materiel Command received OMA funding for ORSA studies amounting to $24,152 in FY 1964, $74,665 in FY 1965, and $15,331 in FY 1966, and in 1966 was authorized eight civilian ORSA professionals (see ASAC *Main Report*, an. B, an. 3, pp. 1–2).

[e]In FY 1970, the USAMB was authorized fifty-eight ORSA professionals, had forty-four professionals on hand, and conducted 696 man-months of self-initiated ORSA studies (see ETASS, pt. II, sec. D, p. 16).

[f]The Supply and Maintenance Command Support Center, earlier located at Frankford Arsenal, Pa., received OMA funding for ORSA studies of $81,000 in FY 1964, $115,000 in FY 1965, and $148,000 in FY 1966, and in 1966 the center was authorized eight civilian ORSA professionals (see ASAC *Main Report*, an. B, an. 3, pp. 1–2).

[g]ASAC *Main Report*, an. B, an. 4, app. 7, atch. 6 (Subordinate Elements of the Test and Evaluation Command).

[h]The Project 58A Project Manager received RDTE funding for ORSA-type studies of $17,000 in both FY 1965 and FY 1966, and in 1966, his office was authorized ten civilian ORSA professionals (see ASAC *Main Report*, an. B, an. 3, pp. 1–2).

commanding general of WECOM told guests at the third Army Operations Research Symposium at Rock Island, Illinois, in March 1964:

> For nine years we have practiced operations research in this command. I think it is one of the few subordinate commands, perhaps the only one, that has recognized, organizationally, the function of operations research. Our people have worked on OR problems in procurement and production and have spearheaded and fostered what were at the time advanced concepts in supply control and numerically controlled machine tools. They are now, of course, more concerned with weapons development and effectiveness from both the military and industrial points of view.[72]

A few years later, on 22 May 1970, WECOM's ORSA chief, Dr. Edward J. Haug, Jr., told students at the OR/SA executive course at the Army Management School:

> One of the major functions of systems analysis in this command mission is to provide quantitative comparisons of candidate weapons systems which are to defeat the same threat . . . [and to] maximize weapon effectiveness while satisfying cost constraints. . . . One of our major objectives in systems analysis at WECOM is to incorporate a sufficient amount of engineering-type analysis in our studies to provide for overall weapon system optimization with realistic constraints imposed. . . . The point I am addressing is that, at our level of weapon development, systems analysis studies must include more detail and engineering analysis than is traditional in systems analysis studies.[73]

The focal point for ORSA activity in WECOM was the Weapons Operations Research Division of HQ WECOM. The Weapons OR Division conducted studies and operational analyses of weapons, production, quality control, and facilities. The WECOM Weapons OR Division received OMA funding for ORSA studies amounting to $76,000 in FY 1964, $98,000 in FY 1965, and $101,000 in FY 1966, and in 1966 the division was authorized eight civilian ORSA professionals.[74]

The United States Army Human Engineering Laboratory (HEL) at Aberdeen Proving Ground, Maryland, was another important AMC activity that conducted significant ORSA-type work. HEL conducted human factors research and engineering; set human factors engineering design standards for wheeled vehicles; studied behavioral and physiological responses under chronic stress; conducted studies of human factors engineering design theory; conducted man-machine compatibility engineering research; did voice warning system studies; and made analyses of human factors bearing on system design and performance.[75] In FY 1970, HEL was authorized sixty-seven professional personnel, had eighty-seven on hand, and did 804 man-months of self-initiated ORSA studies.[76]

United States Army Combat Developments Command

The other major Army command created in the 1962 reorganization was the United States Army Combat Developments Command (CDC). The changes in Army structure and methods ordered by Secretary of Defense McNamara and his associates in the 1960s radically transformed the Army research and development and combat developments systems. However, ORSA continued to be an integral and important part of the process, and CDC elements at all levels made significant use of ORSA studies, analyses, and techniques, both in-house and on contract.[77]

CDC was activated at Fort Belvoir, Virginia, on 20 June 1962, and HQ CDC and its subordinate commands and field agencies became operational on 1 July 1962 under the command of Lt. Gen. John P. Daley. As Secretary of the Army Elvis J. Stahr, Jr., noted in his annual report for FY 1962:

> The purpose of establishing the Combat Developments Command was to pull together under one authority several loosely coordinated and independent small elements, all dealing with various aspects of forces, materiel, and combat development, as well as field testing operations. This command is responsible for making a projection as to the nature of future land warfare and the type of forces, materiel, and concepts necessary to engage in such action.[78]

The following year, Secretary Stahr's successor, Cyrus R. Vance, noted that CDC was established "to carry out combat development functions for the Army, publish current doctrine, and explore and develop concepts for future employment of forces."[79] The principal formal missions of the new command were to command all assigned subordinate elements and to "formulate and document current doctrine for the Army and, in anticipation of the future nature of land warfare, determine the kinds of forces and materiel needed, and how they should be employed."[80] In simpler terms, the mission of CDC was to answer three key questions:

1. How should the Army be organized?
2. How should the Army be equipped?
3. How should the Army fight?[81]

The CDC mission was to be accomplished by developing new concepts, operational doctrine, materiel requirements, and organizational structures and by testing the validity of those concepts, doctrines, requirements, and structures—all of which involved detailed studies and analyses using to a greater or lesser degree ORSA and associated techniques as well as war-gaming, field experimentation, and troop testing.[82] After May 1968, the Army chief of staff directed that CDC focus its resources on designing the Army of the future as a "total land combat system," and place "special emphasis on fostering innovations for the long-range time frame."[83]

Organization of CDC

Upon its activation on 1 July 1962, CDC was organized with a headquarters comprising the usual command and support elements (Command Group, Office of the Chief of Staff, Secretary of the General Staff, Comptroller/Program Coordination Office, and directorates of Personnel and Logistics) with five developmental staff sections (plans, programs, and intelligence; concepts and doctrine development; operations research and experimentation; materiel requirements; and doctrinal and organizational media); six major subordinate commands (Special Weapons Development Office, Combat Development Experimentation Center, Remote Area Conflict Office, Combined Arms Group, Combat Service Support Group, and the Institute of Advanced Studies); and a number of field agencies that were gen-

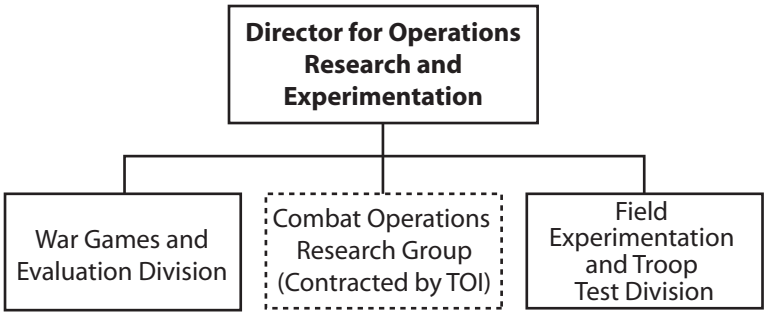
erally co-located with the service school responsible for their subject area.[84]

The HQ CDC Directorate of Operations Research and Experimentation was the principal headquarters staff element involved in ORSA activities and was organized in 1963–1964 as shown in Figure 7–3. The responsibilities of the director of operations research and experimentation included the evaluation of "future operational and organizational concepts pertaining to the US Army through the application of scientific principles and methods."[85] He directed and coordinated CDC war-gaming activities throughout the CDC system and provided advice and assistance to other agencies involved in war-gaming. He was also responsible for formulating the requirements for troop tests and field experiments, for arranging and monitoring such tests and experiments, and for evaluating their results. In addition, he supervised the activities of the Combat Operations Research Group (CORG).[86] Although CORG's personnel were provided under contract by Technical Operations, Inc., of Boston, Massachusetts, CORG operated as HQ CDC's principal in-house ORSA element.

By March 1964, the five headquarters directorates had been reorganized along functional lines and redesignated as the Plans, Doctrine, Materiel, Organization, and Evaluation directorates, and CDC had grown to include seven subordinate commands; a special Test, Evaluation, and Control Group; a special Advanced Tactics Project coordinating office; and twenty-one field agencies, as shown in Figure 7–4. The HQ CDC directorates were subsequently reorganized several times, but as of 1970 three of them were still involved in the conduct or supervision of ORSA studies. The Directorate of Doctrine established and monitored combat developments doctrinal literature programs and monitored and reviewed the approved program of studies carried out by subordinate elements of CDC. The Directorate of Special Studies conducted special studies and analyses for the commanding general, CDC, on topics that generally cut across the functional responsibilities of the various CDC field agencies. The Directorate of Evaluation evaluated future operational and organizational concepts and monitored and reviewed a program of field experiments, war games, troop tests, and operations research studies in support of the overall CDC mission.

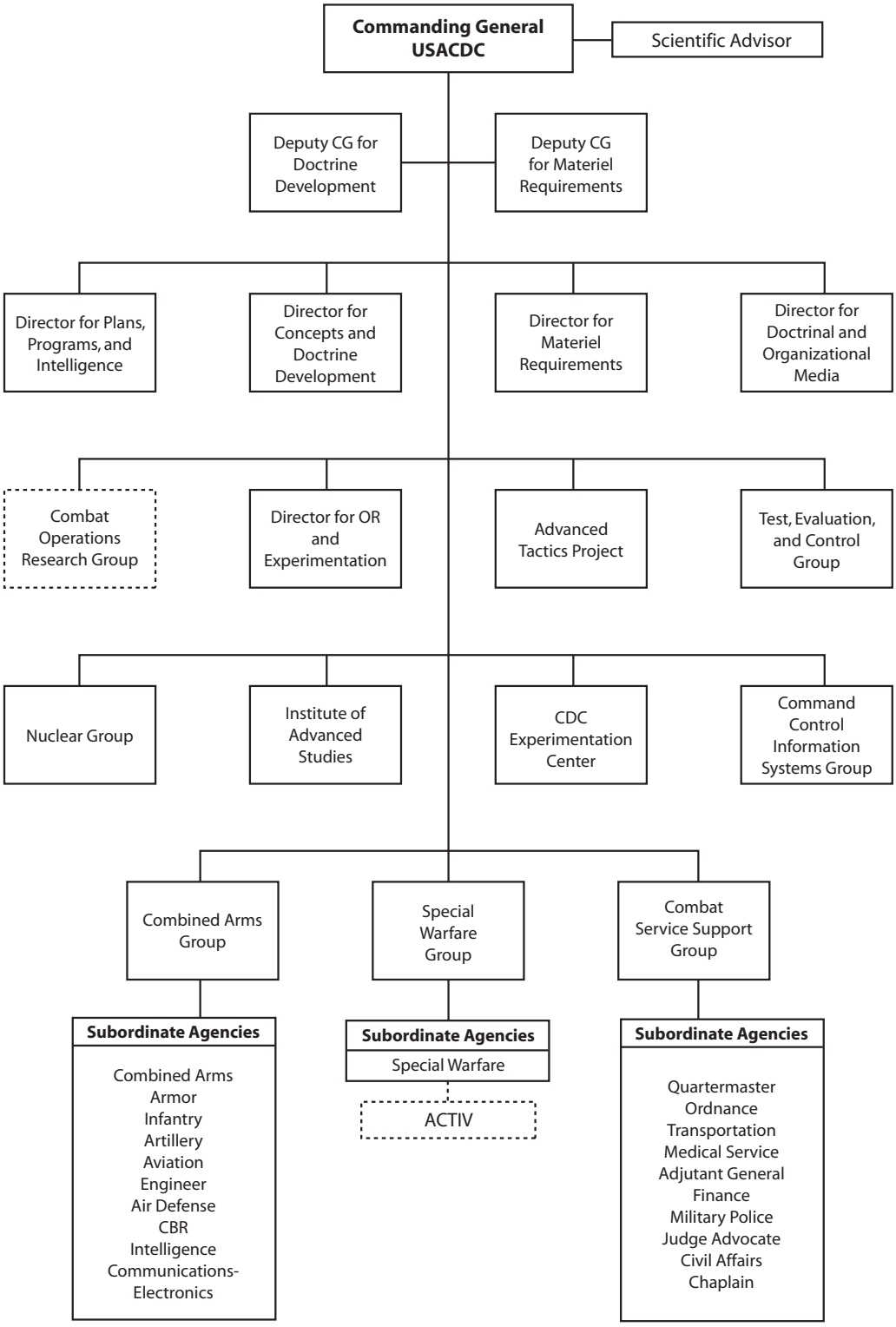
In June 1966, CDC reorganized to make itself more responsive to Army needs. The HQ CDC directorates and the subordinate CDC commands and field agencies were reorganized and renamed, and several new commands were created. The Combined Arms Group was reorganized and renamed the Combat Arms Group, and the Combined Arms Agency became the Institute of Combined Arms and Support.[87] Subsequently, a Combat Support Group was created as a counterpart of the Combat Arms and Combat Service Support groups and the field agencies redistributed accordingly. Thus, by 1970, HQ CDC exercised command and control over some thirty separate research groups, departments, and institutes located at twenty separate installations throughout CONUS, many of which were

Figure 7–3—Organization of Operations Research and Experimentation Directorate, HQ CDC, 1 January 1963



Source: Headquarters, U.S. Army Combat Developments Command, Fort Belvoir, Va., *Staff Directory*, 1 Jan 1963. See also Smith, *A History of the U.S. Army in Operations Research*, p. 77, Figure 7 (U.S. Army Combat Developments Command Organization, 1962).

Figure 7–4—Organization of CDC, June 1964



Source: IAS AHS, Jun 1962–Jun 1964, p. 8, Figure 4 (U.S. Army Combat Developments Command, Jun 1964).

Note: The Test, Evaluation, and Control Group at Fort Benning, Ga., prepared detailed test plans for 11th Air Assault Division, controlled the tests, and evaluated the results. The Advanced Projects Group (also called the Advanced Tactics Project and later redesignated the Institute of Special Studies) was established to monitor the OREGON TRAIL study. ACTIV was an independent agency but operated in close cooperation with AMC and CDC.

involved in ORSA-type activities.[88] The twelve principal subordinate CDC commands were as shown in Table 7–5. Seven of them were "think tanks" or "institutes" dealing with specific aspects of the CDC mission.[89]

CDC ORSA Personnel and Costs

As is the case with the Army Materiel Command, it is nearly impossible to reconstruct with any degree of accuracy the number of Combat Developments Command personnel directly involved in ORSA activities or the annual expenditures on such activities. If anything, the problem is even more difficult for CDC than for AMC due to the substantially greater number of subordinate elements producing ORSA-type studies and analyses or using ORSA techniques. For example, the FY 1965 CDC Administrative Program stated the CDC personnel authorizations for FY 1965 (as shown in Table 7–6) but did not indicate the number of military or civilian personnel involved in ORSA-type work.

In mid-1966, the ASAC recognized that CDC had recently submitted a proposal for a small increase in its in-house ORSA capability involving a larger in-house staff of civilian and professionally trained military personnel throughout CDC, the goal being better management and more flexible use of modern study techniques.[90] The estimate was for the employment of about 200 professionals, an increase of about eighty-five professional personnel and annual additional costs of $2 million in FY 1970. The 1966 ASAC study of Army ORSA personnel requirements also forecast a requirement in the summer of 1970 for CDC of sixty-three military and 125 civilian ORSA specialists and eighty-eight military ORSA executives.[91]

The FY 1963 CDC funding level was $16.9 million, and CDC spent approximately $3,395,000 on in-house studies, including full-time study elements and the cost of ad hoc study groups.[92] Of $19,179,000 spent by the Army in FY 1963 on contract studies, CDC accounted for $1,260,000.[93] The FY 1964 CDC budget was $25.9 million, including increases of $5.6 million for troop

Table 7–5—Principal CDC Subordinate Commands, 1970

Command	*Location*
Institute of Advanced Studies	Carlisle Barracks, Pa.
Institute of Land Warfare	Alexandria, Va.
Institute of Nuclear Studies	Fort Bliss, Tex.
Institute of Systems Analysis	Fort Belvoir, Va.
CDC Experimentation Center	Fort Ord, Calif.
Institute of Special Studies	Fort Belvoir, Va.
Automatic Data Field System Command	Fort Belvoir, Va.
Institute of Combined Arms and Support	Fort Leavenworth, Kans.
Institute of Strategic and Stability Operations	Fort Bragg, N.C.
Combined Arms Group	Fort Leavenworth, Kans.
Combat Support Group	Fort Belvoir, Va.
Combat Service Support Group	Fort Lee, Va.

Source: ETASS, pt. II, sec. D, pp. 10–14. See also ASAC *Main Report*, an. B, an. 4, app. 6.

Note: The Automatic Data Field Systems Command (earlier the Command Control Information Systems Group) integrated ADP systems into the Army in the field. By 1969, most of the institutes shown had already been renamed several times. For example, the Institute of Nuclear Studies began in 1962 as the Office of Special Weapons Development and was later renamed the Nuclear Group before becoming the Institute of Nuclear Studies. Similarly, the 1962 Remote Area Conflict Office had become the Special Warfare and Civil Affairs Group by 1966 and later became the Institute of Strategic and Stability Operations.

Table 7–6—CDC Personnel Authorizations, FY 1965

Organization	*Officers*	*Warrant Officers*	*Enlisted*	*Civilian*	*Total*
HQ CDC	246	1	44	209	500
Combined Arms Group	474	2	157	343	976
Combat Service Support Group	200	1	93	189	483
Special Warfare Group	59	0	17	18	94
Institute of Advanced Studies	16	0	2	21	39
Nuclear Group	23	0	10	10	43
Experimentation Center	191	6	797	44	1,038
Command Control Information System Group	22	0	11	7	40
TOTAL	1,231	10	1,131	841	3,213

Source: ASAC *Main Report*, an. B, an. 4, Incl 1, p. 2.

tests and $3.3 million for ORSA studies.[94] In general, CDC funding problems were minimal, and the CDC budget increased at a rate of about 15 percent per year during the 1960s.[95] In FY 1968 the CDC budget was around $40 million, of which a large portion was for study efforts: about $7 million in RDTE funding and about $30 million in OMA funding.[96]

Although CDC focused on improving its in-house ORSA capabilities, it continued to contract out a significant portion of its ORSA studies and analyses. In 1966, the ASAC estimated that CDC funding for ORSA contracts was as shown in Table 7–7, and during the period FY 1964–1966, at least ten firms held contracts with CDC for ORSA work worth over $100,000 per year, as shown in Table 7–8.

Table 7–7—Combat Developments Command ORSA Contract Costs, FY 1963–FY 1967

Fiscal Year	*Costs*
1963 (estimated)	$1,500,000
1964	5,722,588
1965	7,452,165
1966	6,915,891
1967 (estimated)	9,000,000

Source: ASAC *Main Report*, an. B, an. 1, Table 2; an. B, an. 3, Incl (includes both RDTE and OMA funding).

The CDC Study Program

The annual CDC study program was a major element of the combat developments procedures established by *AR 71–1*.[97] As previously noted, the purpose of the CDC study program was to answer the three fundamental questions: How should the Army be organized? How should the Army be equipped? How should the Army fight?[98] The CDC study program thus focused on "the determination of future operational concepts and techniques, new organizations, and qualitative materiel requirements."[99] The process encompassed a variety of analytical activities—many of which involved the direct application of ORSA to the problems at hand—including studies and analyses; the definition of requirements (QMDO, QMR, and SDR); field experiments, war games, troop tests, and other evaluations; the development of TOEs, TDAs, and MTELs; and the preparation of Field Manuals and Special Texts.[100] The topical areas covered ran the gamut of Army organization, equipment, and doctrine from functional/branch-oriented (infantry, armor, field artillery, air defense, aviation, intelligence, engineer, and communications-electronics) issues to administrative and logistical support to the various types of operations encountered in land warfare (airborne, amphibious, chemical-biological-radiological (CBR), nuclear, and special warfare).

Although the development of concepts, doctrines, requirements, and structures involved studies and analyses using a variety of methodologies, CDC test and evaluation activities involved perhaps the most direct application of ORSA. As the ASAC noted in its 1966 study:

> Most of the output of this entire command [CDC] can be classed as studies and analyses, or the results thereof.

Table 7–8—CDC ORSA Contracts, FY 1964–FY 1966

Contractor	*FY 1964*	*FY 1965*	*FY 1966*	*Comments*
Stanford Research Institute Menlo Park, Calif.	$1,728,000	$2,242,057	$2,794,000	Continuing sole-source contract; OMA funds; studies in support of CDEC.
Technical Operations, Inc. (CORG) Fort Belvoir, Va.	1,400,000	2,100,000	2,500,000	Continuing sole-source contract; RDTE funds; conducts a variety of scientific and technical studies in support of HQ CDC.
Booz-Allen Applied Research, Inc. Bethesda, Md.	868,343	450,085	943,807	Continuing sole-source contract; RDTE funds; conducts a variety of scientific and technical studies for Combined Arms Group at Fort Leavenworth.
Operations Research, Inc. Silver Spring, Md.	275,721	278,881	324,403	Sole-source contract; OMA funds; long-range studies and analyses to support Institute of Advanced Studies, Carlisle Barracks, Pa.
Cornell Aeronautical Laboratory Buffalo, N.Y.	338,519	86,000	—	Competitive contract; RDTE funds; study of probable attrition of Army air vehicles in varying combat environments.
IBM Corporation Bethesda, Md.	289,944	—	—	Competitive contract; RDTE funds; Command and Control Information System (CCIS) Study.
Technical Operations, Inc. Boston, Mass.	184,000	525,000	95,000	Continuing sole-source contract; RDTE funds; conducts a variety of scientific and technical studies in support of the Combat Service Support Command, USACDC, Fort Lee, Va.
Northrop Corporation Anaheim, Calif.	—	250,000	—	Sole-source contract; RDTE funds; cost-effectiveness analysis of Vehicle Rapid Fire Weapons System (VRFWS).
American Research Corporation Fullerton, Calif.	—	247,109	—	Sole-source contract; RDTE funds; MAULER cost-effectiveness study.
Planning Research Corporation Los Angeles, Calif.	91,000	27,000	117,879	Sole-source contract; RDTE funds; studies in support of the advanced aerial fire support system.
TOTAL CDC RDTE	3,604,778	4,276,716	3,733,686	
TOTAL CDC OMA	2,117,810	3,175,449	3,182,205	
TOTAL CDC CONTRACTS	$5,722,588	$7,452,165	$6,915,891	

Source: ASAC *Main Report*, an. B, an. 3, Incl.

> Examination of the operations and products of the command, however, reveals that a number of elements within the command execute or monitor study and analysis tasks in a more scientifically oriented manner than do the other elements.[101]

The planning, conduct, and review of troop tests and evaluations were a major part of the CDC study program. In FY 1963 alone, CDC conducted some twenty-five tests in support of the Howze Board; supervised the CDC Test and Evaluation Unit at Fort Benning supporting the Howze Board; conducted war games for the 11th Air Assault Division (Test); ran eight field experiments; and participated in several joint testing activities.[102] CDC also supported tests of the airmobile concept and special warfare problems being conducted by Army Concept Team in Vietnam (ACTIV). In all, there were seventeen tests under way in FY 1963, and another twelve tests were in the planning stage.

Each year HQ CDC staff directorates reviewed the existing CDC study program, requested proposals from study agencies, proposed new studies, prepared the study program for the coming year, and coordinated it with AMC and other commands. The proposed annual program, prepared in accordance with *AR 71–1*, was published as *USACDC Pamphlet No. 71–3*, a six-volume set that described the CDC work program.[103] Volume I contained a general program description and guidance. Volume II addressed the doctrine program, Part A describing the programmed studies by agency and Part B the programmed doctrinal literature by agency. Volume III contained the materiel program; Volume IV, the organization program; and Volume V, the evaluation program. The final volume, Volume VI, contained the administrative program, with details of the personnel, funding, and logistics required to support the study program.

In any given year, the CDC study program included around 250 studies under way or planned, of which about 150 were completed during the year.[104] The CDC study program for FY 1965, for example, included 231 programmed studies, of which eight were identified as being part of the RAC contract program. Some 214 QMDOs, 373 QMRs, and 119 SDRs as well as some 278 TOEs and MTELs and some 150 Field Manuals and Special Texts were programmed for preparation, revision, change, or review. In addition, thirty-six evaluation activities were programmed: nine field experiments, twenty-two troop tests, and five war-gaming projects, of which two were to be done on contract by RAC and one by STAG in a combination of in-house and contract effort.[105]

The proposed annual study program was forwarded to the DA assistant chief of staff for force development for approval by 30 November of each year.[106] At the same time, any proposals for contract studies were forwarded for approval by the DA chief of research and development.[107] The approved study program elements were then entered into the other key study program management document for CDC, the Combat Development Objectives Guide (CDOG), published by HQDA.[108] The CDOG was revised annually and copies were distributed throughout the Army. It was organized with eighteen chapters corresponding to the various types of operations (airborne, special warfare, amphibious, nuclear, etc.) and combat functions (armor, infantry, field artillery, etc.) and contained a listing of all currently approved study projects, QMDOs, QMRs, SDRs, troop tests, and field experiments being conducted, prepared, or monitored by CDC. The July 1963 revision of the CDOG listed some 184 studies under way, nine of which were also listed in the RAC study program.[109] In addition, some 539 studies were listed as completed or discontinued.

CDC field agencies executed the approved annual study program, and after HQ CDC review was completed and recommendations prepared, the completed studies were submitted to HQDA. Each year HQDA also assigned to CDC a number of special, unprogrammed tasks.[110] Major difficulties arose from the large number of such unprogrammed study requirements.[111] In FY 1963, for example, 75 percent of the available CDC in-house study capability was scheduled for use in the formal study program and 25 percent was reserved for use in unprogrammed requirements, but in reality directed and unprogrammed studies took up about 65 percent of the available study effort, thereby delaying the programmed elements.[112]

At the direction of HQDA, in FY 1966 CDC began development of a series of Army concept programs that were designed "to facilitate the orderly development and integration of new weapons and equipment, new organizations, and new doctrine into Army forces of the future."[113] The objective of the new concept programs was to meld together all the elements of an integrated Land Combat System

(organization, equipment, and operational doctrine), designed for stated periods (short-range, zero to five years in the future; mid-range, ten to fifteen years in the future; and long-range, fifteen to twenty-five years in the future).[114] As Maj. Gen. Julian J. Ewell, the deputy commander of CDC, told students at the Army Management School in November 1967, the long-range forecast was "a real challenge, but affords us the greatest opportunity for really significant improvements in the Army."[115]

The preparation of the concept programs involved the consideration by CDC of two sets of parameters: (1) the functions that defined the Land Combat System (firepower; movement; command, control, and communications [C^3]; intelligence; combat support; and combat service support); and (2) the tasks that the Army had to be ready to accomplish (high-, mid-, and low-intensity conflict; air and missile defense; military aid to U.S. civil authorities and the Army's tasks in civil defense; and complementing allied land powers).[116] In FY 1966, the Army concept program consisted of three main studies.[117] They were the following:

1. *Army 70*, which provided operational, organizational, and materiel guidance for the short-range program until 1970 and "directed attention toward the increasing importance of supporting such missions as stability operations while maintaining the Army's capabilities to engage in more intense forms of conflict."[118]
2. *TASTA* (The Administrative Support of the Theater Army), one of two major doctrinal studies that were part of *Army 70*, extended the functional concepts of the COSTAR (Combat Service Support to the Army) study to the entire army in the field and provided for functional commands to replace the area-oriented sections of the Communications Zone (COMMZ). TASTA also introduced integrated computer systems in the Field Army Support Command and Theater Army Support Command for control of logistical and administrative actions.[119]
3. *Army 75* covered the mid-range period, 1970–1975, dealt with broad, flexible concepts, and envisioned forces capable of engaging successfully in all kinds of operations. It also marked the beginning of a trend toward two basic kinds of divisions: heavy and light.[120]

ORSA in CDC Subordinate Centers, Institutes, and Agencies

Each of the numerous centers, institutes, and agencies subordinate to HQ CDC had its own ORSA element. Those elements ranged from small in-house teams to large ORSA groups operated under contract or with mixed in-house and contractor support. Each element evolved over time as the focus of command interest shifted and resource cuts were imposed.

Combat Developments Command Experimentation Command

The United States Army Combat Developments Command Experimentation Command (CDCEC) at Fort Ord, California, was CDC's principal subordinate element responsible for field tests and experiments. As noted above in Chapter Six, the United States Army Combat Developments Experimentation Center was transferred from HQ CONARC to HQ CDC in July 1962 and later redesignated the United States Army Combat Developments Command Experimentation Command.[121] CDCEC was responsible for performing "scientific, field evaluations of new concepts, doctrine, and organizations" and was supported by the Stanford Research Institute (SRI), which operated the CDCEC Research Office and assisted in the design, conduct, and evaluation of CDCEC field tests and experiments.[122]

Throughout the 1960s and early 1970s, CDCEC conducted an active program of field tests and experiments aimed at improving Army organization and tactical doctrine. Among the many projects supported by CDCEC were the Howze Board study of airmobility, the evaluation of the M16 rifle, and the work of ACTIV.[123] The CDCEC staff, assisted by SRI, planned, supervised, and evaluated the field tests and experiments conducted by CDCEC's assigned TOE and TDA test units. CDCEC was unique in that it was one of the few organizations worldwide that conducted "controlled field experiments from which scientific data was collected."[124]

In 1965, CDCEC began to move toward greater codification and standardization of the way in which field experiments were conducted, and in September 1966 CDCEC underwent a major reorganization. Four project teams were created, each oriented toward a separate functional area.[125] Team I was responsible for mounted combat experiments (10.0 series); Team II, for dismounted combat experiments (20.0 series); Team III, for indirect fire support experiments (30.0 series); and Team IV, for Army aircraft experiments (40.0 series). No special teams were designated for the combat support experiments (50.0 series) or special projects (70.0 series), but in July 1967 Team V was activated to oversee data research and correlation activities (60.0 series).[126] ORSA managers and analysts from SRI worked with each of the teams.

CDCEC was unique in that it had assigned to it TOE as well as TDA units to conduct the tests and experiments. The original assigned test unit, the 1st Experimentation Regiment, was redesignated the 194th Armor Brigade in December 1962.[127] In September 1966, the 194th Armor Brigade was eliminated in favor of two TDA experimental battalions: an Experimental Battalion, Infantry, with five TOE infantry and mechanized infantry companies; and an Experimental Battalion, Armor, with a TOE armor company, a TOE armored cavalry troop, and a TOE field artillery battery.[128] A 1,051-person reduction in CDCEC's enlisted strength in the spring of 1970 resulted in a major reorganization in which all support and experimentation troops were placed under an Experimentation Brigade, as shown above in Figure 7–5. At the same time, a new position of deputy chief of staff for experimentation was created and project teams I–V were placed under his supervision.[129]

Combat Arms Group

The Combat Developments Command controlled more than twenty field agencies, most of which were co-located with the Army service school responsible for the same functional area. The field agencies conducted studies and analyses using ORSA and other methodologies and were grouped under two, later three, "groups" that were responsible for the development of

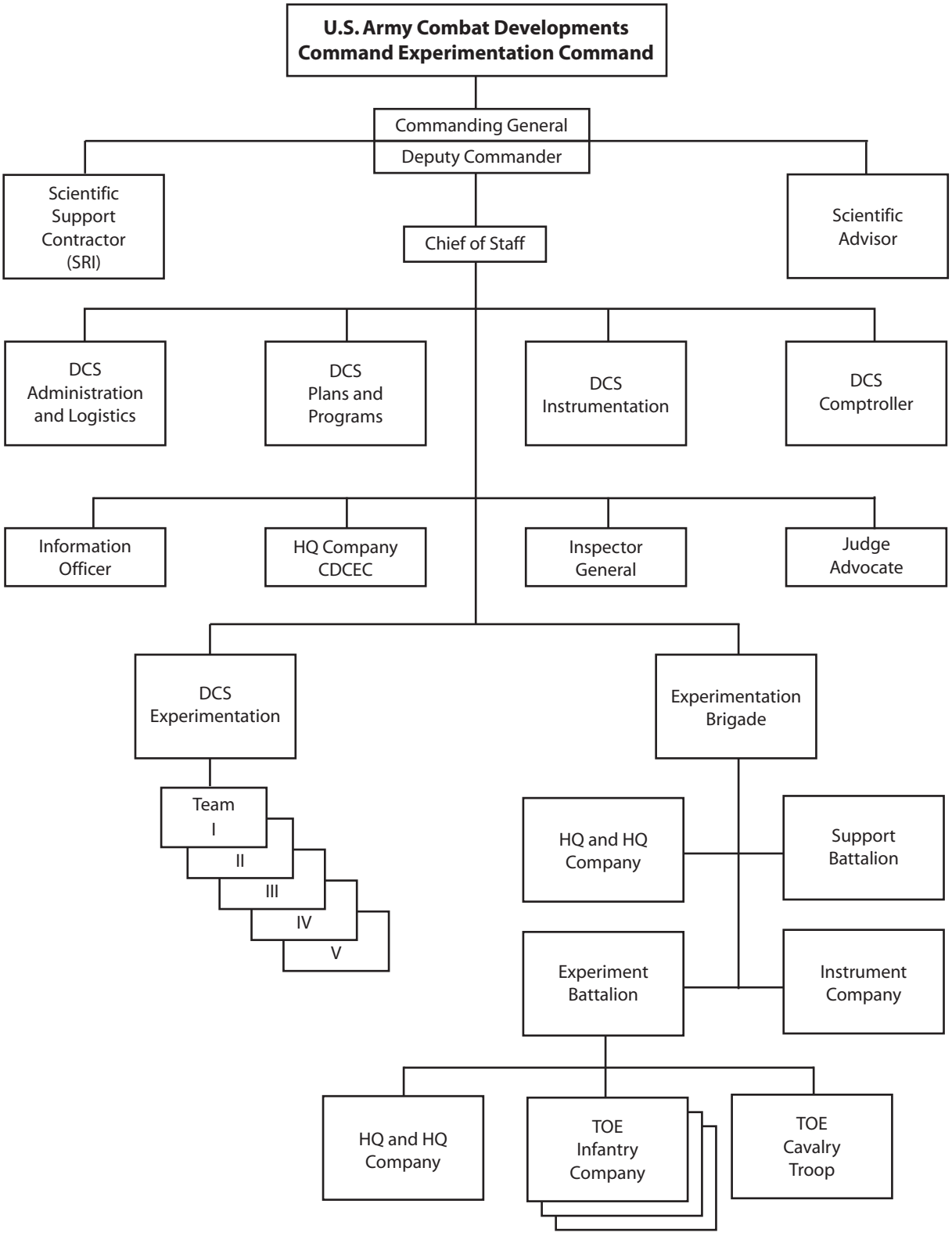
> current and future operational and organizational objectives, doctrine, and tactics; the materiel developments objectives and requirements for the combined arms and for combat and combat support elements of the Army in the field, exclusive of Army Group and higher, but inclusive of Theater Army air defense and unilateral Army operations and Army participation in joint operations, all in accordance with broad guidance provided by the Commanding General, USACDC.[130]

In July 1962, the Combined Arms Group was formed at Fort Leavenworth, Kansas, from elements of the United States Army Command and General Staff College Office of the Chief of Doctrine and Department of Combat Developments.[131] Maj. Gen. Harold K. Johnson assumed command of the Combined Arms Group on 1 July 1962, despite his opposition to the reorganization that had separated the combat developments functions from the teaching functions at the Command and General Staff College.[132] As of 1966, the Combined Arms Group was responsible for ten subordinate CDC field agencies.[133] They were the following:

- Combined Arms Agency, Fort Leavenworth, Kansas
- Air Defense Agency, Fort Bliss, Texas
- Armor Agency, Fort Knox, Kentucky
- Artillery Agency, Fort Sill, Oklahoma
- Aviation Agency, Fort Rucker, Alabama
- Engineer Agency, Fort Belvoir, Virginia
- Infantry Agency, Fort Benning, Georgia
- Intelligence Agency, Fort Holabird, Maryland
- Chemical-Biological-Radiological (CBR) Agency, Fort McClellan, Alabama
- Communications-Electronics Agency, Fort Monmouth, New Jersey, with a detachment at Fort Huachuca, Arizona

Each of the CDC field agencies conducted both in-house and contract research on topics pertinent to their basic functional orientation. Many of the studies and analyses conducted involved the use of ORSA techniques. For example, the Combined Arms Research Office supported the Combined Arms Agency at Fort Leavenworth, Kansas, and did research and analyses of intelligence, firepower, communications, and mobility systems using ORSA and war-gaming.[134] The Weapons Systems Analysis Branch of the Artillery Agency at Fort Sill, Oklahoma, supported by a contract with the University of Oklahoma Research Institute, conducted

Figure 7–5—Organization of CDCEC, 1970



Source: John L. Romjue, *History of Field Experimentation Methodology in the United States Army, 1956–1970* (Fort Ord, Calif.: U.S. Army Combat Developments Command Experimentation Command, Jun 1971), p. 145.

ORSA studies of artillery weapons systems.[135] The Operations Research Directorate of the CBR Agency at Fort McClellan, Alabama, used some applications of linear programming, systems design, probability theory, and statistical analysis for CBR data.[136] The Operations Research Division of the Communications-Electronics Agency at Fort Huachuca, Arizona, also used some applications of simulation and linear programming for the study of field communications systems and was supported by CEIR, Incorporated, in the development of a division-scale communications-electronics war game.[137] The Armor Agency at Fort Knox received ORSA support through a contract with the Systems Research Group of Ohio State University, and the Air Defense Agency at Fort Bliss was supported by SRI, the Air Defense Board, and the White Sands Missile Range.[138]

In 1966, the Combined Arms Group was reorganized and renamed the Combat Arms Group (CAG).[139] At that time, CAG transferred the Air Defense, Engineer, Intelligence, CBR, and Communications-Electronics agencies to the newly created Combat Support Group and picked up the Civil Affairs and Special Warfare agencies from the Special Warfare Group.[140] The Combined Arms Agency became an independent field agency under the title of the Institute of Combined Arms and Support.

In FY 1970, the CAG was authorized ninety-seven ORSA professionals (fifteen military) with seventy-nine on hand (four military) and produced some 843 man-months of ORSA-type effort (645 man-months self-initiated and 198 man-months directed).[141] CAG was involved in the development of concepts, doctrine, organization, and evaluations in the aviation, artillery, armor, and infantry areas and conducted the *Tank, Antitank, and Assault Weapons Requirements Study Phase III (TATAWS III)*; the *Infantry Rifle Unit Study, 1970–1975 (IRUS–75)*; the *Utility Tactical Transport Aircraft System (UTTAS) Study*; a study of the optimum mix of artillery units in the 1976–1980 time frame (LEGAL MIX IV); and a study of the family of Army aircraft in the 1970–1985 time frame (FAAS–85).[142]

Combat Support Group

The Combat Support Group (CSG) was created in 1966 to be the counterpart of the Combat Arms and Combat Service Support groups. The existing field agencies were redistributed accordingly, and CSG assumed responsibility for the Air Defense, Engineer, Intelligence, CBR, Communication-Electronics, and Military Police agencies.[143] By 1970, CSG, located at Fort Belvoir, Virginia, was authorized 183 ORSA professionals (thirteen military) with 149 on hand (two military) and produced some 1,650 man-months of ORSA-type effort (558 man-months directed and 1,092 man-months self-initiated).[144] The CSG conducted research into concepts, doctrine, and organization and evaluated studies in its assigned areas. Among the studies conducted by CSG in FY 1970 were *Selected Intelligence Gathering Methods for the Army 85 (SIGMA 85); Prisoner of War Logistical Support; Geography, Intelligence and Topographical Support Systems (GIANT 75/85);* a study of SAM-D firing doctrine; and a study of tactical satellite communications (TAC SAT COM Program).[145]

Combat Service Support Group

The Combat Service Support Group (CSSG) at Fort Lee, Virginia, was created as a subordinate command of CDC in July 1962 for the purpose of developing

> current and future operational and organizational objectives, doctrine, and tactics; and materiel development objectives and requirements for combat service support elements of the field army and communications zone, to include unilateral Army operations and Army participation in joint operations, all in accordance with broad guidance provided by the Commanding General, USACDC.[146]

CSSG was responsible for nine subordinate CDC field agencies employing ORSA techniques and co-located with the service schools.[147] They were the following:

- Adjutant General Agency, Fort Benjamin Harrison, Indiana
- Chaplain Agency, Fort Lee, Virginia
- Judge Advocate Agency, Charlottesville, Virginia
- Medical Service Agency, Fort Sam Houston, Texas
- Finance Agency, Fort Benjamin Harrison, Indiana

- Military Police Agency, Fort Gordon, Georgia
- Quartermaster Agency, Fort Lee, Virginia
- Ordnance Agency, Aberdeen Proving Ground, Maryland, and its Missile Support Division, Redstone Arsenal, Alabama
- Transportation Agency, Fort Eustis, Virginia

In 1966, the Military Police Agency was transferred to the newly created Combat Support Group, and the other agencies subordinate to the CSSG were realigned to create seven reorganized field agencies:[148]

- Personnel and Administrative Services Agency, Fort Benjamin Harrison, Indiana
- Chaplain Agency, Fort Lee, Virginia
- Judge Advocate Agency, Charlottesville, Virginia
- Medical Service Agency, Fort Sam Houston, Texas
- Supply Agency, Fort Lee, Virginia
- Maintenance Agency, Aberdeen Proving Ground, Maryland
- Transportation Agency, Fort Eustis, Virginia

Two of the CDC field agencies subordinate to CSSG made particular use of ORSA. The Logistics Studies Organization, part of the Quartermaster Agency (later the Supply Agency) at Fort Lee, contracted for ORSA studies and analyses of logistics and administrative support systems, and the Operations Research Branch of the Medical Service Agency at Fort Sam Houston applied statistical analysis, linear programming, and simulations to the study of field medical support of combat operations.[149] The other field agencies also used ORSA methods and techniques to a greater or lesser degree.

By FY 1970, the CSSG and its subordinate field agencies were authorized 220 professional ORSA personnel (twenty-two military) with 189 on hand (two military) and performed a total of 2,060 man-months of ORSA-type work (821 man-months directed and 1,239 man-months self-initiated).[150] Under CSSG supervision, in FY 1970 studies were conducted of the container supply system; modern watercraft; area optometric support of non-divisional units; marine craft maintenance operations; and the role of the chaplain in the motivation of the soldier.[151]

Institute of Combined Arms and Support

The Institute of Combined Arms and Support (ICAS) at Fort Leavenworth, Kansas, was created in 1966 from the former Combined Arms Agency subordinate to the Combined Arms Group. ICAS was responsible for the development of concepts, doctrine, and organization for separate brigades and divisions and other combat units up through theater Army level. By FY 1970, ICAS was authorized fifty-three ORSA professionals (seven military) with forty-nine on hand and produced some 568 man-months of ORSA-type studies (twenty-two man-months directed and 546 man-months self-initiated).[152] During FY 1970, ICAS supervised studies of tactical reconnaissance and surveillance (TARS–75); operational concepts for the Fast Deployment Logistics (FDL) Ship; aerial fire support (AFSA); nuclear warfare (NUWAR); and combined arms and support operations in the 1975 time frame.

Institute of Advanced Studies

In 1962, the responsibility for combat developments activity at the United States Army War College was assigned to the Doctrine and Studies Division. On 1 July 1962, that responsibility, along with some personnel, was transferred to a new Class II activity under the newly established Combat Developments Command, and on 1 August 1962, that activity was named the United States Army Institute of Advanced Studies (IAS).[153] The stated purpose of IAS, located at Carlisle Barracks, Pennsylvania, was "to contribute to future Army effectiveness" by performing "research in the field of future Army operations by preparing and evaluating broad military studies affecting the national security."[154] The official mission assigned to IAS was "to develop strategic, tactical, and logistical doctrine for the organization, employment, and operations of US Army forces on levels above the field army," and to fulfill that mission, IAS prepared "broad studies on international, national, and departmental matters affecting future requirements for Army operations."[155] The IAS mission evolved over time, and by 1968 IAS was charged with

assuring the "orderly and timely development of Army Concept Programs as unifying concepts of the Army in the field," and accomplishing the following tasks:

a. Prepare studies . . . on broad international, national, and departmental matters affecting the future requirements for land warfare including consideration of the joint and combined aspects thereof (short, mid, or long-range).
b. Develop, expand or define selected high priority conceptual areas identified by the Land Combat System Study relating to organization, employment, and operations of major subordinate elements of the Field Army including joint and combined aspects and major nonmilitary constraints on operations.
c. Develop concepts for echelons above Field Army in support of the concept phase of each LCS program.
d. Perform other combat development actions as required.[156]

The commandant of the Army War College was also the commanding general of IAS, and a deputy commander supervised day-to-day operations. The officers who held the office of deputy commander of IAS from 1962 to 1973 are listed in Table 7–9.

The Army War College Doctrine and Studies Division had three subordinate elements (the Thesis and Evaluation, Doctrine, and Advanced Study groups). On 1 July 1962, the Doctrine and Advanced Study groups were transferred to IAS, but the Thesis and Evaluation Group remained part of the War College. The IAS was initially organized with a command element, an Administrative Group and two main operating elements: a Strategic Studies Group and Doctrine and Evaluation Group. A third operating element, the Scientific Advisory Group, was added in the fall of 1962.[157]

The Administrative Group provided the usual support functions.[158] The Strategic Studies Group (SSG) prepared studies on an international, national, and departmental level concerning requirements for land warfare across the spectrum over a ten- to twenty-year period into the future. Using a small study-team concept, SSG was capable of producing three major studies per year. The Doctrine and Evaluation Group had the capability of reviewing about ten studies per month and producing one major study per year. The Scientific Advisory Group (SAG) was concerned with scientific and technological developments and trends pertinent to all military planning time periods and was capable of producing one major study per year. Both the SSG and SAG were supported by contract analysts supplied by Operations Research, Incorporated.

In late 1963, there was a move to transfer responsibility for IAS from CDC to the DA DCSOPS, but nothing came of it.[159] In 1965, the Doctrine and Evaluation Group was made responsible for the production of the basic concept study for each of the CDC concept program elements.[160] This led to the production of the series of concept studies known as *Army 80*, *Army 85*, and *Army 90*. In 1966, the IAS groups were redesignated as directorates, and the Doctrine and Evaluation Group was redesignated the

Table 7–9—Deputy Commanders of IAS, 1962–1973

Incumbent	*Dates*	
Col. Avery W. Masters	1 July 1962	5 June 1963
Col. Frank L. Gunn (Acting)	5 June 1963	12 August 1963
Col. James R. Wendt, Jr.	12 August 1963	8 May 1967
Col. Lucien F. Keller (Acting)	8 May 1967	26 June 1967
Col. Jack A. Boulger	26 June 1967	January 1972
Col. John P. M. Hughes	January 1972	31 August 1972
Col. Joseph E. Pizzi	22 September 1972	1 February 1973

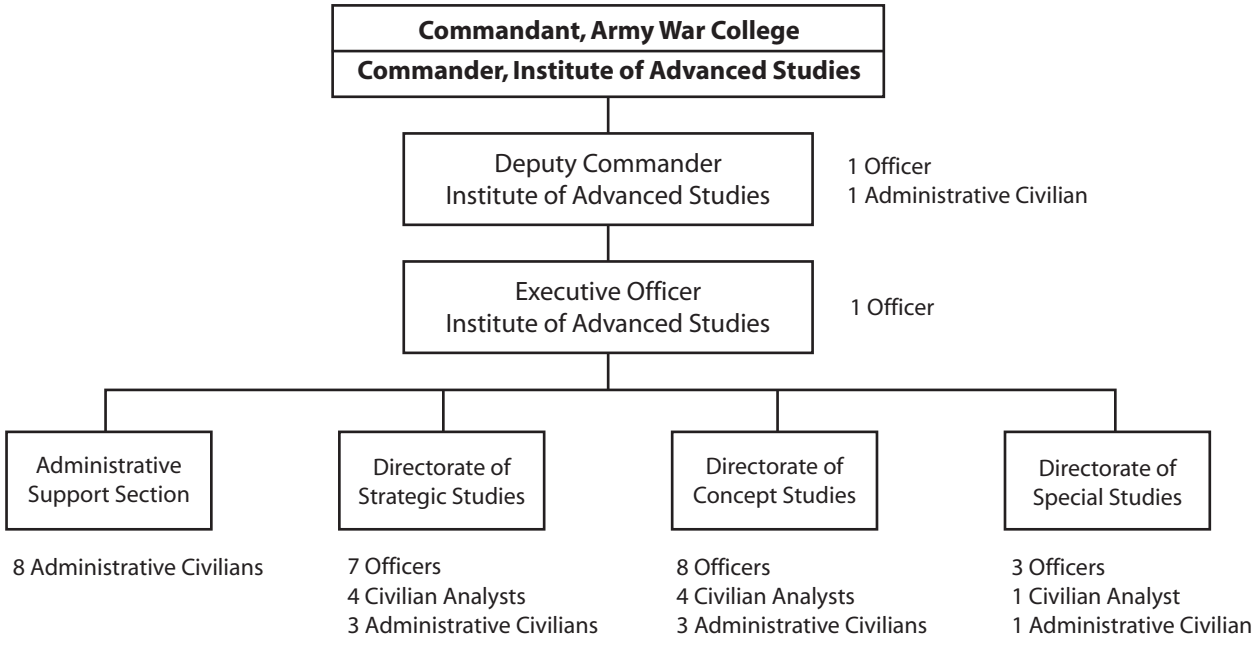
Source: IAS AHS, Jun 1962–Jun 1964, p. 30; U.S. Army Combat Developments Command, Institute of Advanced Studies, *Annual Historical Report, 1 July 1966–30 June 1967 (RCS CS HIS–6 [R2])* (Carlisle Barracks, Pa.: Institute of Advanced Studies, U.S. Army Combat Developments Command, [30 Jun 1967]); U.S. Army Combat Developments Command, Strategic Studies Institute, *Annual Historical Report, 1 July 1971–30 June 1972 (RCS CS HIS–6 [R2])* (Carlisle Barracks, Pa.: Strategic Studies Institute, U.S. Army Combat Developments Command, 14 Mar 1973), p. 4; U.S. Army Combat Developments Command, Strategic Studies Institute, *Annual Historical Report, 1 July 1972–1 February 1973 (RCS CS HIS–6 [R2])* (Carlisle Barracks, Pa.: Strategic Studies Institute, U.S. Army Combat Developments Command, 30 May 1973), p. 2.

Doctrine Directorate in recognition of its focus on the basic concept studies and related projects.[161] The Doctrine Directorate was subsequently redesignated as the Concept Studies Directorate, and the Scientific Advisory Directorate, as the Special Studies Directorate. By September 1968, the IAS was organized as shown in Figure 7–6.

On 9 April 1971, HQDA approved the reorganization of CDC and IAS was officially redesignated the United States Army Combat Developments Command Strategic Studies Institute (SSI) effective 15 April 1971.[162] SSI was subsequently reorganized on 30 June 1972, and the three operational directorates were redesignated Study Directorate nos. 1, 2, and 3.[163] In the fall of 1972, the Army began a major reorganization under the STEADFAST plan, and effective 1 February 1973, the Strategic Studies Institute was discontinued as an agency of CDC and became once more a department of the Army War College, which had a short time earlier, on 12 January 1973, been itself transferred from the staff supervision of the DA DCSPER to the DA DCSOPS.[164] Additional missions and personnel authorizations were added to the Army War College Strategic Studies Institute to make it a more effective and self-sufficient element of the Army Study Program.[165]

The staff of IAS included both military and civilian personnel, and the civilian employees included both administrative personnel and analysts who facilitated "the acquisition of the most advanced thinking in the arts and sciences by providing entree to associates in their respective disciplines."[166] IAS was also supported by contractors, notably ORI, and other civilian research organizations that provided the services of personnel trained in the physical and social sciences, the humanities, and ORSA. The authorized strength of IAS varied over time but generally averaged twenty to twenty-one Army officers and twenty-four to twenty-seven DA civilians, of whom eight to nine were research analysts.[167] By FY 1970, IAS was authorized thirty-

FIGURE 7–6—INSTITUTE OF ADVANCED STUDIES, SEPTEMBER 1968



Source: U.S. Army Combat Developments Command, Institute of Advanced Studies, *Organization and Functions Manual* (Carlisle Barracks, Pa.: Institute of Advanced Studies, U.S. Army Combat Developments Command, 20 Sep 1968), *Change 1* (12 Nov 1968), pp. 5–14.

two ORSA professionals (three military) with twenty-seven on hand and produced some 212 man-months of ORSA-type studies (104 man-months directed and 108 man-months self-initiated).[168]

During the initial planning for IAS a need for seven in-house professional civilian experts (a physicist, a mathematician-programmer, a production engineer, a historian, a political scientist, a sociologist, and an economist) was recognized.[169] The three "hard science" experts were to be assigned to the Scientific Advisory Group and the other four to the Strategic Studies Group. Various options as to how those experts were to be obtained were considered, but only a contract with a research corporation proved feasible. Five such organizations were considered (Research Analysis Corporation [RAC], Stanford Research Institute [SRI], Planning Research Corporation [PRC], Technical Operations, Incorporated [TOI], and Operations Research, Incorporated [ORI]) but only three (PRC, TOI, and ORI) made bids. ORI of Los Angeles, California, and Silver Spring, Maryland, was awarded a contract on 6 March 1963 to supply seven scientists and provide the following services:

a. Application of scientific methods to solving military problems about requirements for land warfare in the future
b. Development, on international, national, and departmental levels, of studies concerning land warfare in the future
c. Correlation of techniques of the social and physical sciences and application to analyses of current and future combat developments problems
d. Evaluation of the impact of scientific trends on industrial strength, projected weapons systems capabilities, and doctrine, operations, and organization of the future
e. Evaluation of studies, both internal and external to the Institute.[170]

The ORI Scientific Support Group, redesignated the Carlisle Research Office, ORI, in 1966, subsequently provided ORSA and other services to the IAS until 1970. The value of the continuing sole-source contract paid from OMA funds for the period FY 1964—FY 1970 is shown in Table 7–10. The reduction in funding for FY 1970 resulted in "reduction of contractor personnel over the year that, in turn, reduced the level of quality and quantity of support."[171] Soon thereafter, ORI support of IAS was phased out in accordance with the general reduction in contract support for the Army Study Program.[172]

The Institute of Advanced Studies/Strategic Studies Institute focused on "broad international, national, and departmental matters affecting the future requirements for land warfare."[173] During a decade of work, IAS/SSI produced more than forty-five major strategic and doctrinal studies and other documents.[174] For the most part, IAS/SSI studies dealt with the world environment and challenges to the Army in the very long range, twenty to twenty-five years in the future. In 1962, IAS inherited a number of ongoing studies from the Army War College Doctrine and Studies Division. They included studies entitled *Conduct of Cold War and Small Scale Conflict, 1975–1983; Space Operations, 1975–1983; Very Long Range Strategic Forecast; Optimum Unifications of Future US Armed Forces; The Army Role in General Thermonuclear War, 1975–1985*; and the preparation of *FM 100–25: Land Warfare—Basic Army Doctrine*.[175] Studies added in 1962–1964 included *The US Army in Large Scale Conventional or Tactical Nuclear Warfare in Europe, 1975–1985; US Army Military Posture Under Arms Control, 1975–1985; US Army Strategic Employment 1985; Impact of Technology on Military Training and Leadership; Strategic Weaponry, 1975–1985; Future Strategic Significance of the Equatorial Belt*; and preparation of *FM 100–20: Counterinsurgency* and *FM 100–1: Doctrinal Guidance*.[176]

In October 1963, the Advanced Tactics (AVTAC) Project was established as a major organizational

Table 7–10—ORI Contracts for Support of the Institute of Advanced Studies, FY 1964–FY 1970

Fiscal Year	*Contract Amount*
1964	$275,721
1965	278,881
1966	324,403
1967	373,413
1968	497,490
1970 (estimated)	410,000

Source: ASAC *Main Report*, an. B, an. 3, Incl; U.S. Army Combat Developments Command, Institute of Advanced Studies, *Annual Historical Report, 1 July 1967–30 June 1968 (RCS CS HIS–6 [R2])* (Carlisle Barracks, Pa.: Institute of Advanced Studies, U.S. Army Combat Developments Command, [30 Jun 1968]), p. 2; IAS AHR, Jul 1967–Jun 1968, p. 6; IAS AHR, Jul 1969–Jun 1970, p. 20.

Note: Figures for FY 1969 are not available.

segment of HQ CDC to support OREGON TRAIL, a top secret, high-priority, comprehensive study of tactical nuclear weapons employment.[177] IAS was directed to prepare a total of seven substudies for OREGON TRAIL, and primary responsibility for the work was assigned to the Strategic Studies Group augmented by action officers and civilian analysts from the other IAS groups. During 1963–1965, IAS devoted most of its research capabilities to completing the seven OREGON TRAIL substudies. In January 1964, Army Chief of Staff General Earle G. Wheeler assigned to IAS the additional high-priority task of conducting a study of the Strategic Land Force Requirements System to provide a basis for developing requirements for U.S. land forces.[178]

In the late 1960s and early 1970s, the work of IAS concentrated on such studies as *Army Roles, Missions, and Doctrine in Low Intensity Conflict; Alternative Strategies for Variant US Military Resource Postures; The Army's Role in Security Assistance Programs*; and *Concepts for Execution of the Swing Strategy*.[179] When SSI was discontinued as a CDC agency in February 1973, work underway included studies on *Tactical Nuclear Concepts, Phase II (NOC II); Changing Strategic Position of Europe (CHAPOSE); The Army Study of the Guard and Reserve Forces; Pacific Asian Strategy for Tomorrow (PAST); Service Roles in Providing Assistance to Allies Under the Nixon Doctrine (SPASTAND);* and a strategic appraisal.[180]

Institute for Land Warfare

In 1966, Secretary of the Army Stanley R. Resor recognized the need for greater integration and cohesion in the planning of Army R&D. The result was the establishment in April 1967 of the Institute of Land Combat (ILC; later redesignated the Institute for Land Warfare [ILW]) to "act as a prime forecasting and long-range-planning center for the Army."[181] ILW was located at the Hoffman Building in Alexandria, Virginia, and by 1970 it had some 170 military and civilian personnel.[182] In FY 1970, the ILW was officially authorized fifty-four ORSA professionals (twenty-four military), had sixty-four on hand (three military), and produced some 685 man-months of ORSA-type studies, all self-initiated.[183] From 1969, the scientific adviser of ILW was Dr. William L. Archer. Born and educated in Canada, Dr. Archer served for fifteen years on the staff of the Canadian Defence Research Board before becoming the director of CORG and then moving to ILW in 1969.[184]

The principal mission of the ILW was to produce the so-called Land Combat Systems Study. The efforts of ILW in part duplicated those of IAS, and the possibility of duplication, combined with Army-wide personnel strength reductions, led in August 1969 to a review of CDC organization that resulted in a proposal for the merger of IAS and ILW with a combined strength of 190 to 220 personnel.[185] The matter received further consideration in June 1970, and in August 1970, the commanding general, CDC, approved the creation of a merged organization at Carlisle Barracks. However, the desire to locate a major part of CDC in the Washington, D.C., area resulted in a decision to reconsider, and the two organizations were never merged.

In the late 1960s, ILW was looking ahead to the battlefield of the 1990s and "forecast a bewildering array of new weapons, possible conflicts, and the effect of automation on war," the costs of which attracted some concern in the Congress and caused Senator William Proxmire of Wisconsin, the chairman of the Joint Congressional Economic Committee, to comment: "Small sums spent for research and development are escalated into billions for new weapons systems, which have never received a detailed and critical review by Congress as a whole."[186] ILW studies under way in FY 1970 included *Conceptual Design and Analysis of the Land Combat System; Land Combat Systems for Operations in the 1990s (LCS–90s); Preferential Analysis of Alternative Land Combat Systems for Operations in the 1990s; Compendium of Plausible Materiel Options;* and *Conflict Situation and Army Tasks, 1985–1995 (CSAT–90s)*.[187]

Institute of Nuclear Studies

The Institute of Nuclear Studies (INS) at Fort Bliss, Texas, began in July 1962 as the CDC Office of Special Weapons Development (OSWD) and was subsequently redesignated as the Nuclear Group. It was CDC's primary agency for the development of objectives, concepts, requirements, doctrine, organization, and equipment pertaining to the use of and defense against

nuclear weapons.[188] The Nuclear Group was also responsible for studies in the field of nuclear safety and assisted Army commanders in the United States to plan and conduct nuclear play during exercises. In FY 1970, INS was authorized twenty-seven ORSA professionals (no military) with fifteen on hand and produced some 180 man-months of ORSA-type work (fifty-five man-months directed and 125 man-months self-initiated) on such topics as *Nuclear Weapon Effects, Targeting, and Equipment Hardening; Army Qualitative Research Requirements for Nuclear Weapons Effects Information Studies; Re-evaluation of Troop Safety and Casualty Criteria*; munition-target relationships; denial of nuclear weapons; and atomic demolition munitions (ADM) yield analyses.[189]

Institute of Strategic and Stability Operations

The Institute of Strategic and Stability Operations (ISSO) at Fort Bragg, North Carolina, began in July 1962 as the CDC Remote Area Conflict Office (RACO), with subordinate elements located in Alaska and at the Jungle Warfare Center in the Panama Canal Zone.[190] RACO was responsible for all combat developments activities pertaining to unconventional warfare, psychological operations, counterinsurgency and counterguerrilla operations, and operations conducted in special environments such as jungle and arctic areas.[191] By 1966, RACO had been redesignated the Special Warfare and Civil Affairs Group (SWCAG) and was responsible for supervising the operations of two CDC field agencies employing ORSA techniques: the Special Warfare Agency at Fort Bragg, North Carolina, and the Civil Affairs Agency at Fort Gordon, Georgia.[192] The SWCAG was subsequently redesignated the Special Warfare Group (SWG) and lost its subordinate CDC field agencies to the Combat Arms Group and Combat Service Support Group. By FY 1970, the SWG had been redesignated once again as the Institute of Strategic and Stability Operations and was authorized fifty-eight ORSA professionals (two military) with forty-two on hand (no military).[193] In FY 1970, ISSO performed some 456 man-months of ORSA-type studies (267 man-months self-initiated and 189 man-months directed) on such topics as low-intensity conflict; *Special Warfare 75; Border Security/Anti-Infiltration; Stability Operations 75 (Low Intensity, Type II); Military Assistance Officer Program (MAOD);* and *US Army Military Assistance 75*.[194]

Institute of Special Studies

The Institute of Special Studies (ISS) at Fort Belvoir, Virginia, began in 1963 as the CDC Advanced Tactics Project (AVTAC) and was responsible for coordinating a series of Top Secret studies of tactical nuclear weapons, tactics, and organization in support of Project OREGON TRAIL.[195] The effort took more than eighteen months and required some forty-five substudies covering tactical and strategic concepts, political-economic-sociological issues, threats, comparative weapon analyses, materiel, combat and service support, target acquisition, and the history of tactical nuclear weapons.[196] Upon completion of the OREGON TRAIL studies, AVTAC was redesignated the Institute of Special Studies and was assigned the mission of conducting complex, short-lead-time, high-priority, and unusual special studies.[197] In FY 1970, ISS was authorized sixty-five ORSA professionals (four military) and had sixty-one on hand (no military).[198] During FY 1970, ISS produced some 651 man-months of ORSA-type activity (sixty-four man-months self-initiated and 587 man-months directed), including studies on non-nuclear ammunition combat rates programming and planning studies; *AH-56A Phase III Study; Air Mobility in the Mid/High Intensity Environment (AM/HI);* and *Southeast Asia Night Operations (SEA NITEOPS)*.[199]

Institute of Systems Analysis

The Institute of Systems Analysis (ISA)—originally named the Systems Analysis Group—was established at Fort Belvoir, Virginia, in 1968 principally to create for CDC an in-house analysis capability to replace CORG, which was expected to be phased out due to increasing Congressional opposition to contract studies.[200] The mission of ISA was to oversee CDC studies in the combat effectiveness and cost analysis fields and to develop and review combat simulation and cost models.[201] From 1968 to 1972, the technical director of ISA was Dr. Marion R. Bryson, a distinguished ORSA practitioner.[202] In FY 1970, ISA was authorized 115 ORSA professionals (no military) and

had thirty-eight on hand (one military).[203] During FY 1970, ISA produced some 605 man-months of ORSA-type work (eighty-nine man-months directed and 516 man-months self-initiated) on such topics as *Hard Point Target Weapon System, 1975–85; Model Development for the Border Security/Anti-Infiltration Study; Cost Effectiveness Analysis for Tactical Satellite Communications; Cost Effectiveness for SEA NITEOPS;* and *OPMOR-Integrated Combined Army and Support Models*.[204]

ORSA in Other Army Major Commands

During the 1960s and early 1970s, the bulk of the Army's in-house ORSA capability was in the Class II activities supervised directly by the Army Staff, AMC, and CDC. However, the other Army major commands, both in the United States and overseas, also had some ORSA capabilities and did, from time to time, conduct studies and analyses using ORSA techniques.[205] Those major command headquarters also employed ORSA-type techniques for the planning and evaluation of maneuvers, exercises, and training tests as well as installation cost and performance reports.[206] For the most part, ORSA work in HQ CONARC and the other Army major commands in the United States and overseas was self-initiated and self-regulated.

United States Continental Army Command

Pursuant to the 1962 Army reorganization plan, the United States Continental Army Command (CONARC) was charged with the training of individuals and units and the preparation of those units for combat. Accordingly, CONARC supervised the Army service schools and other Army training and monitored the readiness of Army units. Although CONARC's main agency for conducting studies and analyses using ORSA techniques, the Combat Operations Research Group (CORG), was transferred to CDC as part of the 1962 reorganization, HQ CONARC and some of its subordinate organizations continued to conduct some ORSA-type studies and analyses, both on contract and in-house. Technical Operations, Incorporated, the CORG contractor, continued to do a limited amount of ORSA work for HQ CONARC on readiness, schools, and training management, and many of the twenty-six Army service schools occasionally conducted studies of topics associated with their assigned mission area using ORSA techniques.[207]

United States Army Air Defense Command

The United States Army Air Defense Command (ARADCOM) was charged with the defense of the Continental United States against aerial attack by enemy bombers and inter-continental ballistic missiles (ICBMs). Air defense presented classic problems suitable for analysis using ORSA techniques. Indeed, OR was used in Great Britain before World War II primarily to solve problems of air defense. ARADCOM thus made substantial use of ORSA techniques in solving the problems of defending the United States against air attack. The principal ARADCOM analytical organization was the Analysis Branch of the Combat Developments Division of the HQ ARADCOM Office of the G–3.[208] The Analysis Branch, located at HQ ARADCOM in Colorado Springs, Colorado, conducted studies and analyses of existing and proposed air defense weapons systems and received contract support from both the Denver Research Institute and SRI.[209]

Army Security, Intelligence, and Communications Commands

The United States Army Security Agency (ASA) was responsible for Army communications security and other electronic intelligence activities. HQ ASA had a small OR division in its headquarters in Arlington, Virginia, that conducted special studies of topics pertinent to the ASA mission.[210] The Army Intelligence Command and the Army Strategic Communications Command appear not to have had dedicated ORSA organizations but did conduct some ORSA-type studies and analyses to support their annual planning, programming, and budgeting efforts and to provide analytical communications engineering support to the Defense Communications Agency.[211]

Overseas Commands

Army major commands in Europe and the Pacific also had some ORSA study capability, usually provided under contract. Headquarters, United States Army,

Europe (USAREUR), was supported by the RAC European field office, and Army forces in Southeast Asia were supported by the RAC field offices in Thailand and South Vietnam.[212] The Army Concept Team in Vietnam (ACTIV), under the control of the United States Army Military Assistance Command, Vietnam (MACV), with technical links to HQDA and HQ CDC, also conducted a variety of ORSA-type studies concerning the performance of weapons systems and other equipment in actual operations in Vietnam.[213] ACTIV produced some fifteen evaluation reports per year.[214]

Conclusion

The great demand for quantitative data and ORSA-type studies and analyses generated by the McNamara team in the Department of Defense from 1961 to 1968 as well as the need for the application of improved decision-making techniques to the complex problems of fighting the war in Southeast Asia and simultaneously planning for the Army of the future, led to a significant expansion of the Army's ORSA capabilities, both through contracts and the creation of in-house capabilities. That expansion slowed after the inauguration of President Richard Nixon in January 1969 due to general budget restrictions and the growing interest of Congress in eliminating, reducing, or restricting the contracting out of research tasks of all types to the FCRCs and other not-for-profit organizations. Although opportunities for ORSA contracting dried up and many smaller private ORSA research firms went under, the level of ORSA capability available to the Army in 1973, particularly in-house, far exceeded that available in 1961. Moreover, the scope of problems that Army ORSA analysts were able and willing to address had expanded tremendously as well. No longer were the classic problems of weapons systems performance, organization, and tactical and strategic doctrine the only issues that ORSA techniques could help to solve. Issues of human behavior, political, economic, and social problems, and the management systems of the Army had all come under scrutiny using ORSA methods.

Throughout the 1960s and early 1970s, the work of the Army analytical community was directed at the whole spectrum of problems facing the Army as it conducted a major war in Southeast Asia, maintained forward-deployed forces in Europe and Korea, and looked to the future. Coordinated through the Army Study System, Army ORSA elements made major contributions to both ongoing operations at home and in Southeast Asia and the development of the Army of the future. The Army analytical community produced both successes and failures, and the analytical process itself was sometimes abused by ignorant or unscrupulous practitioners, but on the whole ORSA managers and analysts, both contract and in-house, served the Army well during a period of turmoil and difficult decisions.

The many studies, analyses, simulations, war games, tests, and evaluations conducted by Army ORSA contractors and in-house organizations between 1961 and 1973 greatly enhanced the Army's ability to deal with ongoing problems and the more complex difficulties of planning for the future. Nevertheless, there remained much to be done, and although Army ORSA capabilities had expanded during the period, senior Army leaders such as Commander of CDC Lt. Gen. John Norton still pointed to the fact that "the gap between our military requirements and our military solutions is opening faster than we are able to solve our problems."[215] General Norton thus advised his listeners at the tenth Army Operations Research Symposium in May 1971 that further improvements in the use of ORSA by the Army were needed. As he saw it, the Army's analytical community needed to do three things: (1) *Use ORSA on ORSA*, (2) *Clear Away the Fog*, and (3) *Be Bold*. By this he meant that the Army's ORSA managers and analysts needed to study the existing ORSA program using ORSA techniques to determine how ORSA might be better used to serve the Army; that Army ORSA analysts needed to beware the obfuscation of their studies and recommendations by the use of ORSA jargon (what he called "ORSA-nese"); and that the Army ORSA community needed to develop new tools to use in the quantitative analysis of Army problems—tools much better than those of the 1940s and 1950s still in use.

CHAPTER SEVEN NOTES

[1] The history of STAG through FY 1963 is discussed in vol. I, ch. 3, of this history. On STAG, see, in particular, U.S. Army Strategy and Tactics Analysis Group, *Organization and Functions Manual* (Bethesda, Md.: U.S. Army Strategy and Tactics Analysis Group, 1 Nov 1962) (cited hereafter as STAG O & F Manual).

[2] U.S. Department of the Army, *Army Regulation No. 15–14: BOARDS, COMMISSIONS, AND COMMITTEES—United States Army Strategy and Tactics Analysis Group* (Washington, D.C.: HQDA, 11 Sep 1961), par. 2; STAG O & F Manual, p. 2–1.

[3] U.S. Department of the Army Study Advisory Committee (ASAC), *Main Report: Army Study Advisory Committee Examination of the Army's Operations Research/Systems Analysis Personnel Requirements* (Washington, D.C.: Office of the Director of Special Studies, Office of the Chief of Staff, HQDA, 30 Aug 1966) (cited hereafter as ASAC *Main Report*), an. B (Operations Research in and for the Army), an. 4, Incl 1 (The Army Analytical Community), app. 5 (Significant Analytical Activity in the Army Staff), atch. 3 (Analytically Oriented Offices, Deputy Chief of Staff for Military Operations and Assistant Chief of Staff for Force Development).

[4] U.S. Army Strategy and Tactics Analysis Group, *Information Brochure* (Bethesda, Md.: U.S. Army Strategy and Tactics Analysis Group, Jun 1972), p. 2 (cited hereafter as STAG Information Brochure). The "allied techniques" referred to included inventory theory, linear programming, dynamic programming, queuing theory, sequencing theory, replacement theory, simulation, game theory, and Monte Carlo.

[5] U.S. Army Strategy and Tactics Analysis Group, *Fact Sheet–U. S. Army Strategy and Tactics Analysis Group*, Bethesda, Md., n.d. [c. 1962], pp. 1–2 (copy in College Park, Md., National Archives and Records Administration [NARA] II, Record Group [RG] 319 [Records of the Army Staff, 1903–1992], Entry 100 [Deputy Chief of Staff G3 Operations—Strategy and Tactics Analysis Group, 1960–1962], box 3 [Security Classified General Correspondence of the Strategy and Tactics Analysis Group, 1960–1962, 203–04], Folder [203–04 OPPR Program Report Files, 1962, Fact Sheets]).

[6] Memo for Director, Strategy, Plans and Policy Division, ODCSOPS, from Chief, STAG, Bethesda, Md., 5 Aug 1966, sub: Proposed Reorganization of STAG (reproduced in U.S. Army Strategy and Tactics Analysis Group, *United States Army Strategy and Tactics Analysis Group Historical Summary Fiscal Year 1967* [Bethesda, Md.: U.S. Army Strategy and Tactics Analysis Group, 1967], an. A [cited hereafter as STAG, *Historical Summary*–FY 1967]).

[7] STAG Information Brochure, p. 7; U.S. Army Strategy and Tactics Analysis Group, United States Army Strategy and Tactics Analysis Group Annual *Historical Summary (RCS CSHIS–6 R2), 1 July 1972 to 15 January 1973* (Bethesda, Md.: U.S. Army Strategy and Tactics Analysis Group, 1973), an. A (Organization Chart, USASTAG, as of 14 Jan 1973) (cited hereafter as STAG, *Historical Summary, 1 July 1972–15 January 1973*).

[8] Memo, Chief, STAG, to Lt Col Fisher, Mr. Onufrak, Dr. Ling, and Mr. Hurd, Bethesda, 14 Sep 1961, sub: Proposed Reorganization for FY 63–67 (copy in NARA II, RG 319, Entry 100, box 1, Folder [201–22 DA Mobilization Program Planning Files, 1961]).

[9] ASAC *Main Report*, an. C (Requirements for OR/SA Personnel), Table C–1 (Consolidated OR/SA Personnel Requirements).

[10] STAG O & F Manual, p. 3–4. In April 1961, STAG leased temporary space at 7805 Old Georgetown Road in Bethesda, Md., and after 19 June 1961, STAG occupied a leased office building at 4815 Rugby Avenue in Bethesda.

[11] U.S. Department of the Army, Office of the Chief of Staff, Director of Special Studies, *The Army Study System: A Staff Study by the Director of Special Studies, Office of the Chief of Staff, United States Army* (Washington, D.C.: Director of Special Studies, Office of the Chief of Staff, HQDA, May 1964), I, p. 25 (cited hereafter as Bonesteel Study).

[12] ASAC *Main Report*, an. B, an. 3, pp. 1–2.

[13] STAG, *Historical Summary–FY 1967*, pp. 5 and 6, Figure 2 (Budget: FY–67).

[14] STAG, *Historical Summary, 1 July 1972–15 January 1973*, p. 3. On 15 January 1973, the remainder of the FY 1973 STAG budget was transferred to the new Concepts Analysis Agency.

[15] STAG, *Historical Summary–FY 1967*, pp. 7–21. TARTARUS was a computerized differential war-gaming model to assess movement and attrition of large land forces in contact under both nuclear and nonnuclear fires. It had the capacity to manage a theater-level war game of up to 300 units, each described by up to ninety-four resources or weapons types (see William P. Hanrahan, Jr., "War Gaming," *Army Management Views XIV*, no. 2 [November 1969], pp. 135–41).

[16] STAG, *Historical Summary, 1 July 1972–15 January 1973*, pp. ii and 5–21.

[17] The early history of ARO-D and its predecessor, OOR, is discussed in vol. I, ch. 3, of this history. For a summary, see "ARO History," www.arl.army.mil/aro/history/history.htm; copy in possession of the author. In 1973, ARO-D was redesignated as the Army Research Office (ARO) and the following year it was transferred from the Office of the Chief of Research and Development (OCRD) to AMC as part of Operation Steadfast. ARO continues to exist as the Army's principal oversight and contracting agency for scientific research programs.

[18] Col Donovan F. Burton (Commander, ARO-D), "Welcome," in *Proceedings of the [Seventh] United States Army Operations Research Symposium, 22–24 May 1968, Durham, North Carolina, Part I—Unclassified Volume* (Durham, N.C.: Army Research Office-Durham, 1968), p. 3.

[19] Bonesteel Study, I, an. C, Incl 1 (Nature of Army Study Effort), p. 39; Incl 2 (Management and Control), p. 45; and Incl 3, atch. 10 (U.S. Army Personnel Research Office Work Program and Reports), p. 76. The Combat Systems Research Laboratory was a subordinate activity of USAPRO and also conducted some ORSA-type work.

[20] Ibid. The annual USAPRO work program was coordinated with the HumRRO program by the Army Human Factors Research Advisory Committee.

[21] U.S. Department of the Army, Committee to Evaluate the Army Study System, *Final Report of the Committee to Evaluate the Army Study System* (Washington, D.C.: Headquarters, Department of the Army, Sep 1969) (cited hereafter as ETASS), Part II, sec. D (Capabilities of Principal Army Study Organizations Subcommittee Report), p. 6.

[22] Ibid.

[23] Ibid., p. 5.

[24] Ibid. LDSRA had a total of about 1,300 man-months of professional talent available, but most of it was used in areas other than ORSA-type studies.

[25] Ibid., p. 6.

[26] Ibid., p. 7.

[27] ASAC Main Report, an. B, an. 3, p. 2.

[28] ETASS, pt. II, sec. D, p. 7.

[29] ASAC Main Report, an. B, an. 3, p. 2.

[30] ETASS, pt. II, sec. D, p. 7.

[31] On the 1962 Army reorganization, see, *inter alia*, U.S. Department of the Army, Office of the Secretary of the Army, "Annual Report of the Secretary of the Army for Fiscal Year 1962," in U.S. Department of Defense, *Annual Report of the Secretary of Defense and the Annual Reports of the Secretary of the Army, Secretary of the Navy, Secretary of the Air Force, for Fiscal Year 1962* (Washington, D.C.: Government Printing Office, 1963), pp. 189–93.

[32] On the impact of the 1962 reorganization, see, *inter alia*, Lt Gen Frank S. Besson, Jr., "Research and Development Within the U.S. Army Materiel Command" in *Proceedings of the [Second] United States Army Operations Research Symposium, 26, 27, 28 March 1963*, Durham, North Carolina, pt. I (Durham, N.C.: Operations Research Technical Assistance Group, U.S. Army Research Office-Durham, 1963), p. 205; and Brig Gen James G. Kalergis, "Management in the Army Materiel Command," *Army Management Views XV*, no. 1 (1970), p. 32.

[33] Maj F. L. Smith, *A History of the U.S. Army in Operations Research* (Fort Leavenworth, Kans.: U.S. Army Command and General Staff College, 22 May 1967), p. 79.

[34] U.S. Army Materiel Command, *United States Army Materiel Command Activation Plan* (Washington, D.C.: U.S. Army Materiel Command, 16 Jul 1962), p. 1 (quoted in Smith, *A History of the U.S. Army in Operations Research*, pp. 79–80).

[35] General Frank S. Besson, Jr., "Army Materiel Command," *Army Management Views IX*, pt. I (1963–1964), p. 111.

[36] Kalergis, "Management in the Army Materiel Command," p. 33.

[37] Besson, "Research and Development within the U.S. Army Materiel Command," pp. 212–13.

[38] Lt Gen William B. Bunker, "Systems Analysis from the Manager's Viewpoint," *Army Management Views XIII*, no. 2 (December 1968), p. 2.

[39] ASAC *Main Report*, an. B, an. 4, pp. 14–16; and Smith, *A History of the U.S. Army in Operations Research*, pp. 80–81.

[40] Smith, *A History of the U.S. Army in Operations Research*, p. 81.

[41] ASAC *Main Report*, an. B, an. 4, p. 16.

[42] Bonesteel Study, I, an. B (Army Study Agencies and Facilities), pp. 112–14.

[43] ASAC *Main Report*, an. B, an. 4, pp. 15–16.

[44] Bonesteel Study, I, an. C, Incl 1, p. 39.

[45] Ibid., C, Incl 2, p. 46.

[46] Ibid., an. C, Incl 1, p. 39. AMC research and development (R&D) studies were conducted as part of the R&D functions and were not part of the LSP. The LSP was also affected by the large number of unprogrammed study requests received by AMC from the Army Staff and other commands and agencies.

[47] *ASAC, Main Report*, an. B, an. 4, app. 3 (Summary of Current Army Data Generating Activity).

[48] Ibid., an. C, Table C–1.

[49] Bonesteel Study, I, Main Study, p. 25.

[50] Bunker, "Systems Analysis from the Manager's Viewpoint," p. 2.

[51] Unless otherwise noted, the following discussion of the ORSA elements in HQ AMC is based on Bonesteel Study, I, an. B, pp. 112–14; and ASAC *Main Report*, an. B, an. 4, app. 7, atch. 1 (Selected Analytically Oriented Offices in HQ USAMC).

[52] Smith, *A History of the U.S. Army in Operations Research*, pp. 80–81.

[53] Ibid., p. 80.

[54] William J. Tropf and Horace Schow II, "Data Collection and Analysis Effort Within the U.S. Army Materiel Command, in *Proceedings of the [Eighth] United States Army Operations Research Symposium, 21–23 May 1969, Durham, North Carolina* (Durham, N.C.: U.S. Army Research Office-Durham, 1969), p. 365.

[55] Ibid., p. 366.

[56] Paul L. Peck, "The Implications of ADP Networking Standards on OR," in *Proceedings of the [Eighth] United States Army Operations Research Symposium, 21–23 May 1969*), p. 271.

[57] Kalergis, "Management in the Army Materiel Command," pp. 34–35.

[58] Unless otherwise noted, the following discussion is based on ASAC *Main Report*, an. B, an. 4, app. 7, atch. 7; Bonesteel Study, I, Main Study, p. 21; and Bonesteel Study, I, an. B, pp. 112–14.

[59] ETASS, pt. II, sec. D, p. 15.

[60] Bonesteel Study, I, an. C, Incl 3, atch. 9 (Defense Logistics Studies Information Exchange).

[61] Wilbur B. Payne, "Some Principles Relating to Operations Research in the Army," *Army Management Views XIV*, no. 1 (July 1969), p. 133; Bonesteel Study, I, an. B, pp. 112–14. The early history of BRL and WSL is described in vol. I, ch. 4, of this history.

[62] ASAC *Main Report*, an. B, an. 3, pp. 1–2.

[63] Ibid., an. B, an. 1, p. 8. The spin-off of AMSAC from BRL was not a smooth process. As Dr. Frank Grubbs later recalled, the leaders of BRL—abetted by the director of laboratories at HQ AMC, Dr. J. Toll Thomas—dragged their feet, and Lt. Gen. Bunker, the deputy commanding general of AMC, finally had to send Col. Gruenther and Bill Tropf to Aberdeen to expedite the establishment of AMSAC as part of the larger Aberdeen Proving Ground Research and Development Center (see Dr. Frank Grubbs, oral history interview with Eugene P. Visco, Aberdeen Proving Ground, Md., 26 Oct 1994, pp. 7–10 [part of Deputy Under Secretary of the Army for Operations Research Oral History Program conducted in association with the U.S. Army War College/U.S. Army Military History Institute]).

[64] See www.federallabs.org/servlet/printContentServlet?printID=1035&print Region=Mid- Atlantic&printType=LPRO, downloaded 7 January 2005; copy in possession of the author.

[65] Ibid. AMSAA also took over the very important wound ballistics program from BRL.

[66] ASAC *Main Report*, an. C, Table C–1.

[67] ETASS, pt. II, sec. D, p. 16. There was one officer assigned with an OR degree, and seventy-eight of the civilian employees were qualified ORSA specialists.

[68] Ibid., p. 15.

[69] Ibid.

[70] Unless otherwise indicated, the following discussion of ORSA activities in the AMC subordinate commands is based on two main sources: Bonesteel Study, I, an. B, pp. 112–14; and the attachments to ASAC *Main Report*, an. B, an. 4, app. 7 (U.S. Army Materiel Command and Subordinate Agencies).

[71] Brig Gen Roland B. Anderson, "Welcoming Address," in *Proceedings of the [Third] United States Army Operations Research Symposium, 25, 26, 27 May 1964, Rock Island, Illinois, Part I—Unclassified Papers* (Durham, N.C.: Operations Research Technical Assistance Group, U.S. Army Research Office-Durham, 1964), p. 3.

[72] Ibid.

[73] Remarks of Dr. Haug, in Henry A. Rasmussen, "Application of Operations Research/Systems Analysis to the U.S. Army Weapons Command," *Army Management Views XV*, no. 2 (1970), pp. 121–22.

[74] ASAC *Main Report*, an. B, an. 3, pp. 1–2.

[75] ETASS, pt. II, sec. D, p. 16.

[76] Ibid.

[77] The early history of CDC is discussed in vol. I, ch. 4, of this history. Details of the application of ORSA in CDC are addressed in U.S. Army Combat Developments Command, *Methodology Notebook for Action Officers, Part I* (Fort Belvoir, Va.: Technical Operations, Inc., CORG for HQ, USACDC, May 1967); and U.S. Army Combat Developments Command, Combat Support Group, *Methodology Notebook for Action Officers, part II*

(Fort Belvoir, Va.: Organization and Evaluation Division, U.S. Army Combat Developments Command Combat Support Group, Mar 1970).

[78] "Annual Report of the Secretary of the Army for Fiscal Year 1962," p. 193.

[79] "Annual Report of the Secretary of the Army for Fiscal Year 1963," p. 121.

[80] The CDC mission statement is reproduced in Ltr, Lt Gen John P. Daley (CG, CDC), Fort Belvoir, Va., 20 Mar 1963, sub: Briefing for the Army Policy Council (inclosure to Ltr, Lt Gen John P. Daley, Fort Belvoir, Va., 25 Mar 1963, sub: *Status Report* on US Army Combat Developments Command, 1–2) (cited hereafter as Daley, *Status Report*), and ASAC *Main Report*, an. B, an. 4, Incl 1, p. 1.

[81] Daley, *Status Report*, p. 2. See also U.S. Army Combat Developments Command, *United States Army Combat Developments Command Activation Plan*, vol. I (Fort Belvoir, Va.: U.S. Army Combat Developments Command, 1 Jun 1962).

[82] ASAC *Main Report*, an. B, an. 4, Incl 1, p. 1.

[83] Maj Gen Julian J. Ewell, "The Combat Developments Command Management System," *Army Management Views XIII*, no. 1 (May 1968), p. 37.

[84] U.S. Army Combat Developments Command, Institute of Advanced Studies, *Annual Historical Summary (RCS CSHIS–6 [R2], 20 June 1962–30 June 1964* (Carlisle Barracks, Pa.: Institute of Advanced Studies, U.S. Army Combat Developments Command, [30 Jun 1964], pp. 3–4 (cited hereafter as IAS AHS, Jun 1962–Jun 1964). See also Lt Gen Dwight E. Beach, "The Combat Developments Command Program," *Army Management Views IX*, pt. I (1963–1964), p. 126, Figure 2; Daley, *Status Report*, p. 2; and USACDC General Orders No. 5, Fort Belvoir, Va., 21 Jun 1962.

[85] Smith, *A History of the U.S. Army in Operations Research*, p. 78.

[86] CORG was transferred from HQ CONARC to HQ CDC upon the activation of HQ CDC in 1962. The early history of CORG is described in vol. I, ch. 4, of this history and its organization and functions are discussed in ch. 6 above.

[87] U.S. Army Training and Doctrine Command, Historical Office, *TRADOC On-Line History, Chapter 7: Combat Developments* (Fort Monroe, Va.: Historical Office, Headquarters, U.S. Army Training and Doctrine Command, n.d.), pp. 6–7 (cited hereafter as TRADOC On-Line History, ch. 7). On 15 April 1972, the Combat Arms Group was renamed the Combat Systems Group.

[88] Ewell, "The Combat Developments Command Management System," p. 48.

[89] Dickson, *Think Tanks*, p. 164.

[90] ASAC, *Main Report*, an. B., an. 1, p. 8..

[91] Ibid., an. C, Table C–1.

[92] Daley, *Status Report*, p. 4; Bonesteel Study, I, Main Study, p. 25.

[93] Bonesteel Study, I, Main Study, p. 25.

[94] Daley, *Status Report*, p. 4.

[95] Ewell, "The Combat Developments Command Management System," p. 50.

[96] Ibid.

[97] Bonesteel Study, I, Main Study, p. 19.

[98] Daley, *Status Report*, p. 2.

[99] Bonesteel Study, I, an. C, Incl 1, p. 39.

[100] Ewell, "The Combat Developments Command Management System," pp. 42–43; ASAC *Main Report*, an. B, an. 4, app. 6. See also ASAC *Main Report*, an. B, an. 4, app. 3. QMDOs (Qualitative Materiel Development Objectives) furnished guidance for Army research and exploratory development; DA-approved QMRs (Qualitative Materiel Requirements) became the basis for engineering or systems development and productions programs; SDRs (Special Development Requirements) dealt with particularly important projects; Tables of Organization and Equipment (TOEs), Tables of Distribution and Allowances (TDAs), and Manning Tables and Equipment Lists (MTELs) prescribed how the Army should be equipped; and Field Manuals and Special Texts prescribed how the Army should fight.

[101] ASAC *Main Report*, an. B, an. 4, p. 11. In an. B, an. 4, app. 6, the ASAC study group singled out thirteen CDC elements that met the more stringent criterion (the HQ CDC directorates of Doctrine, Evaluation, and Special Studies and CORG; the Nuclear Group, the Institute of Advanced Studies, and the Combat Developments Experimentation Center; two elements of the Combat Service Support Group; and four elements of the Combat Arms Group).

[102] Daley, *Status Report*, pp. 8–9. The "Air Assault Division" and "Offensive Operations in Vietnam" war games began in January 1963 and ran for an extended period. They were supported by the CDC Test and Evaluation Unit at Fort Benning that planned and conducted the troop testing of air assault units after completion of the organization, equipping, and training phases by CONARC (see Daley, *Status Report*, p. 9). CDC involvement in the Howze Board and other airmobility development projects and CDC cooperation with ACTIV are discussed in greater detail in chs. 8 and 9.

[103] ASAC *Main Report*, an. B, an. 4, Incl 1, p. 1.

[104] Bonesteel Study, I, an. C, Incl 1, p. 39.

[105] ASAC *Main Report*, an. B, an. 4, Incl 1, p. 2.

[106] Bonesteel Study, I, Main Study, pp. 19–20, and an. C, Incl 3, atch. 2, p. 57.

[107] About 25 percent of all CDC-sponsored contract studies were funded and approved internally by CDC.

[108] Bonesteel Study, I, an. C, Incl 2, p. 45, and Incl 3, atch. 2 (Combat Developments Objectives Guide), pp. 56–57. Note that the annual study program published in *USACDC Pamphlet No. 71–3* was prepared by HQ CDC but that the CDOG was prepared and published by HQDA (see Bonesteel Study, I, an. C, Incl 2, p. 45). CDC also published a quarterly listing of combat development actions summarized by five-year program (see Ewell, "The Combat Developments Command Management System," p. 49).

[109] Ibid., I, an. C, Incl 3, atch. 2, pp. 56–57.

[110] In FY 1963, CDC conducted some forty-seven DA-directed studies, of which thirty-five were scheduled for completion in FY 1963, and the CDOG listed 152 studies, of which fifty were to be completed in FY 1963. CDC also completed and forwarded to DA four QMDOs, fifteen QMRs, and three SDRs, and, as of March 1963, CDC still had requirements for the preparation of some additional 171 QMDOs, 340 QMRs, and sixty SDRs and was considering recommending for deletion some seventy QMRs and ten SDRs. In FY 1963, CDC also dispatched some 129 ROAD Division TOEs and fifty-six other TOEs to HQDA for approval and had under preparation some seventy-one TOEs for the Howze Board as well as thirty-three ROAD Separate Brigade TOEs and seventy-one MTELs. As of FY 1963, CDC had completed nineteen Field Manuals and published eighteen Special Texts (see Daley, *Status Report*, pp. 6–8).

[111] Bonesteel Study, I, Main Study, p. 20. As of March 1963, CDC was involved in four such major unprogrammed tasks: support of the study group at Fort Belvoir, Va., which was charged to determine Army fire support needs in the FY 1965–FY 1970 time frame; support of Operation Crossbow, a joint Army–Air Force test directed by the secretary of defense to evaluate the capabilities of the HOUND DOG missile against the HAWK surface-to-air missile conducted at Fort Bliss, Tex.; guidance and support for the conduct of the air assault unit tests at Fort Benning and Fort Stewart, Ga.; and support of testing being carried out by ACTIV (see Daley, *Status Report*, pp. 5–6).

[112] Ibid., p. 19.

[113] U.S. Department of the Army, Office of the Secretary of the Army, "Annual Report of the Secretary of the Army for Fiscal Year 1966," in U.S. Department of Defense, *Department of Defense Annual Report for Fiscal Year*

1966 Including the Annual Reports of the Secretary of Defense, Secretary of the Army, Secretary of the Navy, and Secretary of the Air Force (Washington, D.C.: Government Printing Office, 1967), p. 197.

[114] Ewell, "The Combat Developments Command Management System," p. 40.

[115] Ibid., pp. 38–39.

[116] Ibid., pp. 40–41.

[117] By November 1967, there were five concept programs in being (*Army 70, Army 75, Army 80, Army 85, and Army 90*), and they involved some 4,000 identifiable separate mission actions within the CDC program, most of which involved the use of ORSA techniques in one way or another (see Ewell, "The Combat Developments Command Management System," p. 46).

[118] "Annual Report of the Secretary of the Army for Fiscal Year 1966," p. 137.

[119] Ibid., p. 138.

[120] Ibid. In addition, the *Army 85* concept study explored the long range.

[121] For the early history of CDEC and its support by SRI, see vol. I, ch. 4, of this history. The history of CDEC/CDCEC from 1956 to 1970 is covered in John L. Romjue, *History of Field Experimentation Methodology in the United States Army, 1956–1970* (Fort Ord, Calif.: U.S. Army Combat Developments Command Experimentation Command, Jun 1971).

[122] Beach, "The Combat Developments Command Program," p. 142.

[123] Daley, *Status Report*, p. 4.

[124] Beach, "The Combat Developments Command Program," pp. 15–16.

[125] Romjue, *History of Field Experimentation Methodology*, pp. 143–44.

[126] Ibid., p. 144.

[127] Daley, *Status Report*, p. 3.

[128] Romjue, *History of Field Experimentation Methodology*, pp. 141 and 143.

[129] Ibid., p. 144.

[130] Smith, *A History of the U.S. Army in Operations Research*, p. 78.

[131] TRADOC On-Line History, ch. 7, pp. 6–7.

[132] Ibid.

[133] ASAC *Main Report*, an. B, an. 4, app. 6. See also Bonesteel Study, I, an. B, pp. 114–15.

[134] Ibid., an. B, an. 4, app. 6, atch. 4 (Four Selected Analytically Oriented Elements of USACDC CAG).

[135] Ibid.; Col George F. Leist, "Session IV," in *Proceedings of the [Second] United States Army Operations Research Symposium, 26, 27, 28 March 1963, Durham, North Carolina, Part I*, p. 97.

[136] ASAC *Main Report*, an. B, an. 4, app. 6, atch. 4.

[137] Ibid.; and Leist, "Session IV," p. 97.

[138] Leist, "Session IV," p. 97.

[139] TRADOC On-Line History, ch. 7. On 15 April 1972, the Combat Arms Group was renamed the Combat Systems Group.

[140] Ewell, "The Combat Developments Command Management System," p. 47, Figure 2.

[141] ETASS, pt. II, sec. D, p. 10.

[142] Ibid.

[143] Ewell, "The Combat Developments Command Management System," p. 47, Figure 2.

[144] ETASS, pt. II, sec. D, p. 10.

[145] Ibid.

[146] Smith, *A History of the U.S. Army in Operations Research*, p. 78.

[147] ASAC *Main Report*, an. B, an. 4, app. 6. See also Bonesteel Study, I, an. B, pp. 114–15.

[148] Ewell, "The Combat Developments Command Management System," p. 47, Figure 2.

[149] ASAC *Main Report*, an. B, an. 4, app. 6, atch. 3 (Two Selected Analytically Oriented Elements of USACDC SSG). From 1 January 1966, the services provided by the Logistics Support Office were provided by CORG as part of its annual study program.

[150] ETASS, pt. II, sec. D, p. 11.

[151] Ibid.

[152] Ibid., pt. II, sec. D, p. 12.

[153] U.S. Army Combat Developments Command, Institute of Advanced Studies, *Organization and Functions Manual* (Carlisle Barracks, Pa.: Institute of Advanced Studies, U.S. Army Combat Developments Command, 20 Sep 1968), *Change 1* (12 Nov 1968), p. 1 (cited hereafter as IAS O&F Manual). See Headquarters, U.S. Army Combat Developments Command, General Orders No. 5, 21 Jun 1962. On 1 May 1963, the USAIAS was redesignated the U.S. Army Combat Developments Command Institute for Advanced Studies (USACDCIAS). It should be noted that the history of IAS is somewhat better documented than that of other CDC field agencies, primarily because all of its Annual Historical Summaries/Annual Historical Reports have survived.

[154] Ibid.

[155] IAS AHS, Jun 1962–Jun 1964, p. 17.

[156] IAS O&F Manual, p. 3.

[157] IAS AHS, Jun 1962–Jun 1964, pp. 10 and 14, Figure 8 (U.S. Army Institute of Advanced Studies [CDC], Oct 1962); SSI AHR Jul 1972–Feb 1973, p. 21.

[158] On the functions and capabilities of the IAS groups, see AHS Jun 1962–Jun 1964, pp. 21–23.

[159] Bonesteel Study, I, Summary, p. vii.

[160] U.S. Army Combat Developments Command, Strategic Studies Institute, *Annual Historical Report* (cited hereafter as SSI AHR), Jul 1972–Feb 1973, p. 22.

[161] Ibid.; U.S. Army Combat Developments Command, Institute of Advanced Studies, *Annual Historical Report, 1 July 1965–30 June 1966 (RCS CS HIS–6 [R2])* (Carlisle Barracks, Pa.: Institute of Advanced Studies, U.S. Army Combat Developments Command, [30 Jun 1966]), p. 2 (cited hereafter as IAS AHR Jul 1965–Jun 1966).

[162] SSI AHR, Jul 1971–Jun 1972, p. 1.

[163] Ibid., pp. 8 and 11, Figure 2 (Organization of Strategic Studies Institute, 30 Jun 1972).

[164] SSI AHR, Jul 1972–Feb 1973, pp. 1, 4, and 20. See also U.S. Army Combat Developments Command, General Orders No. 46, 23 January 1973.

[165] SSI AHR, Jul 1972–Feb 1973, pp. 24–25. There were two significant additions to SSI (an Advanced Analysis Group and an Environmental Forecasting Group) and the personnel authorization was increased to twenty-one officers and seventeen civilian research analysts.

[166] IAS AHS, Jun 1962–Jun 1964, p. 20.

[167] See, *inter alia*, U.S. Army Combat Developments Command, Institute of Advanced Studies, *Annual Historical Report, 1 July 1968–30 June 1969 (RCS CS HIS–6 [R2])* (Carlisle Barracks, Pa.: Strategic Studies Institute, U.S. Army Combat Developments Command, [30 Jun 1969]), p. 4; U.S. Army Combat Developments Command, Institute of Advanced Studies, *Annual Historical Report, 1 July 1969–30 June 1970 (RCS CS HIS–6 [R2])* (Carlisle Barracks, Pa.: Institute of Advanced Studies, U.S. Army Combat Developments Command, [30 Jun 1970]), p. 16; SSI AHR, Jul 1972–Feb 1973, p. 21.

[168] ETASS, pt. II, sec. D, p. 12.

[169] IAS AHS, Jun 1962–Jun 1964, pp. 24–27. See Deputy Commander, USAIAS, Memo for the Commanding General, USAIAS, Carlisle Barracks, Pa., 26 Oct 1962, sub: Professional Civilian Support for USAIAS.

[170] IAS AHS, Jun 1962–Jun 1964, pp. 24–27.

[171] IAS AHR Jul 1969–Jun 1970, p. 20.

[172] The author of SSI AHR, Jul 1972–Feb 1973 (p. 24), described the phase-out of ORI support for IAS as due to "changed DOD policy and resource constraints."

[173] See, *inter alia*, Bonesteel Study, I, an. B, pp. 114–15; ASAC Main Report, an. B, an. 4, app. 6, atch. 2; and ETASS, pt. II, sec. D, p. 12.

[174] SSI AHR, Jul 1972–Feb 1973, p. 25. A listing of studies completed by IAS during the period Jul 1962–Feb 1973 can be found in SSI AHR, Jul 1972–Feb 1973, pp. 27–29, app. A (Institute Studies Completed as an Agency of CDC, 1962–1973).

[175] IAS AHS, Jun 1962–Jun 1964, pp. 31–33; SSI AHR, Jul 1972–Feb 1973, p. 21.

[176] IAS AHS, Jun 1962–Jun 1964, pp. 33–36.

[177] Ibid., pp. 37–38.

[178] Ibid., pp. 38–39. The initial report was submitted to AVTAC on 28 May 1964 with submission to DOD scheduled for July 1964.

[179] SSI AHR, Jul 1972–Feb 1973, p. 24.

[180] Ibid., pp. 7–19 and 24–25.

[181] Dickson, *Think Tanks*, pp. 163–65.

[182] Ibid. The 1966 ASAC study of Army ORSA personnel requirements had forecast a summer 1970 requirement for an "Institute of Land Combat Systems" of twelve military and thirteen civilian ORSA specialists and no ORSA executives (see ASAC *Main Report*, an. C, Table C–1).

[183] ETASS, pt. II, sec. D, p. 13.

[184] See the brief biosketch accompanying William L. Archer, "Systems Analysis Needs More Operations Research," *Army Management Views XIV*, no. 1 (July 1969), p. 122.

[185] SSI AHR, Jul 1972–Feb 1973, pp. 22–24. See Ltr, Headquarters U.S. Combat Developments Command, Fort Belvoir, Va., 4 Aug 1969, sub: Study of Missions, Functions and Organization of US Army Combat Developments Command.

[186] Quoted by Maffre, "Defense Report/Congress presses Pentagon to phase out 'think tanks,' shift emphasis to in-house R and D," p. 2436.

[187] ETASS, pt. II, sec. D, p. 13.

[188] Smith, *A History of the U.S. Army in Operations Research*, p. 79; Bonesteel Study, I, an. B, pp. 114–15; ASAC *Main Report*, an. B, an. 4, app. 6, atch. 2.

[189] ETASS, pt. II, sec. D, p. 11.

[190] Smith, *A History of the U.S. Army in Operations Research*, p. 76.

[191] Ibid., pp. 78–79.

[192] ASAC *Main Report*, an. B, an. 4, app. 6. See also Bonesteel Study, I, an. B, pp. 114–15.

[193] ETASS, pt. II, sec. D, p. 14.

[194] Ibid.

[195] CDC, *Methodology Notebook for Action Officers*, pt. I, pp. X–4 to X–13.

[196] Ibid., p. X–4. The work on OREGON TRAIL involved a number of CDC in-house and contract ORSA organizations. For example, in FY 1965, the Hudson Institute of Hudson, N.Y., performed some $30,000 worth of sole-source contract work in support of OREGON TRAIL (see ASAC *Main Report*, an. B, an. 3, Incl).

[197] ETASS, pt. II, sec. D, p. 11.

[198] Ibid.

[199] Ibid. The *Southeast Asia Night Operations* study was actually done by CORG for ISS.

[200] E. B. Vandiver (director, Center for Army Analysis), conversation with the author, Fort Belvoir, Va., 29 Aug 2005. ISA was also to replace ISS, and it was envisioned that as CORG and ISS were gradually phased out, ISA would assume their functions.

[201] Ibid., p. 13.

[202] Dr. Bryson was subsequently senior scientist and scientific adviser at CDCEC at Fort Ord, Calif., from 1972 to 1983, when CDCEC was renamed the Test and Experimentation Command Experimentation Center and was moved to Fort Hunter-Liggett, where Bryson was its director from 1983 to 1991. He later served as the technical director, Headquarters, Test and Experimentation Command, Fort Hood, Tex., from 1991 until his retirement from federal service in 1994. He was elected a Lifetime Fellow of the Military Operations Research Society. Dr. Bryson "left a lasting imprint on how the Army of today and of the future will conduct operational and force development tests and experiments . . . the impact that Dr. Bryson has made on operational testing yesterday, today, and tomorrow is unparalleled" (see the entry for Dr. Marion R. Bryson in U.S. Army Operational Test Command Hall of Fame at www.otc.army.mil/otcweb/bryson.htm; copy in possession of the author).

[203] ETASS, pt. II, sec. D, p. 13.

[204] Ibid.

[205] The Bonesteel study group estimated that the other Army major commands produced perhaps twenty important ORSA-type studies per year (see Bonesteel Study, I, an. C, Incl 1, p. 41).

[206] ASAC *Main Report*, an. B, an. 4, app. 3. In the mid-1960s there were more than thirty-five significant exercises per year and some 1,500–2,000 training or readiness tests. Installation cost and performance reports involved the analysis of cost data and work measurement.

[207] Ibid., an. B, an. 4, p. 17, and app. 8 (Other CONUS Commands with Identifiable Analytical Elements).

[208] Ibid.

[209] Ibid. In FY 1966, HQ ARADCOM expenditures on ORSA contracts amounted to $660,341 in OMA funds (see ASAC *Main Report*, an. B, an. 3, Incl).

[210] Ibid.

[211] Ibid., an. B, an. 4, p. 17.

[212] Ibid., an. B, an. 4, p. 18, and app. 9 (Army Analytically Oriented Elements Located Overseas).

[213] Ibid., ACTIV is discussed in greater detail in ch. 9.

[214] Ibid., an. B, an. 4, app. 3.

[215] Lt Gen John Norton, "New Initiatives in ORSA," in *Proceedings of the [Tenth] United States Army Operations Research Symposium: "The Next Decade," 26–28 May 1971, Durham, North Carolina*, p. 9.

CHAPTER EIGHT

ORSA, Counterinsurgency, and Airmobility

The McNamara revolution in defense management and the consequent expansion of Army operations research and systems analysis (ORSA) activity took place against the background of the growing involvement of the United States in countering the Communist-led insurgency in Southeast Asia. Between 1961 and 1973, Army leaders scrambled to establish ORSA programs to ensure their ability to provide the quantitative data demanded by Secretary McNamara and his staff in the Office of the Secretary of Defense (OSD) and to utilize ORSA methods to assist in the process of making decisions regarding the complex problems of future Army organization and doctrine. At the same time, Army leaders faced the enormous problems of mobilizing, deploying, and employing U.S. forces to Vietnam and surrounding areas of Southeast Asia. The day-to-day problems of managing and fighting the war in Southeast Asia prompted a renewed interest in the application of ORSA techniques to concrete problems of battlefield performance of weapons and other equipment, organization, and tactics—issues that had led to the creation of operations research in World War II. Thus, in a sense Army ORSA returned to its roots. At the same time, the classic applications of ORSA were augmented by the use of ORSA techniques to deal with the many complex political, economic, and social aspects of the war in Vietnam.

Even before the commitment of U.S. combat forces in Vietnam in 1965, the Army's contract and in-house ORSA elements in CONUS were fully engaged in the systematic study of the region and of potential issues regarding the employment and support of U.S. forces in Southeast Asia. A number of high-level staff studies, symposia, formal ORSA studies, and war games regarding the two characteristic elements of the Vietnam War—counterinsurgency and airmobility—were completed or well under way before the first Army combat units landed, and Army ORSA elements in CONUS continued to produce important studies and games on these and other pertinent topics throughout the course of the war. The bulk of these activities were initiated by the Army's principal ORSA contractors—the Special Operations Research Office (SORO), the Research Analysis Corporation (RAC), the Combat Operations Research Group (CORG) at Headquarters, U.S. Army Combat Developments Command (HQ CDC), and the Human Resources Research Office (HumRRO). Their efforts were encouraged and supported by the Office of the Deputy Under Secretary of the Army for Operations Research (DUSA [OR]), the Army Staff, the commanders of the Combat Developments Command (CDC) and Army Materiel Command (AMC), and other Army ORSA and research and development (R&D) elements at all levels. The Office of the Assistant Secretary of Defense (Systems Analysis), on the other hand, played only a minor role in the process.

The outcome of these efforts was mixed. Although studies of insurgency, counterinsurgency, and the physical, political, and cultural geography of Southeast Asia significantly enhanced our knowledge of the area of conflict and the enemy, the complexity of the situation and our own cultural biases inhibited a complete understanding and effective solutions. On the other hand, the studies, tests, and evaluations of airmobility doctrine and methods was very successful

and introduced a new era in combat tactics, an era in which the helicopter, aerial fire support, and the concept of rapid movement of men and materiel by air became dominant characteristics of the American way of conducting war.

ORSA and Counterinsurgency

The Army's interest in insurgency and counterinsurgency, in nation building, and in the techniques of guerrilla and counterguerrilla operations long predated the commitment of Army forces in Southeast Asia in the 1960s. In fact, it can be argued that such matters were major issues even before the establishment of the U.S. Army in 1775. Colonial conflicts with American Indian indigenous peoples, the long French and Indian wars, and the American Revolutionary War itself were essentially forms of insurgency and counterinsurgency. The suppression of dissident elements within the new republic in the late eighteenth century, the long conflict with American Indian tribes that dominated Army activities during the nineteenth century, and the suppression of insurgencies in the Philippines and Latin America in the early twentieth century were followed by U.S. Army support of partisan operations in World War II and in Korea as well as counterinsurgency operations in Greece and elsewhere in the late 1940s and early 1950s. The ultimately unsuccessful attempt by the French to regain control of their colonies in Indochina in the post–World War II period served to further heighten interest in the means and methods of countering insurgency and focused attention on such operations in Southeast Asia.

The renewed interest in counterinsurgency was manifested in several ways. Senior Army officers chaired several high-level boards that investigated the Army's role and capabilities in special warfare. The annual Army Operations Research Symposia (AORS) also became venues for the presentation and discussion of ongoing work dealing with the problems of limited warfare, counterinsurgency, and related topics. The Army's contract and in-house ORSA elements produced a number of formal studies on various aspects of insurgency and counterinsurgency, and numerous books and articles began to appear on the topic, many of which were written by ORSA specialists. But as a senior RAC analyst, Roswell B. Wing, told attendees at the second AORS in 1963:

> [T]he application of this technique [operations research] must necessarily be somewhat limited until a body of knowledge is developed and concrete data is made available to work with within this field. Case Studies of past counterinsurgency experience will help to provide such data. It should be observed, however, that the limitations on the availability of data present a rather special challenge to Operations Research as a discipline, and suggest the need for developing new and imaginative methods for use in this important problem area.[1]

To be sure, a substantial portion of the work done on insurgency, counterinsurgency, unconventional warfare, psychological operations, and nation building relied on the traditional methodologies of history, political science, economics, and sociology, but innovative applications of ORSA to such problems were also forthcoming, and the Army's understanding of counterinsurgency and related issues expanded rapidly during the 1960s and early 1970s.

High-Level Army Boards Dealing with Special Warfare

President Kennedy's well-known interest in limited warfare in general and the use of the Army's Special Forces in particular was reflected in increased interest within the Army in such matters. Soon after the Kennedy administration took office in 1961, the Army established a number of special boards to investigate the Army's existing capabilities and doctrine for special warfare and to recommend necessary changes in the existing organization and employment of special operating forces. Two Army boards in particular had important influence on the Army's subsequent special warfare organization and doctrine: the 1961 board headed by Brig. Gen. Richard G. Stilwell and the 1962 board headed by Lt. Gen. Hamilton H. Howze.

On 11 September 1961, Secretary of the Army Elvis J. Stahr, Jr., assigned Brig. Gen. Richard G. Stilwell to "evaluate and make recommendations with respect to the Counter-Insurgency Operations Courses presented by the Army's Special Warfare Center and by instrumentalities of three Unified Commands" and to "make an independent survey of how the Army was discharging a series of generally related tasks, targeted on

the less developed nations of the Free World and with the common objective of strengthening the capability of national military and paramilitary contingents to ensure the internal defense of their respective countries."[2] To reduce his task to manageable proportions, General Stilwell chose to limit his inquiry to the three major purposes "to be served by U.S. military elements working alongside and guiding their indigenous counterparts," as enunciated in the address of Army Chief of Staff General George H. Decker to the Army War College on 8 June 1961. Those three major purposes were the following:

> a) To give impetus to the employment of military talent and resources in ways contributing to the political stability, economic betterment and social progress of the country concerned.
> b) To heighten the effectiveness of indigenous military and paramilitary forces in insuring against the development of dissident factions; or in dealing with armed insurgency, should it erupt.
> c) To accelerate the development of indigenous military and paramilitary capabilities to include support mechanisms, for conducting subversion or guerrilla activities, in contiguous Communist territory.[3]

General Stilwell's conclusions were conditioned by two major premises: first, "that the activities under survey (the unconventional, unorthodox, paramilitary, military assistance by another name, or whatever) are simply auxiliary weapons within the total array of U.S. power resources and that they are effective only when applied in coordination with those other resources," and second, "that it is the operative policy of the Executive Branch to exploit fully the potential of the U.S. Army to improve the overall capability of indigenous armed forces to deal with problems of internal defense."[4] Among the twenty-five broad conclusions reached by General Stilwell, the most general was "that the Army can divert appreciable numbers of its best personnel to these activities without derogation of its other missions and functions."[5] He also recommended the creation of a special assistant for paramilitary and psychological operations in the Office of the Secretary of the Army as well as various means of strengthening the Special Warfare Division of the Office of the Deputy Chief of Staff for Military Operations, the Special Warfare Center, the Military Assistance Advisory Groups around the world, and the Army Special Forces and increasing efforts by the Army to inform Army and other service personnel as well as government officials about the capabilities of the Army with respect to counterinsurgency.[6] General Stilwell also addressed the functions of SORO, noting:

> It is my belief that the SORO program of work, and the priorities attached thereto, are not meshed with the current missions of the Special Warfare Division and Special Forces units; the weight of effort is now in support of psychological operations whereas the reverse should be true. In addition, there is some doubt that SORO, as presently staffed, can shift gears rapidly and effectively. The advantages of SORO's absorption by large research organizations are worth investigation.[7]

Although General Stilwell's study did not involve the conscious use of ORSA methods, it did set in motion a series of studies and analyses that did make use of such methods. One such study was led by General Howze, the commanding general of the U.S. XVIII Airborne Corps in the early 1960s. General Howze is perhaps best known as the chairman of the 1962 Army board that studied airmobility. However, immediately before he took the chair of the more famous Howze Board, General Howze chaired another board that dealt with the Army's capabilities in the field of counterinsurgency. The United States Continental Army Command (CONARC) Special Warfare Board was convened by General Herbert B. Powell, the commanding general, CONARC, in early January 1962 and met at Fort Bragg, North Carolina, on 8 January 1962 and completed its work on 25 January 1962.[8] In the directive establishing the board, General Powell noted: "Continued high governmental interest in special warfare matters dictates that review of all special warfare operations to include counterinsurgency operations be conducted by CONARC."[9]

The CONARC Special Warfare Board was presided over by General Howze and included as members three major generals, four brigadier generals, and two colonels.[10] In his final report General Howze noted:

> [T]he Board has viewed the problem primarily from the DA/CONARC level, at the same time taking cognizance of the essential actions which should be taken at the highest levels of the government to enhance US efforts in the cold war . . . high level guidance furnished through the CG, USCONARC, by the Memorandum, OCS, US Army, dated 15 June 1961, subject: "Army Concept of the Military Aspects of the Cold War," and by the findings of the Stilwell Reports.[11]

General Howze also noted that "a clear charter for special warfare activities is provided by the policy statements included in the address made by the Chief of Staff, US Army, to the Army War College on 8 June 1961," and that the board's recommendations provided "a comprehensive program for increasing Army capabilities in this field."[12] He also noted:

> Until very recently US Army actions in the special warfare field have been entirely within the hot war concept. Doctrine, organization, training and operational planning have been directed towards guerrilla operations, escape and evasion and psychological warfare, and all considerations have been restricted to an overt war or post-war atmosphere. In planning for and implementing military assistance programs, the Army has, of course, considered economic and political factors. However, Army doctrine and in fact national policy have inhibited Army actions in the politico-economic and psychological fields. Army thought has not been specifically directed at the broad preventive field we now call counter insurgency.[13]

In their discussion of the subject, the members of the board focused on the inadequacies of the 2 January 1962 HQDA DCSOPS paper titled "Concept of Employment of U.S. Army Forces in Paramilitary Operations," which emphasized the "revitalization of the Military Assistance Program . . . by obtaining maximum efficiency from indigenous military and paramilitary forces" with Army Special Forces used to train and support indigenous forces.[14] The board found that such a policy set up a system parallel to and conflicting with the normal Military Assistance Advisory Group advisory system and relied entirely on small Special Forces units with minimum support. The board suggested a broader approach involving area-oriented Special Forces units; counterinsurgency training for all Army forces and the designation of a battle group in at least three divisions for special qualification; generous use of helicopters and other aircraft; special orientations for key officers; and the development and procurement of materiel for special warfare.[15]

The CONARC Special Warfare Board reached some thirty-four major conclusions concerning every aspect of the Army's special warfare operations and made nineteen major recommendations.[16] The board's conclusions and recommendations covered the organization, strength, manning, training, missions, and employment of Army Special Forces, including Reserve Special Forces; the Special Warfare School and other special warfare training; psychological operations and intelligence operations related to special warfare; and the need for a Cold War Operations Coordinating Agency to coordinate the special warfare and counterinsurgency activities of all U.S. government agencies.[17] In his cover letter transmitting the board's final report to General Powell, General Howze stated:

> As it proceeded in its deliberations the Board became more and more impressed with the size of the cold war task facing the United States, and was at the same time also impressed by the Army's potential in contributing to the solution of that task. If the Board's recommendations are approved the Army will experience a very considerable reorientation of its outlook and effort, particularly as respects training. I do not however believe that this will react, overall, to the detriment of the Army, but will instead give it a new and larger sense of purpose.[18]

General Powell approved the final report of the CONARC Special Warfare Board, except for those portions relating to counterinsurgency training for Army reserve components and to provision of a special uniform for Army Special Forces, and forwarded it to HQDA, noting:

> The report of the Howze Board provides a significant contribution toward provision of improved responsiveness of the US Army in the counterinsurgency/counterguerrilla, paramilitary fields. Early review and provision of necessary guidance is requested.[19]

The final report of the CONARC Special Warfare Board established the parameters for future development of Army doctrine and organization for counterinsurgency and other special warfare operations and had a direct impact on the organization and employment of Army Special Forces units in Vietnam.

In the mid-1960s, the Army again sought to review and consolidate its doctrine for counterinsurgency. On 23 July 1964, Assistant Chief of Staff for Force Development (ACSFOR) Lt. Gen. Ben Harrell wrote to the commanding general of CDC and requested that CDC prepare a plan for a comprehensive review of Army counterinsurgency doctrine for use in the Army school and training systems.[20] The requested plan was developed by the CDC Special Warfare Group and was approved by the commanding general of CDC

with only minor wording changes on 18 August 1964 and forwarded to HQDA the following day. The plan provided for a systematic survey of existing doctrinal materials, including regulations, manuals, school texts and curricula, and other statements of Army doctrine on counterinsurgency and related topics, such as studies and analyses.

Symposia on Counterinsurgency

From the early 1960s, unconventional warfare and the application of ORSA to counterinsurgency were frequent topics of books and articles in both military and civilian academic journals and of discussion at Army symposia. In March 1962, the Special Operations Research Office hosted a three-day symposium on the role of social science research in Army limited war policy and plans.[21] The symposium, sponsored by the Army's chief of research and development (CRD), was held in Washington, D.C., and was attended by more than 300 people, including high-ranking officers and civilian executives of the Department of Defense and all of the armed services as well as leading government researchers and civilian academics interested in the problems of limited warfare and counterinsurgency. The stated purpose of the symposium was

> (1) To present a clear picture of the Army's limited-war mission, with special emphasis on its counterinsurgency mission.
> (2) To identify the Army's requirements for behavioral and social science research and to stimulate the interest of members of the behavioral and social science community in the Army's research and development programs.
> (3) To promote understanding of the Army's research and development efforts and coordination with the efforts of other government agencies and departments which have similar or overlapping (but no duplicate) interests in counterinsurgency problems.[22]

Secretary of the Army Elvis J. Stahr, Jr., addressed the symposium and laid out the Army's existing policy on limited warfare and counterinsurgency, a policy that emphasized placing increased "*concurrent* emphasis on the forces and techniques necessary to cope with subversion, insurgency, and guerrilla warfare" and the Army's role of assisting indigenous governments in improving their own internal defenses.[23] Col. William H. Kinard, Jr., the director of special warfare, ODCSOPS, also addressed the symposium and summarized the development of Army Special Forces and the post–World War II efforts of the Army to train and prepare for counterinsurgency. Colonel Kinard noted particularly the role of Special Forces in the Military Assistance Program and the policy of placing primary responsibility for internal defense against subversion and insurgency on the indigenous government.[24] Dr. E. K. Karcher, Jr., of the Office of the Chief of Research and Development also surveyed the existing Army agencies responsible for human factors research (the Army Personnel Research Office, HumRRO, SORO, and the Human Engineering and Psychophysiology laboratories) and described the dimensions of a comprehensive military social science research program focused on counterinsurgency and related topics.[25]

Attendees at the SORO symposium concluded that "Much more knowledge needs to be acquired and applied to the counterinsurgency weapon system, and it would be self-defeating to ignore the contributions to that knowledge which the behavioral and social sciences can make," and they went on to note that the contribution of the behavioral and social sciences to the Army's counterinsurgency capabilities could be summarized under three headings:

> (1) The application of *existing knowledge* to military requirements.
> (2) The use of *existing techniques* for acquiring new knowledge required that is not presently available.
> (3) The development of *new techniques* for acquiring new knowledge required not presently available, and for which existing techniques are inadequate.[26]

The third Army Operations Research Symposium, held on 25–27 May 1964, at Rock Island, Illinois, presented a panel on special warfare that included such eminent experts on counterinsurgency operations as Maj. Gen. William P. Yarborough (then commanding general, United States Army Special Warfare School), R. G. K. Thomson (then of the British Embassy in Saigon), Col. Stewart C. Graham, O.B.E., M.C. (then commandant of the Australian Jungle Training Center), Maj. Gen. Henry Templer Alexander, C.B., C.B.E., O.B.E., and D.S.O. (who commanded the 26th Gurkha Brigade during the Malayan Emergency), and

Dr. Hugh M. Cole (then vice president, RAC).[27] The highlights of the third AORS included statements to this effect:

- To conduct effective guerrilla and jungle warfare operations, specialized training is necessary in order to change attitudes toward hardships, effort and danger.
- Counterinsurgency operations should not be thought of as scaled-down versions of major military operations. They are long-term propositions. Specialized training and knowledge are necessary to cope with counterinsurgency problems.
- Propaganda and psychological operations are not supplementary to special warfare but are primary weapons; people and not terrain are the objectives.
- Operations Research techniques can be applied to counterinsurgency problems but they must be sharpened by the incorporation of vital factors from the behavioral sciences.[28]

In his remarks to the attendees at the symposium, Dr. Hugh Cole addressed the factors that served to limit the application of ORSA to the problems of counterinsurgency.[29] He noted that the professional interest of most ORSA practitioners was focused on large-scale, modern armies engaged in conventional and nuclear operations on continental land masses and that inter-service rivalries served to complicate the search for solutions to counterinsurgency problems. Cole also cited what he called "the trend toward 'gimmickry,'" the tendency to focus research efforts on the weapons and equipment used in counterinsurgency operations rather than focusing on the more pertinent, but less tangible, factors of morale, training, and the human factors associated with counterinsurgency. He also cited the lack of quantitative data on counterinsurgency, without which the operations researcher cannot do his analyses, as well as the fact that the newer tools of ORSA, such as linear programming, computer simulations, inventory analysis, and project scheduling, might be less useful than some of the older techniques sharpened and focused on counterinsurgency problems. Dr. Cole ended his remarks with a warning:

> If the U.S. Army does not devote proper attention to and show real interest in the application of operations research in counterinsurgency, we can guarantee, I think, on the basis of past experience, that the Department of Defense and the U.S. Air Force will do work in operations research on those problems in counterinsurgency which are of vital concern to the U.S. Army.[30]

While the participants in the third AORS recognized that ORSA had an important role to play in the Army's approach to counterinsurgency, they also recognized that much remained to be done. As stated in the symposium's "Executive Summary":

> There is very definitely a role for operations research in counterinsurgency problems, even though little has been done in the area to date. Conflicting and competing goals in the conduct of counterinsurgency often preclude a clear statement of goals and objectives, without which the operations researcher cannot attack the problem. Most work in the area of military operations research has pertained to large, conventional, modern armies; operations research in counterinsurgency must be concerned with single weapons, small units, and few casualties. Again, previous work has been of a quantitative nature; to be valuable to counterinsurgency, operations research must broaden it scope and move rapidly into the non-quantitative fields of politics, sociology, and psychology, developing techniques to perform qualitative analysis with data of low quality. Operations research has already proved valuable in counterinsurgency, but the possible contributions of operations research techniques are yet to be properly and fully exploited.[31]

The attention devoted to the application of ORSA to the problems of counterinsurgency remained high throughout the 1960s. In a lengthy presentation at the fourth AORS at Redstone Arsenal in 1965, Seymour J. Deitchman, then special assistant for counterinsurgency in the Office of the Director of Defense Research and Engineering, addressed the need for ORSA as a tool in the Army's counterinsurgency arsenal but noted that "while operations research is turning its attention to the new problem its growth in this area is slow and halting . . . it needs much more dynamic expansion as well as some new directions to which we have given little thought."[32] Deitchman went on to discuss the full range of ways in which ORSA might assist in solving the problems associated with counterinsurgency operations, from the construction of resource allocation, strategic, and tactical models to suggesting means of building economic and sociological strength.[33]

Formal Studies of Counterinsurgency

The interest in special warfare shown by President Kennedy and his advisers, Army boards such as the one headed by General Howze, and the frequent discussion of counterinsurgency at symposia and in the media

prompted the production of numerous formal studies of counterinsurgency and related topics by the Army's contract and in-house ORSA activities. Important work on the subject was done by SORO, RAC, CORG, and other Army ORSA elements throughout the 1960s and early 1970s.

In 1956, the Army established the Special Operations Research Office under contract with American University in Washington, D.C., for the purpose of conducting research in insurgency/counterinsurgency and related activities.[34] As noted in Chapter Six above, the scope of SORO research and publications included political, economic, social, and cultural trends; the causes and nature of insurgency and tactics for combating it; the psychological vulnerabilities of foreign populations and the means of exploiting them; and the problems of providing military assistance to foreign countries.[35] SORO produced about twenty original publications per year as well as periodic bibliographies listing the studies produced under five main headings: general, counterinsurgency, psychological operations, unconventional warfare, and foreign area studies handbooks.[36] Among the many studies produced by SORO was a handbook of counterinsurgency guidelines for area commanders, published as a DA pamphlet.[37]

The Research Analysis Corporation was HQDA's principal ORSA contractor, and throughout the 1960s and early 1970s, the RAC home office in McLean, Virginia, produced a number of studies dealing with counterinsurgency operations in Southeast Asia, as did the RAC field offices in Thailand and South Vietnam. A few of the more general and representative RAC studies on counterinsurgency in Southeast Asia and related topics are listed in Table 8–1.

The Combat Operations Research Group (CORG), operated by Technical Operations, Incorporated, for HQ CDC, was dedicated primarily to ORSA work dealing with combat developments; but it also produced several studies dealing with counterinsurgency. Among those were a seven-volume *Guide to Non-Materiel Resources on Special Warfare and Civil Affairs* (CORG-M-199; April 1965); and Allen K. McIntosh and others, *U.S. Army Socio-Political Education Requirements for Internal Defense and Internal Development Operations* (CORG-M-293; July 1967).

Counterinsurgency War Games

By 1961, war games and simulations were an accepted part of the battery of techniques that ORSA analysts could bring to the search for solutions to the Army's most complex problems. The increased interest in unconventional warfare and nation building prompted by the policies of the Kennedy administration resulted in attempts to apply war-gaming and simulation methods to the "new" problems of counterinsurgency, and Army ORSA contractors and in-house activities produced a number of counterinsurgency war games.[38] RAC, CORG, and the United States Army Strategy and Tactics Analysis Group (STAG) all modified existing games or created new ones to focus on counterinsurgency operations. The DOD Advanced Research Projects Agency (DARPA) also sponsored the preparation of games focused on ground operations in a counterinsurgency environment.[39]

RAC prepared and ran a number of war games ranging in focus from the strategic to the tactical level. RAC's TACSPIEL game, designed to simulate ground combat at company to division level, was modified to incorporate counterinsurgency operations down to squad level and to consider such factors as harassment tactics, small-unit operations, ambushes, and sabotage.[40] TACSPIEL was a "two-sided, free-play, analytic, rigidly assessed, manually-operated" game and took about six hours to play. One of the modifications of TACSPIEL was designed to evaluate an air cavalry squadron supporting an Army of the Republic of Vietnam division in operations against guerrilla forces.[41]

CORG supported the War Games Division of HQ CDC, whose principal game was SYNTAC, a large, manually played, computer-assisted game used to evaluate future Army operational and organizational concepts.[42] SYNTAC was used, for example, to evaluate an airmobile assault division operating in a counterinsurgency role in Southeast Asia, and many of the nineteen submodels were modified to better simulate operations in a counterinsurgency environment.

STAG, located in Bethesda, Maryland, operated under the HQDA DCSOPS as the Army's primary war-gaming facility.[43] Although STAG was mainly concerned with theater-level operations and the testing of new doctrine and tactics, it also considered

Table 8–1—List of Representative RAC Studies on Counterinsurgency

RAC Number	*Title*	*Date*
RAC-R-60	Counterinfiltration Operations in Borneo during Confrontation	Nov 1968
RAC-R-83	A Model US Army Advisory System for Internal Defense and Internal Development, 2 volumes	Dec 1969–Jan 1970
RAC-T-360	A Psychological Warfare Casebook	Mar 1958
RAC-T-416	US Army Counterinsurgency Operations	Nov 1963
RAC-T-435	Case Study of US Counterinsurgency Operations in Laos, 1955–62	Sep 1964
RAC-T-477	US Army Special Forces Operations Under the Civilian Irregular Defense Groups Program in Vietnam, 1961–64	Apr 1966
RAC-TP-105	Southeast Asia Conflict and Operations Research	Jan 1964
RAC-TP-147	Bibliography on Counterinsurgency and Allied Subjects	Mar 1965
RAC-TP-191	Neutralization of Viet Cong Safe Havens: A Preliminary Study	Sep 1965
RAC-TP-201	A Construct of Insurgency-Counterinsurgency in Vietnam	Mar 1966
RAC-TP-232	Cost Analysis of Counterinsurgency Land-Combat Operations: Vietnam, 1957–64; 2 volumes	Aug 1967
RAC-TP-240	Intelligence Requirements in Incipient Insurgency	Dec 1966
RAC-TP-241	Mobilization and Utilization of Minority Groups for Counterinsurgency	Feb 1967
RAC-TP-249	An Annotated Bibliography of Material on the Role of the Armed Forces in National Development	Jan 1967
RAC-TP-274	An Exploratory Analysis of the Reporting, Measuring, and Evaluation of Revolutionary Development in South Vietnam	Nov 1967
RAC-TP-281	Planning Factors for Counterinsurgency Land-Combat Operations Based on RVN Experience, FY 1958–64	Nov 1967
RAC-TP-298	Communist China's Interest, Objectives and Policies in Vietnam	Apr 1968
RAC-TP-309	Measurement of Pacification Progress in Vietnam	Sep 1968

Table 8–1—List of Representative RAC Studies on Counterinsurgency—Continued

RAC Number	*Title*	*Date*
RAC-TP-320	Area Analysis for Counterinsurgent Operations: Selected Southeast Asian Areas	Feb 1968
RAC-TP-341	Prospects for Regional Military Cooperation in Southeast Asia	Jan 1969
RAC-TP-354	US Army Special Forces and Similar Internal Defense Advisory Operations in Mainland Southeast Asia, 1962–67	Jun 1969
RAC-TP-419	A Projection of Probable Communist Tactics (Operational Behavior) for Takeover of Developing Countries, Post-Vietnam Through 1985; 2 volumes	Apr 1970

Source: Research Analysis Corp., *RAC Publications List* (McLean, Va.: Research Analysis Corp., Feb 1972).

operations at lower levels. The STAG models (games) of most interest with respect to counterinsurgency were CENTAUR, GUEVARA, and a battalion-level counterinsurgency game. CENTAUR was STAG's largest and most complex game and provided a computer-supported model of close combat and support operations down to company level.[44] It was used primarily to test operational plans. CENTAUR, and its follow-on model, LEGION, were modified to accommodate some counterinsurgency play. In the mid-1960s, STAG developed GUEVARA, a fully computerized model for the investigation of guerrilla operations.[45] It operated on an event- rather than a time-increment basis and did not model weapons or casualties. GUEVARA included provisions for assessing the loyalty of a population and the effects of provocations such as the capture of towns, ambushes, and roadblocks. STAG also developed a Counterinsurgency Battalion-Level War Game set in the jungles of Southeast Asia designed to evaluate tactics and weapons at the small unit level. The game was entirely manual except for the use of one computer program to generate intelligence reports. It also included some simulation of the use of helicopters in a counterinsurgency environment.

The DOD Advanced Research Projects Agency also sponsored contracts with public ORSA firms for the development of war games and simulations pertinent to Army counterinsurgency operations. One manual, closed, two-sided game, developed by the Simulmatics Corporation of Cambridge, Massachusetts, dealt with insurgent operations and police responses in an urban environment.[46] The game was "basically operational," but the major emphasis was on "attitude, sympathies, and other behavioral factors."[47] The DARPA-AGILE COIN Game was developed under contract by Abt Associates, Inc., of Cambridge, Massachusetts, and addressed the transition in a revolutionary conflict from Mao's "Phase I" (subversion) to "Phase II" (guerrilla warfare).[48] The manually played game was intended as a first step toward a computer simulation and was the only game that addressed the very complex terror phase of an insurgency.

ORSA and Airmobility

The use of helicopters to transport soldiers and supplies and to provide fire support for ground forces was one of the chief characteristics of the war in Vietnam. Airmobility and the use of armed helicopters were not, however, by-products of the Vietnam War; rather, they were the results of the long evolution of Army aviation in the post–World War II era.[49] Lt. Gen. John J. Tolson, a senior Army aviator, began his monograph on airmobility in the Vietnam War by noting:

> On 11 December 1961 the United States aircraft carrier USNS Card docked in downtown Saigon with 82 U.S. Army H–21 helicopters and 400 men. . . . This event had a two-fold significance: it was the first major symbol of United States combat power in Vietnam; and, it was

> the beginning of a new era of airmobility in the United States Army. Just twelve days later these helicopters were committed into the first airmobile combat action in Vietnam, Operation CHOPPER. Approximately 1,000 Vietnamese paratroopers were airlifted into a suspected Viet Cong headquarters complex about ten miles west of the Vietnamese capitol. The paratroopers captured an elusive underground radio transmitter after meeting only slight resistance from a surprised enemy. . . . The events of December 1961 prefaced a decade of unparalleled growth of airmobility.[50]

Indeed, as General Tolson so aptly stated:

> The integration of aircraft into the organic structure of the ground forces is as radical a change as the move from the horse to the truck. . . . Although Vietnam was the first large combat test of airmobility, air assault operations in Southeast Asia would not have been possible without certain key decisions a decade earlier.[51]

Further, those key decisions would not have been possible without the use of ORSA techniques applied to the development of Army aircraft, to the development of Army aviation organization and doctrine, and to the testing and evaluation of airmobile concepts in the late 1950s and early 1960s.

Prelude to the Howze Board

The Army Tactical Mobility Requirements Board, better known as the Howze Board after its president, Lt. Gen. Hamilton H. Howze, rendered its final report in September 1962. The Howze Board report was the culmination of efforts stretching over more than a decade to promote the use of both fixed-wing aircraft and helicopters to enhance the Army's combat power through improved aerial firepower and mobility. The key decisions made as a result of the Howze Board report shaped Army organization and tactical doctrine for the remainder of the twentieth century. Those decisions could not have been made without the use of ORSA techniques, and the Howze Board study of airmobility, together with the resulting program for the testing and evaluation of the airmobile concept, was the largest and most complex application of ORSA techniques to a major Army problem up to that time.

The concept of airmobility and the extensive use of helicopters to transport and support Army troops during the Vietnam War and after had its roots in the development of organic Army aviation in World War II and the Korean War; the technological advances in aircraft, particularly helicopter, design and capabilities achieved in the 1950s; and the innovative thinking of Lt. Gen. James M. Gavin and many other advocates of Army aviation during the late 1950s. The concept also owed its growth and popularity in the early 1960s to Secretary McNamara, who personally promoted the idea of replacing ground transport with aircraft as a means of enhancing Army combat power.[52]

Following the creation of the Army Air Forces as a separate entity in the Marshall reorganization of March 1942, the Army successfully retained some aviation assets within the Army Ground Forces despite the opposition of General Henry H. Arnold, the chief of staff of the new Army Air Forces.[53] For the most part, Army aviation in World War II and the immediate post-war period consisted of a limited number of small, light, fixed-wing aircraft used for artillery spotting and liaison duties. The Army was successful in keeping its limited aviation assets following passage of the National Security Act of 1947, which created the U.S. Air Force as a separate service, and the subsequent debates over service roles and missions that culminated in the Key West agreements and the 1949 National Security Act revisions.

With the Korean War, 1950–1953, came the limited use of helicopters for medical evacuation and troop transport, and Army aviation advocates began to consider seriously the possible use of organic Army aviation for substantial movements of personnel and supplies and the potential of helicopters armed with machine guns and rockets as means of providing fire support to ground combat forces. In 1951, an Army aviation section was established in the Office of the Army G–3, and on 21 August 1952, the Army moved to form twelve helicopter battalions even though it had neither a practical, tested transport helicopter nor an established doctrine for its employment.[54] In 1954, the Army Aviation School was moved from Fort Sill, Oklahoma, to Fort Rucker, Alabama, where together with the Aviation Test Board and the Aviation Combat Developments Agency it became part of the Army Aviation Center under the command of Brig. Gen. Carl I. Hutton.[55] Army aviation subsequently took on the character of both a combat arm and a technical service like the Corps of Engineers or the Signal Corps.[56]

In April 1954, interest in Army aviation and the advantages of airmobility was heightened when General Gavin published an article titled "Cavalry, and I Don't Mean Horses" in the April issue of *Harper's* in which he suggested that aircraft be used for the functions of reconnaissance, screening, and blocking formerly performed by horse or mechanized cavalry elements.[57] In November 1954, the Army promulgated a Comprehensive Four-Year Plan for Army Aviation, and in 1955 Exercise SAGEBRUSH was conducted using helicopters for tactical troop transport, which spurred additional interest in the use of armed helicopters to provide fire support for "air assaults."[58] Testing of armed light aircraft in an antitank role was also carried out at about the same time in exercises ABLE BUSTER and BAKER BUSTER.[59]

In January 1956, General Howze became the G–3 aviation staff officer (and later the director of Army aviation) in HQDA ODCSOPS. In June 1956, General Hutton directed Lt. Col. Jay D. Vanderpool, an unrated combat developments officer assigned to Fort Rucker, to begin experiments in arming helicopters with a variety of weapons.[60] Colonel Vanderpool's experiments soon extended to the development of flying techniques and tactical methods for a "sky cavalry" concept. Working during off-duty hours and weekends, Vanderpool and a small team of officers and enlisted men scrounged materials and weapons from a variety of sources and successfully armed a Bell H–13 helicopter with .50-caliber World War II aircraft machine guns and 80-mm. rockets. General Hutton then set Colonel Vanderpool and his team to develop the aircraft and pilot requirements and draft employment doctrine for a company-size air cavalry organization. Using a 1936 field manual on cavalry tactics, Vanderpool developed a manual for sky cavalry tactics that included such innovations as nap-of-the-earth flying techniques. Subsequently an ad hoc air cavalry troop, initially designated the Aerial Combat Reconnaissance Platoon and later redesignated the 7292d Aerial Combat Reconnaissance Company (Provisional), was formed and ran demonstrations for visitors at Fort Rucker and elsewhere.[61] From 1957, experiments similar to those at Fort Rucker were also conducted at Fort Benning, Georgia, and included the installation of a French SS–10 wire-guided antitank missile on an OH–13 helicopter.[62]

Colonel Vanderpool and the Army's other aviation advocates also had before them the example of the French use of helicopters for troop movement and aerial fire support in the war in Algeria from 1954 to 1962. Reports from Algeria by military attachés and other observers as well as a number of ORSA-type studies of helicopter performance and tactics, some of which were produced by American helicopter manufacturers, served to spur further interest in the United States. Of particular interest were a 1956 French government report on the employment of helicopter-borne units in North Africa and two ORSA studies produced by the Vertol Aircraft Corporation, one on French helicopter operations in Algeria from June 1956 to September 1959 and another specifically on H–21 helicopter operations in Algeria.[63] The French employment of air power in Algeria, and the use of helicopters in particular, were also the subject of later studies by the RAND Corporation, RAC, and the Air University Aerospace Studies Institute.[64]

The Army's growing interest in armed aircraft aroused renewed attempts by the Air Force to stifle any such development. After World War II, the Air Force jealously guarded its turf and consistently sought to restrict the Army to small, unarmed, fixed-wing liaison aircraft and unarmed helicopters. The Air Force focused its attention on strategic nuclear bombardment and air superiority, neglected its unfashionable missions of troop transport and close air support of ground forces, and was generally successful in retarding, if not suppressing, the development of Army aviation in the 1950s, in part because the Eisenhower "New Look" (1953–1956) and "New New Look" (1956–1960) strategies emphasized strategic airpower and nuclear deterrence. In November 1956, Secretary of Defense Charles E. Wilson established formal policies that limited the Army aviation program.[65] The Army was prohibited from owning fixed-wing aircraft of an empty weight greater than 5,000 pounds or helicopters of an empty weight greater than 20,000 pounds. Secretary Wilson also prohibited the Army from establishing its own aviation research facilities by requiring the Army to use existing Air Force and Navy facilities. He also prohibited the development or procurement of new Army aircraft, thereby limiting the Army's ability to take advantage of new technology to improve battlefield mobility.

Despite the opposition of the Air Force and the restrictions on Army aviation imposed by the secretary of defense, the advocates of Army aviation and airmobility made substantial progress in the late 1950s by obtaining exceptions to policy, by off-the-record activities, by taking advantage of the slight shift toward limited war preparations in the service budgets, and by relying on "forces in being" and bringing active units up to full strength.[66] Ironically, between 1956 and 1961 the Army lost two divisions, thirty-eight antiaircraft battalions, and two atomic support commands, but the active Army aircraft inventory actually increased 56 percent from 3,573 to 5,564 aircraft.[67] Nevertheless, Army aviation remained in some disarray because there was no clear, generally accepted Army aviation doctrine; because a variety of aircraft were obsolete or ill-suited to their assigned mission; and because there was no coherent plan for long-range development.

What the Army did have was a small but dedicated group of pro-aviation activists eager to enhance the Army's combat power through greater airmobility and aerial firepower. That group included Lt. Gen. James M. Gavin (Army G–3, 1954–1955; and chief of research and development, 1955–1958); General Paul D. Adams (Army G–3, 1955; and CG, XVIII Airborne Corps, 1955–1957); Lt. Gen. Herbert B. Powell (CG, The Infantry Center, 1956–1958; and later CG, CONARC); Lt. Gen. Hamilton H. Howze (director of Army aviation, 1955–1958; CG, 82d Airborne Division, 1958–1959; and CG, XVIII Airborne Corps, 1961–1963); Brig. Gen. Carl I. Hutton, the commandant of the Aviation School; the Army's senior aviator, Col. Robert R. Williams; and Col. Jay D. Vanderpool.[68] These senior officers, aided by a coterie of lower-ranking Army officers, moved forward the concept of airmobility and aerial fire support during the late 1950s and early 1960s despite strong opposition from the Air Force, DOD restrictions, and general apathy in the Army at large.

The Rogers Board

Given the need to rationalize the Army's aviation requirements and anticipating the election of a new administration with greater interest in limited conventional and unconventional warfare, on 15 January 1960, Army Chief of Staff General Lyman L. Lemnitzer established a board of ten general officers to review the status of Army aviation and to establish "a long-range Army aircraft development program."[69] The Army Aircraft Requirements Review Board was headed by Lt. Gen. Gordon B. Rogers, then the deputy commanding general, CONARC, and included as members Maj. Gens. Robert J. Wood, Hamilton H. Howze, Thomas F. Van Natta, Alva R. Fitch, Richard D. Meyer, and Ernest F. Easterbrook; and Brig. Gens. Lawrence J. Lincoln, William M. Thames, Jr., and Clifton F. von Kann.[70] Col. Robert R. Williams, then the chief of the Airmobility Division in OCRD, was "the guiding genius behind the formation of the Rogers Board" and served as its secretary.[71]

In October 1959, the Army's chief of research and development, Lt. Gen. Arthur G. Trudeau, had directed preparation of an Army Aircraft Development Plan to provide guidance for Army aviation R&D over the next decade. To implement the plan, OCRD devised "three broad development objectives," or "Army Study Requirements," that set forth the Army's need for light observation, manned surveillance, and tactical transport aircraft. These requirements were presented to members of the aircraft industry at Fort Monroe in December 1959, and on 1 February 1960, forty-five companies responded with 119 design concepts for solution of the problems stated by the Army Study Requirements, and the submitted concepts were subsequently evaluated technically by the Office of the Chief of Transportation and operationally by OCRD.

The Rogers Board met at Fort Monroe from 29 February to 6 March 1960, and "reviewed the Army Aircraft Development Plan, discussed roles and missions of Army aviation, projected Army funding, assessed combat surveillance requirements, and detailed procurement plans."[72] The board recommended the development of a new observation helicopter to go into production by FY 1964 as a replacement for the L–19, H–18, and H–23; the development of a new surveillance aircraft by 1970; and further study of requirements for a vertical/short take off and landing aircraft to replace the Chinook helicopter and Caribou transport in the early 1970s. The Rogers Board also recommended the planned replacement of each type of Army aircraft on a ten-year cycle. Taking into account the existing budgetary restraints, the Rogers Board proposed only "modest investment in aircraft development and acquisition," but General Howze was permitted to add

an enclosure to the board's report that advocated "the prompt establishment of an experimental air cavalry unit of regimental size," and the board recommended that DCSOPS and CONARC prepare an in-depth study of the concept of air fighting units with the activation of an experimental unit to test the feasibility of such units.[73]

The recommendations of the Rogers Board were approved by General Lemnitzer on 19 March 1960. As General Tolson has noted:

> The importance of the Rogers Board has been somewhat obscured by the later Howze Board and tests of the 11th Air Assault Division. However, it was a remarkable milestone in Army airmobility. It set forward a chain of actions which had a profound effect on later concepts. . . . The work of the Rogers Board was symptomatic of a renaissance throughout many segments of the Army—in its schools and its fighting units.[74]

General Howze's enclosure to the Rogers Board report, titled "The Requirement for Air Fighting Units," anticipated the famous Howze Board study by two years but contained the essence of what that board would later propose. In it, General Howze stated:

> [A] new course of action, parallel to and of equal importance to the modernization of conventional type ground units, is urgently necessary. The Army should proceed vigorously and at once in the development of fighting units (which may be called air cavalry) whose mode of tactical employment will take maximum advantage of the unique mobility and flexibility of light aircraft—aircraft which will be employed to provide, for the execution of the missions assigned these units, not only mobility for the relatively few riflemen and machine gunners, but also direct fire support, artillery and missile fire adjustment, command, communications, security, reconnaissance, and supply.[75]

General Howze's vision would soon be realized, in large part due to his leadership. In fact, two years before the Army board that bears his name convened, steps were taken toward the creation of the type of airmobile unit he espoused. In 1960, Lt. Col. Russell P. Bonasso, the aviation officer of the 101st Airborne Division, recommended to his division commander, Maj. Gen. William C. Westmoreland, the consolidation of division aviation assets under centralized control, and after a lengthy discussion General Westmoreland approved the formation of the 101st Combat Aviation Battalion (Provisional).[76] Its predecessors, such as the 7292d Aerial Combat Reconnaissance Company (Provisional), were ad hoc provisional experimental organizations, but the 101st Aviation Battalion was the first of what would become standard Army aviation units.

Army aviation advocates expended an enormous amount of effort during the 1950s to arrive at the point where they stood in 1960. Although possessed of great vision and a high level of technical skill, they could not have made the effective choices they did make without the use of ORSA methods, even in their more primitive forms. To a greater or lesser degree, all the development decisions and testing of Army aircraft and aviation organization and doctrine in the 1950s had benefited from some use of such methods, but the continued development of Army aircraft and the development and testing of airmobile organization and tactics that followed in the 1960s would use them wholesale.

Genesis of the Howze Board

As General Lemnitzer had foreseen, the election of 1960 placed in office a new president and with him a new approach to U.S. military strategy. President John F. Kennedy took office in January 1961 and almost immediately the president and his new secretary of defense, Robert S. McNamara, began to reshape the U.S. armed forces and their basic strategic doctrine. The heavy reliance on nuclear deterrence embodied in the Eisenhower doctrine of "massive retaliation" was discarded in favor of what came to be called the doctrine of "flexible response," a military strategy that emphasized the need to perform successfully all along the spectrum of conflict, from general nuclear war to counterinsurgency. The active threat of Communist subversion and insurgency in the so-called Third World focused attention on the limited war end of the spectrum of conflict and placed a premium on such military virtues as mobility, flexibility, speed, and conventional firepower. The Kennedy strategy of flexible response, or "graduated deterrence," implied an enhanced role for Army aviation as a means of mobility for forward-area forces in either conventional or nuclear operations or in unconventional warfare, and there was consensus that the Army's aircraft inventory needed to be increased and modernized to meet the

new requirements.[77] Consequently, the Army's stock rose, and the emerging Army capabilities in both counterinsurgency operations and airmobility came to be highly valued and prospered accordingly.

Secretary McNamara, preoccupied with the concepts of systematic analysis and cost-effectiveness, was quick to recognize the advantages to be gained by replacing relatively limited means of ground mobility with the speed and flexibility offered by fixed-wing aircraft and helicopters.[78] The Berlin crisis in August 1961 and the military buildup in Europe that ensued, as well as the ongoing reorganization of Army divisions, the growing interest in counterinsurgency operations, and new requirements for Army aircraft to support military assistance programs worldwide that exhausted the Army's inventory of aviation units in the United States and outpaced current aircraft procurement levels, brought to Secretary McNamara's attention the need for additional and more efficient means of moving personnel and materiel over long distances as well as on the battlefield.[79]

In late September 1961, Secretary McNamara faced decisions regarding the procurement of Army aircraft and the number of Army aviation companies. On 4 October he met with General Clyde D. Eddleman, the Army's vice chief of staff; Brig. Gen. Clifton von Kann, the director of Army aviation; and Maj. James J. Brockmyer, the Army aviation action officer, to discuss the matter and concluded that perhaps the early procurement of large numbers of the new Bell helicopter then under development would be in the national interest.[80] The following day, he asked Secretary of the Army Elvis J. Stahr, Jr., to conduct a study of Army aviation requirements and to comment on Army aviation requirements by mid-November. Meanwhile, General von Kann began his own study of the Army aviation program and the Army's aircraft requirements through 1970. General von Kann's study became the Army response to Secretary McNamara's request.[81]

The analysts in OSD studied the Army response during January and February 1962 and concluded that it left much to be desired. They particularly criticized the Army's approach as being far too cautious, noting that while the Army apparently recognized the benefits of organic aviation, "the numbers of aircraft requested seemed unduly modest."[82] DOD Comptroller Charles J. Hitch noted: "Although aviation offers the only feasible solution to the Army's problems of mobility in the battle area, the Army is reluctant to adopt it wholeheartedly as a substitute for conventional transportation methods."[83]

Prompted by Army aviation advocates on his staff, on 19 April 1962, Secretary McNamara sent two memorandums to Secretary Stahr.[84] Both memorandums were couched in peremptory language and were very critical of the Army's initial response to McNamara's inquiries regarding Army aviation. In the first and more formal of the two memorandums, Secretary McNamara expressed his concern that the Army's proposed aircraft procurement program fell "considerably short of providing, in the near future, modern aircraft to fill the stated requirements" and did not provide "a clear picture regarding either the optimum mix of aircraft types or the absolute total numbers that will be required."[85] He went on to demand that by 1 September 1962, the Army should

> completely re-examine its quantitative and qualitative requirements for aviation. This re-examination should consist of an extensive program of analyses, exercises and field tests to evaluate revolutionary new concepts of tactical mobility and to recommend action to give the Army the maximum attainable mobility in the combat area.[86]

Secretary McNamara also demanded that the results of the Army's new study should be presented in terms of "cost-effectiveness and transport-effectiveness" and should involve "the use of operations analysis in planning, observing, recording data, and analyzing the results for the field test program. . . ."[87]

The second memorandum addressed to Secretary of the Army Stahr was more personal but no less critical and demanding in tone.[88] In it, Secretary McNamara began by stating:

> I do not believe the Army has fully explored the opportunities offered by aeronautical technology for making a revolutionary break with traditional surface mobility means. Air vehicles operating close to, but above, the ground appear to me to offer the possibility of a quantum increase in effectiveness. I think that every possibility in this area should be exploited.[89]

As for the reexamination of Army aviation requirements directed by his other 19 June 1962 memorandum, Secretary McNamara noted that it

should be "a bold, 'new look' at land warfare mobility," conducted "in an atmosphere divorced from traditional viewpoints and past policies," and any "bold, new ideas" surfaced by the reexamination, he wrote, should also "be protected from veto or dilution by conservative staff review."[90] Leaving nothing to chance, Secretary McNamara went so far as to name a number of individuals who he felt should participate in the study, including Lt. Gen. Hamilton H. Howze; Brig. Gens. Delk M. Oden, Walter B. Richardson, and Robert R. Williams; Cols. John Norton and Alexander J. Rankin; Frank A. Parker, Jr., the president of RAC; Dr. Edwin W. Paxson of the RAND Corporation; and Edward H. Heinemann, a well-known aviation consultant. And to reinforce his view of the importance of a comprehensive, new examination of Army aviation, Secretary McNamara concluded his memorandum:

> I shall be disappointed if the Army's reexamination merely produces logistically oriented recommendations to procure more of the same, rather than a plan for employment of fresh and perhaps unorthodox concepts which will give us a significant increase in mobility.[91]

Despite some continued reticence in the Army leadership, Secretary McNamara was soon to get what he wanted.[92] As General Tolson would later proclaim:

> This benchmark in airmobility history resulted from the fortunate confluence of several trends: first, the personal dissatisfaction of the Secretary of Defense with the Army's failure to exploit the potential capabilities of airmobility; secondly, an undeniable attitude of many office of the Secretary of Defense civilian analysts who looked upon the service staffs and most officers as reluctantly being dragged into the twentieth century; third, there was a nucleus of Army aviation oriented officers both in the office of the Secretary of Defense staff and Army Staff who recognized the possibility of capitalizing on Mr. McNamara's attitude to sweep aside ultraconservative resistance within the Army itself. Finally, there was an opportunity to present to the Secretary of Defense for his signature directives that would cause the Army to appoint an evaluation by individuals known for their farsightedness and to submit recommendations directly to the Secretary of Defense in order to avoid intermediate filtering.[93]

Secretary of the Army Stahr reacted quickly to the two McNamara memorandums. On 28 April 1962 he directed General Herbert B. Powell, CG CONARC, to establish a board that would conduct the reexamination of Army mobility requirements demanded by Secretary McNamara.[94] The board was charged to conduct "a comprehensive study of aviation requirements for Army forces during the period 1963–1975 and develop a recommended program taking maximum advantage of aviation technology to meet these requirements."[95] Secretary Stahr's instructions echoed the two 19 April McNamara memorandums and prescribed that the study and recommended program: (1) be based on "careful analysis and war games, and to the extent feasible on the results of fields tests and exercises"; (2) "examine and exploit new approaches and concepts"; and (3) "not be restricted by current limitations on characteristics of organic Army aircraft."[96] Secretary Stahr directed that the board provide by 10 May 1962 an outline plan of how it intended to perform its tasks with a final report rendered by 24 August 1962.[97] He also instructed other Army agencies to provided support and assistance to CONARC and the board as required.

On 3 May 1962, General Powell appointed Lt. Gen. Hamilton H. Howze, CG, XVIII Airborne Corps, at Fort Bragg, North Carolina, as president of the Army Tactical Mobility Requirements Board and provided him with the authority to organize the work of the board as he saw fit and to task Army units and agencies for test units and support as required.[98] The other members of the board, some of whom had been "nominated" by Secretary McNamara, included Edward H. Heinemann (aviation consultant, Los Angeles, California); Frank A. Parker, Jr. (president, RAC, Bethesda, Maryland); Dr. Edwin W. Paxson (RAND Corporation, Santa Monica, California); Eugene Vidal (U.S. Army Scientific Advisory Panel, Washington, D.C.); Fred W. Wolcott (Aeronutronics Division, Ford Motor Company, Newport Beach, California); Maj. Gen. Norman H. Vissering (CG, U.S. Army Transportation Training Center, Fort Eustis, Virginia); Maj. Gen. Ben Harrell (CG, U.S. Army Infantry Center, Fort Benning, Georgia); Maj. Gen. Clifton F. von Kann (ACS J–3, HQ U.S. Strike Command, MacDill AFB, Florida); Maj. Gen. William B. Rosson (special assistant to the chief of staff for special warfare, Washington, D.C.); Brig. Gen. John J. Lane (ODCSLOG, HQDA, Washington, D.C.); Brig. Gen. Beverley E. Powell (CG, XVIII Airborne Corps Artillery, Fort Bragg, North Carolina); Brig. Gen. Edward L. Rowny (HQ, 82d Airborne Division, Fort

Bragg, North Carolina); Brig. Gen. Frederic W. Boye, Jr. (assistant commandant, U.S. Army Armor School, Fort Knox, Kentucky); Brig. Gen. Delk M. Oden (director of Army aviation, HQDA, Washington, D.C.); Brig. Gen. Ben Sternberg (ODCSPER, HQDA, Washington, D.C.); Brig. Gen. Robert R. Williams (CG, U.S. Army Aviation Center, Fort Rucker, Alabama); and Brig. Gen. William E. Lynn, Jr. (HQ, 4th Infantry Division, Fort Lewis, Washington).[99]

The five civilians and twelve general officers led by General Howze constituted the board's Steering and Review Committee. In addition, an advisory panel was created consisting of Lt. Gen. Arthur G. Trudeau (USA Ret.), then the president of the Gulf Research and Development Company of Pittsburgh, Pennsylvania, and Dr. Jacob A. Stockfisch, then in the Office of the Assistant Secretary of Defense (Comptroller).[100] The routine administration of the board was entrusted to a twenty-nine-member secretariat headed by Col. John Norton (HQ CONARC, Fort Monroe, Virginia), who was named as executive to the president of the board.[101] Colonel Norton was assisted by Col. George W. Putnam, Jr. (ODCSOPS, HQDA, Washington, D.C.), Col. George S. Beatty, Jr. (U.S. Army Aviation Center, Fort Rucker, Alabama), Col. Alexander J. Rankin (U.S. Army Aviation Board, Fort Rucker, Alabama), and Col. Franklin M. Davis, Jr. (U.S. Army War College, Carlisle Barracks, Pennsylvania).[102] In all, the official membership of the Howze Board, except for personnel assigned to the troop test units, operations research and war-gaming activities, and others providing indirect support, consisted of some 199 officers, forty-one enlisted men, and fifty-three civilians.[103] Another ninety civilians and some 3,200 military personnel were involved for varying periods in the troop test, experimentation, and war-gaming efforts.[104]

Organization of the Howze Board

Given the interest of Secretary McNamara and Secretary of the Army Stahr, the Howze Board enjoyed almost unlimited resources and authority to task units throughout the Army and other DOD agencies as well.[105] The only resource in short supply was time. As General Howze later noted, in order to submit his report to HQ CONARC by 20 August he had to assemble the required people and equipment and organize the effort in May and conduct the study and required field tests, exercises, and war games in June and July.[106] Told by HQDA that the report should "fit into a standard Army footlocker" and that 300 copies were required, General Howze and his executive officer, Colonel Norton, calculated that in order to meet the 20 August deadline, the board's report would have to be finished by 1 August in order to allow sufficient time for it to be printed.[107] He thus had less than one hundred days to complete the task.

To organize the work of the board, General Howze initially established seven working committees, as shown in Table 8–2. On 22 June 1962, the seven committees were reorganized into eight working groups, as shown in Table 8–3.

Each of the working committees/groups was headed by a general officer except for the smallest, the five-man Operations Research Working Committee/Group, which was headed by Frank A. Parker, Jr., the president of RAC.[108] The largest of the working committees/groups was the sixty-nine-person Field Test Committee/Group headed by Brig. Gen. Edward L. Rowny.[109]

Methodology of the Howze Board

The principal question facing the board, as stated in its final report, was "To what extent may aircraft properly be substituted for ground vehicles to provide combat and logistical mobility for the Army? Corollary to the basic question are the advantages and penalties incurred by the substitution."[110] The efforts of the board to understand the problem and devise viable recommendations were varied and wide-ranging. As General Howze stated in the board's final report, "The most significant activity of the Board was the investigation, test, and evaluation of operational concepts of airmobility. Solutions were expressed in terms of organization, procedures, and the application of weaponry and aircraft."[111] The centerpiece of the board's efforts was the Force Effectiveness Study, the objective of which was "to assemble the evidence developed by the Board and relate it to principal combat and combat support functions and units for assessment of comparative unit effectiveness."[112] Three sets of comparisons were made: (1) an Air Assault Division versus a ROAD (Reorganization Objective Army Division) Infantry/Mechanized

Table 8–2—Howze Board Working Committees, 5 May–21 June 1962

Committee	*Functional Area*	*Location*
I	Recon, Security, and Target Acquisition	Fort Bragg, N.C.
II	Tactical Mobility	Fort Benning, Ga.
III	Fire Power	Fort Sill, Okla.
IV	Logistics Operations and Support	Fort Eustis, Va.
V	Operations Research	Washington, D.C.
VI	Field Tests	Fort Bragg, N.C.
VII	Programs, Policy, and Budget	Washington, D.C.

Source: Howze Board Final Report, an. A, p. 17.

Table 8–3—Howze Board Working Groups, 22 June–31 July 1962

Group	*Functional Area*	*Location*
A	Counterinsurgency	Fort Bragg, N.C.
B	Combat Forces	Fort Bragg, N.C.
C	Logistic Forces	Fort Eustis, Va.
D	Long Range	Fort Rucker, Ala.
E	Strategic Area	Washington, D.C.
F	Operations Research	Washington, D.C.
G	Field Tests	Fort Bragg, N.C.
H	Programs, Policy, and Budget	Fort Bragg, N.C.

Source: Howze Board Final Report, an. A, p. 32.

Division; (2) an Air Cavalry Combat Brigade versus an Army Cavalry Group; and (3) an air line of communication versus a ground line of communication (from strategic unloading point to division level). Each set of comparisons was then run against three conflict scenarios set in the FY 1964–FY 1968 time frame: (1) against guerrillas; (2) against an unsophisticated but conventionally organized force (for example, Communist China in Southeast Asia); and (3) against a sophisticated enemy (for example, the Soviet Union in Europe).

The resources of personnel and equipment dedicated to the work of the Howze Board were substantial. The board's activities involved the use of troops from three battle groups of the 82d Airborne Division and some twenty-five fixed-wing aircraft and 125 helicopters, most of which were provided by the 6th Aviation Group (Provisional), which put in more than 11,000 flying hours, mostly at low altitude, over a period of eleven weeks.[113] The U.S. Air Force also participated and provided support by sixteen C–130s for seven days.[114]

Under the direction of Brig. Gen. Edward L. Rowny, the chief of the Field Test Committee/Group, the Howze Board conducted three major exercises: the employment of an airmobile task force in the Georgia swamps to simulate operations in Indochina; a counterguerrilla exercise in the mountains and dense forests of western Virginia; and a reenactment in the Fort Bragg, North Carolina, area of Lt. Gen. Walton H. Walker's defense of the Pusan Perimeter in Korea in 1950 but

with the addition of airmobile units.[115] The major exercises were preceded by some sixteen small unit field tests conducted in May 1962, and some thirty "side tests" of new weapons and equipment took place concurrently with the major exercises.[116] General Rowny's assessment of the tests was that they "proved beyond a doubt that the use of helicopters in counterinsurgency was here to stay."[117] General Howze was less sanguine and later described these tests as "tactical experimentation" and not real tests in a scientific sense but "rather a series of trials to see what would work and what would not."[118] General Howze was also the first to admit that there was too much activity in too little time, noting, "It would have been better to proceed sequentially, but there was not time for this."[119]

Concurrent with the tests and exercises, the board conducted extensive operations research and war-gaming to evaluate and validate the various test efforts. The OR and war-gaming efforts were supported by a variety of ORSA contract organizations, including RAC, CORG, SRI, and the RAND Corporation.[120] As noted in the board's final report, seven scientists from RAC, CORG, SRI, and RAND "observed the tests on a daily basis and combined their judgments with those of the officers who developed the tests and also observed them."[121] RAC and CORG also did studies and analyses in support of the board and carried out the war-gaming effort, while RAND and SRI provided analysts for consultation and evaluation of the work of the various board committees/groups.[122] General Howze judged these efforts as "most beneficial."[123]

RAC and CORG were heavily involved in war-gaming in support of the board's efforts, the principal scenario of which was the use of airmobile forces to oppose a Soviet invasion of Iran through the Zagros Mountains.[124] The objective of the Howze Board war-gaming efforts, conducted under the general supervision of RAC, was the following:

> to provide measurable responses to various questions posed by the airmobility concept, particularly those pertaining to the combat effectiveness of airmobile organizations (as compared to their surface transported counterparts) and to optimum over-all organization within the airmobile resources likely to be available.[125]

The war games played involved varying mixes of airmobile and ground formations of reinforced company size and smaller; battalion- and brigade-size units with normal reinforcements; divisions; and theater-level elements, to include combat forces, theater support organizations, and appropriate segments of the inter-theater lines of communications. As noted in the board's final report:

> The final effort was an analysis of four areas studies based on the situations developed and employed to examine the general purpose forces requirement by another Army study group (Conventional War Forces 1967, ODCSOPS). Here the group used analytical techniques rather than gaming; these permitted rapid evaluation of large force engagements throughout the theater.[126]

This work was done primarily by RAC, and General Howze's assessment was the following:

> To me, the work done by RAC in analyzing—not war-gaming—the possibilities and problems to be encountered in the quick positioning of airmobile formations, under logically assumed situations, in four different world hot spots was most illuminating; this alone was enough to make one believe in their applicability and effectiveness.[127]

To supplement the studies, analyses, war games, tests, exercises, and evaluations that comprised the core of its efforts, the Howze Board also sent out some 400 letters to senior officers and more than 300 letters to commercial firms in the aircraft industry soliciting their comments and suggestions.[128] The responses ranged from outright opposition to the concept of airmobility to wholehearted support of the board's efforts to demonstrate the viability of the concept and increase the Army's mobility and combat power through the use of air transport and armed helicopters. Some sixty of the response letters are preserved in the George W. Putnam, Jr., Papers at the U.S. Army Military History Institute and provide a unique view of the state of thinking about airmobility on the part of the Army's senior leaders on the eve of the Vietnam War.[129]

Conclusions and Recommendations of the Howze Board

Having worked at a feverish pitch for nearly four months, the Army Tactical Mobility Requirements Board rendered its final report to the secretary of the Army through CG CONARC and the chief of staff

of the Army, as scheduled on 20 August 1962.[130] In his cover letter forwarding the board's report, General Howze stated:

> The Board and its subordinate committees have investigated all essential aspects of the very complex matter which is Army aviation. . . . I must acknowledge that the job is not in all respects complete, and that further study, test and war gaming are much to be desired and therefore recommended. . . . The foregoing does not indicate that I consider the Board's findings invalidated or its judgment faulty; the time made available although not sufficient to prove all details of the Board's recommendations as respects organization, personnel, equipment, maintenance and doctrine, was quite sufficient to enable it, with conviction, to chart a course of action which will serve to increase markedly the combat and logistical efficiency of the Army.[131]

As stated in its final report, the board had

> only a single, general conclusion: adoption by the Army of the airmobile concept—however imperfectly it may be described and justified in this report—is necessary and desirable. In some respects the transition [from ground to air mobility] is inevitable, just as was that from animal mobility to motor.[132]

Of course, the recommendations of the board flowing from its single, general conclusion were more numerous and complex. Having considered five alternative programs, the board recommended alternative 3 as being the "most responsive to the requirements for increased combat effectiveness."[133] Alternative 3 envisioned the creation within six years of five Air Assault Divisions (AADs), three Air Cavalry Combat Brigades (ACCBs), and five Air Transport Brigades (ATBs), and it also included proposals for increasing the mobility and the logistical support effectiveness of the eleven Reorganization Objective Army Divisions and other Army combat units.[134] There was no indication that the proposed Air Assault Divisions were specifically designed for deployment to Vietnam; it was proposed that they be stationed in Korea (one), Hawaii (one), and the continental United States (three).[135] To implement the program outlined as alternative 3, the board proposed to increase the number of Army aviation units to thirty-seven, the number of Army fixed-wing aircraft to 1,521, and the number of Army helicopters to 10,747.[136] The detailed program for development of a new generation of aircraft, weapons, electronics, and other items to be available by 1975 required an increase in RDTE funding from $823 million in 1963 to $1.505 billion in 1968 and a total obligation authority over five years of some $4,225,200,000.[137] Alternative 3 was also estimated to require an increase in the number of qualified Army aviators from 8,900 in 1963 to some 20,600 in 1968, about half of whom were to be warrant officers.[138]

The centerpiece of the Howze Board recommendations was the creation of five Air Assault Divisions, three Air Cavalry Combat Brigades, and five Air Transport Brigades. Each of the proposed AADs would have thirty fixed-wing aircraft, 429 helicopters, and 15,029 personnel.[139] The AAD's artillery would be restricted to air-transportable 105-mm. howitzers and "Little John" rockets but would be augmented by armed fixed-wing Mohawk aircraft and armed helicopters; and the large number of aircraft (459 versus 100 in the standard ROAD) would provide the capability of lifting one-third of the division in a single lift.[140] The proposed ACCBs were designed to perform an antitank role as well as classic cavalry functions (reconnaissance, screening, and delaying). Each ACCB would have 316 helicopters and 2,562 personnel.[141] The function of the five proposed ATBs was to deliver supplies from airfields serviced by the Air Force to forward airfields in the division and brigade areas, and one such brigade could provide limited logistics support for an AAD over a distance of 175 miles.[142] Each of the ATBs was to have eighty-one fixed-wing aircraft, fifty-three helicopters, and 3,764 personnel.[143]

In the board's final report, General Howze called for "the creation of a strong management system for creation of the new capability by addition of staff positions to the present staff structure"; the development of detailed airmobile doctrine by CDC in coordination with the other major commands; an increase in the Army's authorization for commissioned and warrant officer aviators; and a major revision of the concepts and procedures for aircraft maintenance.[144] He also called for four additional follow-on actions related to Army aircraft and airmobile doctrine: additional experimentation and testing; additional research and development; continued product improvement; and an annual review of the Army's aviation requirements.[145] General Howze also cited the benefits to be derived from approval of the board's recommendations:

> All these [benefits] may be lumped under a single heading—the combat effectiveness of the Army. . . . The Alternative 3 Army will have an unusual flexibility of response to any of the likely demands for the application of land combat power, and a much improved effectiveness in execution. . . . There are also corollary benefits, of which one only is worth mentioning here: the incorporation of the concept of modern tactical mobility into the Army will have an enormously vitalizing effect on its whole structure, and this in turn cannot fail to strengthen our national reaction to whatever challenges the future may hold.[146]

The CONARC commander, General Herbert B. Powell, forwarded the Howze Board report to the Army chief of staff on the same day he received it, 20 August 1962, noting his full support of the airmobile concept as developed by the board as well as of "the increased use of Warrant Officers and a broader recruitment program to attract capable young men into Army aviation."[147] However, General Powell also recommended that the Army convert only four, not five, divisions to the new air assault configuration and suggested that the cost estimates provided by the board were perhaps too low, that costs to implement the program would be about $7 billion rather than $4.2 billion over the five-year development period.[148] He also declined to recommend, as did the Howze Board, the cancellation of the GOER tactical vehicle program or the new Main Battle Tank program, both of which he stated merited further review.[149] He concluded his endorsement by suggesting that a further review of Air Force requirements related to support of the Army be conducted.[150]

The outgoing Army chief of staff, General George H. Decker, refused to allow the Army Staff to water down the recommendations of the Howze Board and recommended to Secretary of the Army Cyrus R. Vance that he forward the report to Secretary of Defense McNamara unchanged.[151] But rather than immediately approving and directing implementation of the Howze Board recommendations, Secretary of Defense McNamara passed the report on to the analysts in the OSD Comptroller's Office for review.[152] The OSD systems analysts conducted a thorough review and concluded:

> [the] Board's efforts are incomplete . . . [the Board was] asked to do too much in too short a time . . . [the Final Report] clearly indicates that there is by no means a solid foundation for endorsement of the force structure and procurement decisions recommended by the Final Report and loosely endorsed by the Department of the Army. . . . Most of these issues are amenable and tractable to further analysis, wargaming, testing, and evaluation. The Board's efforts—and to a lesser degree those of the Air Force—satisfies us that it is worth additional effort and expense to determine how to place more emphasis on aviation in order to enhance the Army's effectiveness.[153]

The OSD critique was organized around issues in four main categories: (1) technical-equipment, (2) force structure and effectiveness, (3) roles and missions, and (4) further testing and evaluation. However, the focus of the critique was on equipment and procurement issues. As the OSD analysts stated:

> We focus on equipment issues first because some of them are difficult to ignore and because some immediate procurement decisions are involved. We are particularly concerned about the LOH helicopter, and the Mohawk and Caribou aircraft. The last two items, especially, are costly; they are also the focal point of roles and missions problems.[154]

In their critique, the OSD analysts emphasized the need for additional testing and evaluation of the airmobile concept and of the proposed organizations, particularly the Air Assault Division. They stressed the need to include the Air Force in any further testing and evaluation as well as the need for further war-gaming that would take into account "the level and timing of Air Force support necessary to support and complement Air Assault Division capability."[155] They also noted: "The cycle of activation, training test and evaluation will probably require 18 months, so that the latter half of 1964 is the earliest date a final decision on future force structures could be made. Even to achieve this will require the Army to move promptly."[156]

Reaction to the Howze Board Report

Reaction to the Howze Board final report within the Army was mixed. While the advocates of Army aviation were elated and supported the conclusions and recommendations of the board wholeheartedly, there were also a number of senior officers who were less enthusiastic about the prospect of reducing funding for ground combat systems in order to finance the proposed

Air Assault Divisions, Air Cavalry Combat Brigades, and Air Transport Brigades. Army Vice Chief of Staff General Barksdale Hamlett, for example, was skeptical and recommended that the airmobile concept should first be tried out with only one division.[157] As Lt. Gen. Edward L. Rowny later recalled, the Howze Board proposal to form new airmobile forces and substantially increase the number of Army aircraft was "an unpopular idea in the Pentagon because the people around the chief of staff of the Army were, for the most part, armor officers. They felt that every helicopter introduced into the Army would mean one less tank. As a result, they opposed the concept."[158]

As was to be expected, the Air Force reacted quickly and in a most negative way to the recommendations of the Howze Board. The Air Force had sent a brigadier general to monitor the Howze Board proceedings, but although he had observed the tests and exercises, he had generally been excluded from the Steering Committee and working committee/group deliberations because, as General Howze himself later stated, "…in some sensitive areas, frank debate would not have been possible in his presence. And, certainly what he reported would have alarmed the Air Force and that admirable establishment really needed no additional agitation."[159]

Although it was carefully stated in the Howze Board final report that "The Army airmobility program as recommended by the Board does not lessen in any way the importance or the magnitude of Army requirements for support by the Air Force," General John P. McConnell, the Air Force chief of staff, quickly appointed his own board to provide a counter to the Army's proposals.[160] The Air Force board, headed by Lt. Gen. Gabriel P. Disosway, the vice commander of the Tactical Air Command, rendered a four-volume report that strongly criticized the Howze Board recommendations on both technical and doctrinal grounds as impractical and contrary to the assigned roles and missions of the services.[161] The real sticking points were the Army's advocacy of the armed Mohawk reconnaissance/attack aircraft and the Caribou STOL transport.[162] The former appeared to usurp the Air Force's assigned mission of providing close air support to ground forces and the latter impinged on the Air Force's assigned air transport mission.[163] Although in reality the Air Force was wont to neglect its close air support and air transport missions in favor of strategic bombardment and air superiority missions, the Air Force nevertheless was unwilling to surrender any part of those missions to the Army and thus vigorously objected to the Howze Board recommendations. On the whole, the conclusions and recommendations of the Disosway report were "moderate and well-conceived," although the board of senior Air Force officers could not resist the temptation to append a request for four additional fighter-bomber squadrons, supposedly to provide additional close air support for the Army.[164]

Testing and Evaluating the Airmobile Concept

Nothing much was done toward implementing the Howze Board recommendations until early October 1962, when Army aviation advocates Col. Robert R. Williams and Brig. Gen. Clifton von Kann spoke to the new Army chief of staff, General Earle G. Wheeler, at the annual meeting of the Association of the United States Army.[165] General Wheeler subsequently called General Howze, Colonel Norton, and Maj. James Brockmyer to Washington and set them to work in his office preparing rebuttals to the many criticisms of the Howze Board report and preparing for implementation of the report's recommendations.[166] In mid-October, General Howze had to return to his command at Fort Bragg to deal with the Cuban missile crisis. He was replaced by Colonel Williams, and what had been expected to be a ten-day task in fact lasted three months.[167]

In early November 1962, the CG CDC issued instructions to his subordinate agencies to begin the preparation of Special Texts, TOEs, and other materials to support the implementation of the Howze Board recommendations.[168] However, as General Tolson later wrote:

> Throughout the fall of 1962 it appeared, at times, that the work of the Howze Board was going to be studied to death and finally filed away for historians. The fact that it survived attacks by members of Congress, the Air Force, and conservative elements within the Army was a tribute both to the soundness of its basic conclusions and to the dedicated officers within the Army who believed that airmobility was the wave of the future.[169]

While the Howze Board final report was being reviewed, critiqued, and defended, some Army aviation leaders, such as General Howze himself, pushed for

the immediate conversion of one division (usually the 82d Airborne Division) to the proposed air assault configuration.[170] However, the idea of forming a test Air Assault Division and conducting additional tests and evaluations of the airmobile concept and its associated equipment, organization, and doctrine grew. Heeding the advice of his systems analysts, Secretary of Defense McNamara chose to continue the testing of the air assault concept and approved an increase of 15,000 men in Army troop strength for FY 1964 (from 960,000 to 975,000) in order to form a provisional AAD and a provisional ATB to carry out the additional testing and evaluation.[171]

In anticipation of a requirement to support the testing and evaluation of the airmobile concept pursuant to the final report of the Howze Board, in December 1962 Maj. Gen. Ben Harrell, the commanding general of the U.S. Army Infantry Center (USAIC) at Fort Benning, Georgia, appointed Col. Hubert E. Strange as a special project officer for coordinating what was to be called Project TEAM (Test and Evaluation of Air Mobility).[172] The requirement for testing the Air Assault Division concept became firm on 7 January 1963, when the HQDA DCSOPS issued the initial plans for the formation, training, and testing of one AAD and one ATB.[173]

On 15 February 1963, HQ CDC activated the 11th Air Assault Division (Test) and the 10th Air Transport Brigade (Test) at Fort Benning and attached them to USAIC.[174] Maj. Gen. H. W. O. Kinnard, himself an Army aviator, was chosen to command the test division, and Col. Delbert L. Bristol was chosen to command the test air transport brigade, and the two test units were provided with an initial cadre of 191 officers, 187 warrant officers, and 3,114 enlisted men.[175] An initial complement of twenty-nine fixed-wing aircraft and 125 helicopters was also provided.[176] The men and equipment needed to form the 11th AAD and 10th ATB were obtained by stripping the 101st Airborne Division and other Army units, and helicopter production was increased.

The Test, Evaluation, and Control Group

The 7 January 1963 HQDA DCSOPS letter also named Maj. Gen. Ben Harrell, the CG USAIC, as test director and established the Army Air Mobile Test Unit (AMTU) at Fort Benning to plan and conduct the test and evaluation program.[177] The AMTU was soon redesignated as the Training, Evaluation, and Control Group (TEC Group) and was given the mission of ensuring "such on-the-spot coordination of organization, equipping, training and testing as necessary to permit the evaluation & refinement of operational doctrine and organizational structure of the 11th Air Assault Division and the 10th Air Transport Brigade."[178]

During January and February 1963, Colonel Strange and his small cadre assisted in formation of the two test organizations, thereby delaying somewhat the TEC Group's own organization and preparation of plans for the forthcoming tests.[179] Eventually, the TEC Group settled into the Harmony Church area of Fort Benning and was authorized a third quarter FY 1963 complement of fifty-one personnel (seventeen officers, twenty-nine enlisted men, and five civilians).[180] In March 1963, the TEC Group was augmented by representatives of CORG, and further augmentation was received in the form of representatives of AMC in May, HQDA ACSFOR in June, and United States Strike Command (STRICOM) in August.[181]

As of 5 July 1963, the 258 TEC Group personnel were organized in three principal divisions (Field Test, Organization and Materiel, and Test Support) plus a nine-man contingent from CORG. The Field Test Division was the principal mission division and was organized with one section for each of the main functional areas to be tested (reconnaissance and security, mobility, combat support, combat service support, communications and control, and controller). The Organization and Materiel Division prepared necessary test unit TOEs and other documentation, provided liaison with industry, and ensured that the aircraft, weapons, and other equipment needed by the test units were available on time. On 23 August 1963, Brig. Gen. Robert R. Williams replaced Colonel Strange as chief, TEC Group, and the TEC Group subsequently underwent several important reorganizations.[182]

In December 1963, the TEC Group was reorganized to facilitate the inclusion of air traffic control as a functional test area and meet the need for an industrial liaison office to deal with the responses of industry to the new airmobility concept. In June 1964, when Maj. Gen. Charles W. G. Rich was promoted to lieutenant general and reassigned to command the Third U.S.

Army, the TEC Group became a Third Army unit. On 1 July 1964, the TEC Group received a sizable personnel augmentation in order to create an exercise director's headquarters for Exercise AIR ASSAULT II, scheduled for the fall of 1964.[183] The TEC Group reached its peak authorization of personnel during the final phases of the test and evaluation program in late 1964. In December 1964, the TEC Group underwent yet another minor reorganization in anticipation of its participation in Joint Test Exercise GOLD FIRE II and at the same time reached its peak strength of some 376 permanent personnel plus personnel on temporary duty, bringing the total to some 600 officers and 1,400 enlisted men.[184] In March 1965, the TEC Group became a CDC agency and was reorganized once again, as shown in Figure 8–1. The 1 March 1965 configuration was retained until the TEC Group was deactivated on 30 June 1965.

HQ CDC Responsibilities

At HQ CDC, responsibility for the testing and evaluation of the airmobile concept lay with the Tactical Air Mobility Division.[185] The division had both a military element and a civilian contract support element from CORG. The military element included an Evaluation Branch and a Program Branch. The Evaluation Branch was the central element in the data analysis phase and consisted of five cells corresponding to the five functional areas being evaluated: intelligence and security, mobility, combat support, combat service support, and materiel.[186] The Program Branch laid out the program for the test and evaluation and related activities. The CORG Field Test and Experimentation Office was organized into an Air Mobility Studies Branch that prepared analytical studies; a War Gaming Branch that prepared and conducted war games, and a Functional Analysis Project, which acted as a holding cell for OR analysts and other scientific specialists who provided support for the test design and data evaluation.[187]

Test and Evaluation Program Command Relationships

The command relationships of the various elements of the Air Assault Division test program are depicted in Figure 8–2.

ORSA Support of the Air Mobility Test and Evaluation Program

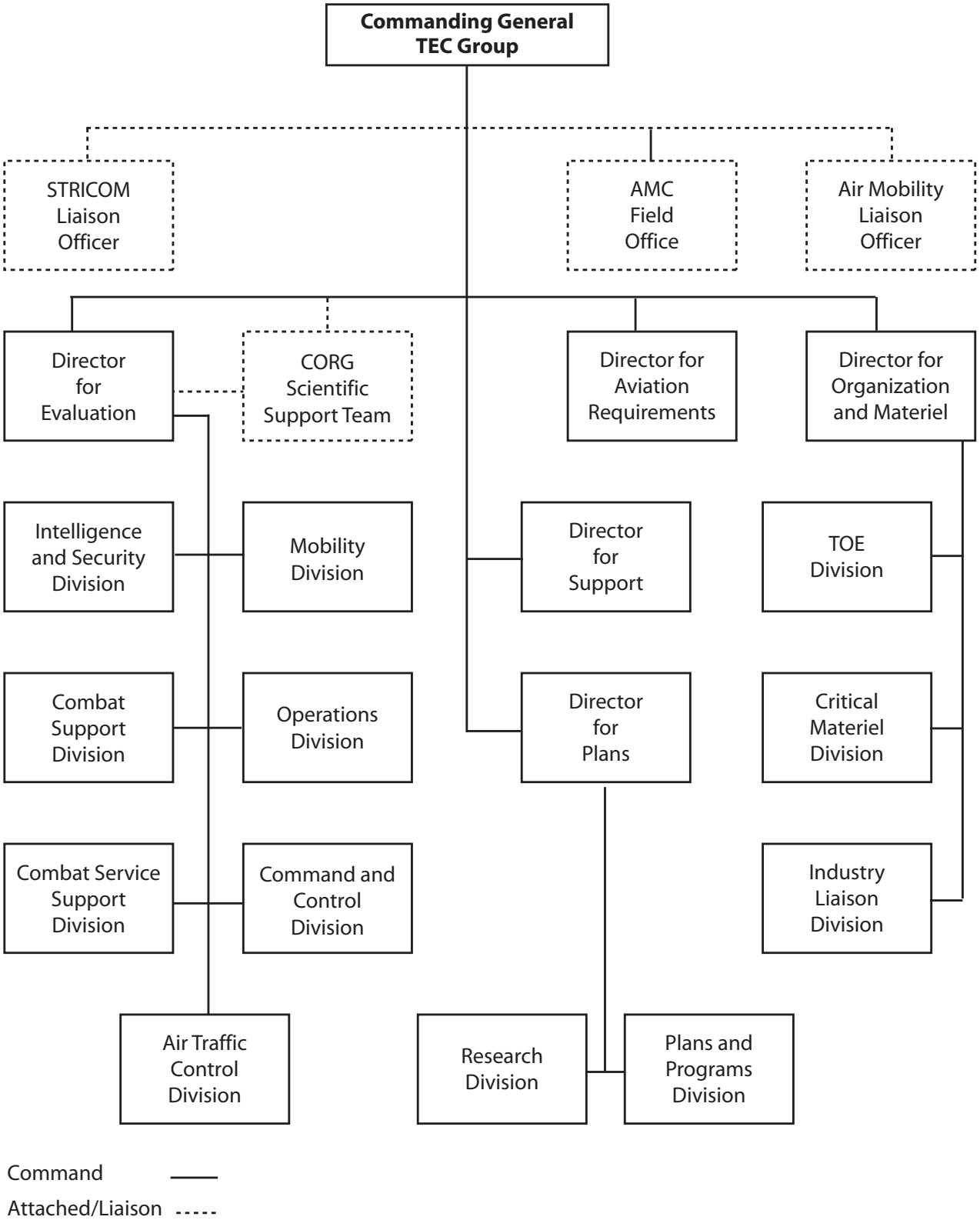
A broad range of Army ORSA elements, both contract and in-house, had supported the work of the Howze Board. The level of support provided by Army ORSA analysts for the test and evaluation of the 11th AAD and 10th ATB was, if anything, even more intense and direct.[188] Both the TEC Group at Fort Benning and the Tactical Air Mobility Division of HQ CDC at Fort Belvoir were supported by elements of CORG. The TEC Group was supported by a CORG Scientific Support Team led by Hunter Woodall who reported directly to Brig. Gen. Williams, the test director.[189] Initially staffed with four operations analysts, the Scientific Support Team subsequently grew to around ten analysts and was augmented by CORG's parent company, Technical Operations, Incorporated, for the major AIR ASSAULT I and AIR ASSAULT II exercises.[190] The CORG team provided support principally in the area of test methods, instrumentation data processing, and report writing. Woodall's Scientific Support Team was backed up by the CORG Field Test and Experimentation Office at HQ CDC, which also supported the CDC Tactical Air Mobility Division.[191]

Of course, ORSA studies and analyses in support of the Air Assault Division test program and on the airmobile concept in general continued throughout the period in the Army service schools, in AMC and CDC headquarters and in their subordinate agencies, and in the offices of the various Army ORSA contractors.[192] Some of this work was in direct support of the Air Assault Division test and evaluation program and some was of a more general nature, but all contributed to the fund of information on airmobile equipment, organization, and tactical doctrine.

Methodology of the Air Assault Test and Evaluation Program

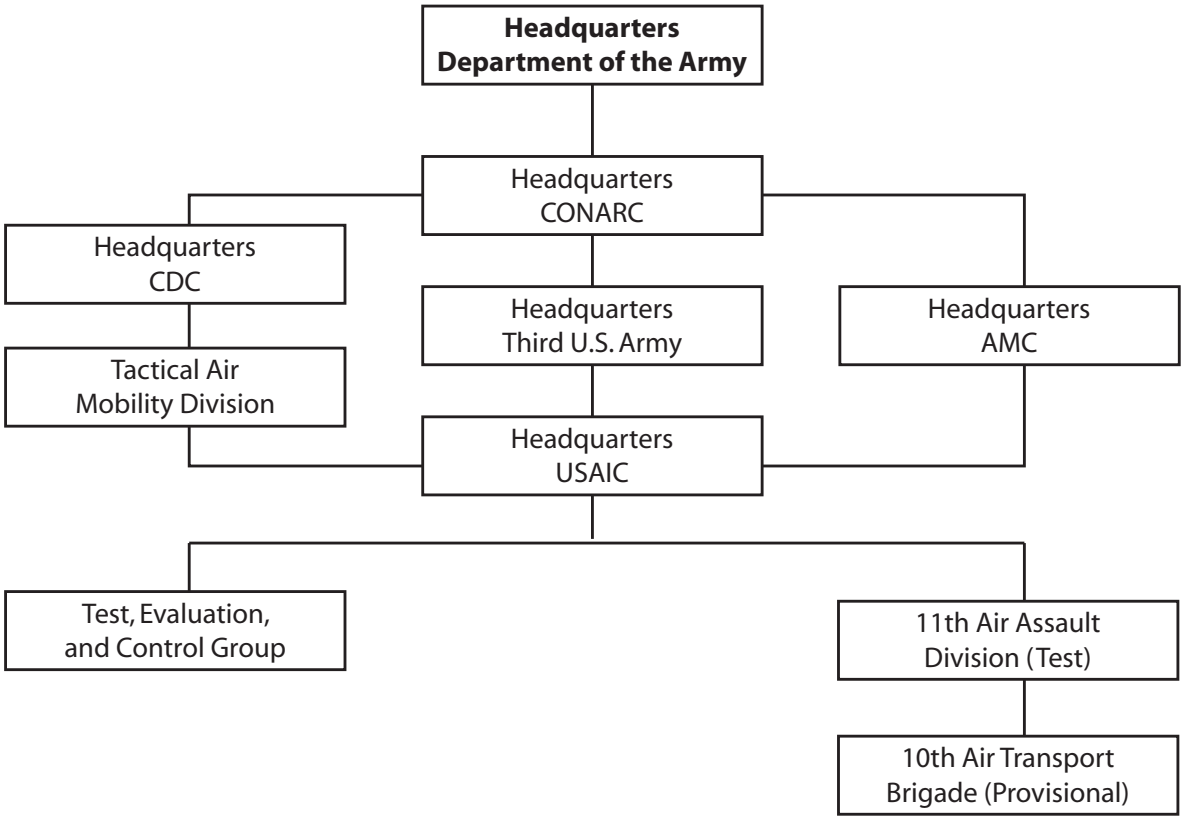
Based on HQDA guidance and a test directive published by HQ CDC, the TEC Group laid out a three-year, three-phase air assault test and evaluation program.[193] In Phase I, the testing and evaluation was to focus on organizational and operational concepts for one air assault infantry battalion supported by a proportional ATB slice. In Phase II, the focus was to

FIGURE 8–1—ORGANIZATION OF THE TEC GROUP, 1 MARCH 1965



Source: TEC Group History, p. 59 (app. C–VII [Mar 1965 Reorganization]).

Figure 8–2—Air Assault Division Test Program Relationships



Source: As of 15 February 1963. Based primarily on TEC Group History, pp. 30–31 (app. A [Project TEAM Command Relationships]).
Note: The Test, Evaluation, and Control Group was responsible for coordinating with Aggressor Forces and other support elements.

be on an air assault brigade supported by proportional division and ATB slices. Phase III was to involve testing and evaluation of the entire 11th AAD and 10th ATB. Phase II and Phase III were also to include some joint Army–Air Force tests under the direction of Headquarters, United States Strike Command (STRICOM).[194]

The HQ CDC test directive envisioned the test and evaluation program as a series of thirty-nine separate company-sized tests similar to Army Training Tests (ATTs), but disagreement soon arose over the basic test design. One side supported the CDC "unit," or ATT, approach; the other advocated a more innovative approach that focused on the various functional areas (intelligence, combat support, command and control, etc.). On 21 June 1963, the CG CDC approved the functional test approach as the best method of testing the concepts of airmobility.[195]

The testing and evaluation of the 11th AAD and 10th ATB involved a high degree of innovation at all levels. Nap-of-the-earth flying, day and night formation flying of helicopters, the arming of helicopters and Mohawks, aerial rocket artillery, and forward-area refueling were all new concepts tested for the first time. Consequently, the ORSA analysts assigned to TEC Group and CDC were required to develop a completely new methodology for a large and wide-ranging test and evaluation program of a sort unseen since before World War II.[196] That new methodology was based on the evaluation of the combat systems and how those systems interacted with each other. The selection of an effective test and evaluation methodology was complicated by two factors. First, the development of new techniques, procedures, and tactics was occurring every day. Second, training and testing of the units proceeded simultaneously. It was therefore difficult

to isolate the key factors and the means of measuring their effectiveness.[197] In general, the test and evaluation process followed the basic design described in the TEC Group History:

> Based on the test program, the composition of units to be tested, and the test locale, the broad test objectives were refined to identify the substantial data and data requirements needed for a functional evaluation. These data were incorporated into a detailed exercise scenario that included appropriate unit actions in sufficient numbers to obtain representative scientific findings. Following development of the exercise scenario, detailed data collection plans were developed to insure that, throughout the text exercise, essential events were examined by evaluator personnel and required information was collected.[198]

Both the Tactical Air Mobility Division at HQ CDC and the TEC Group relied on variations of the basic methodology described in the TEC Group History, but of course the process was actually much more complex and involved the establishment of test objectives and subobjectives; the identification of "essential elements of analysis"; preparation of data-collection and evaluation plans, including standards for evaluating effectiveness; collection of data using several types of documentation; a three-step data reduction phase; a two-step evaluation of results; and, finally, integration of the conclusions and the preparation of a set of recommendations.[199] The HQ CDC analysts focused on the five basic military functional areas (intelligence, mobility, firepower, command, control and communications [C^3], and service support) and identified 103 "essential elements of analysis" that formed the framework of their analysis.[200] The TEC Group focused on seventy test objectives (and 273 subobjectives) related to sixteen primary areas of evaluation derived from "the major questions about the air mobility concept that the upcoming maneuvers ought to answer" provided by HQ CDC.[201] The process also involved the consideration of various alternative force structures in three principal combat environments: counterguerrilla, conventional, and nuclear war. Throughout, cost-effectiveness was a major consideration in line with the known proclivities of Secretary McNamara and his Whiz Kids.

The methodology created for the air assault test and evaluation program by the CORG analysts at HQ CDC and at TEC Group was something entirely new. As Dr. Ed Raines has observed:

> The air assault tests of 1963 and 1964 represented the U.S. Army's first attempt since 1937 to systematically evaluate the underlying concept behind divisional organization. Methods of analysis had shifted so radically since then that the Combat Operations Research Group analysts who developed these procedures started with close to a blank slate. Because the air assault tests were examining a concept upon which an organization was to be structured rather than an organization derived from an already tested concept, the analysts adopt "a systems test approach." They collected data to measure how the tested units performed "basic military functions," such as intelligence and security, reconnaissance, and combat service support. The analysts investigated "these functions and their interrelationship" in as much detail as was feasible. In a sense throughout the tests the analysts were learning how to learn. The air assault tests became the starting point for all subsequent tests of large units.[202]

Exercises AIR ASSAULT I and II

The Phase I period ran from 1 May to 31 December 1963. The centerpiece of Phase I testing and evaluation was Exercise AIR ASSAULT I, which took place at Fort Stewart, Georgia, between 15 September and 16 October 1963.[203] AIR ASSAULT I involved a reinforced battalion task force with some 2,800 men and 121 aircraft and began with the air movement of the participant units from Fort Benning to Fort Stewart, where the actual test took place over an area of some 2,100 square kilometers. The results of the tests were provided to HQ CDC in the form of a report that contained the basic data derived from the test as the basis for determining the operational effectiveness of the air assault units tested within the overall context of the airmobility concept.[204]

In March 1964, the decision was made to accelerate the test and evaluation program by six months, and the planned phases II and III of the test and evaluation program were compressed into one phase.[205] A brigade training exercise was substituted for the planned Phase II brigade field test, and the proposed Phase II and Phase III testing and evaluation events were incorporated in Exercise AIR ASSAULT II, a force-on-force exercise in the Carolinas pitting the 11th AAD and 10th ATB against a reinforced 82d

Airborne Division. Planning for AIR ASSAULT II began in January 1964, and AIR ASSAULT II was conducted between 14 October and 12 November 1964 and involved some 35,000 personnel deployed over an area of some 4 million acres in the Carolinas. Exercise AIR ASSAULT II was preceded by Exercise HAWK BLADE, conducted on 2–3 October 1964 for the purpose of providing "the operational environment necessary for the testing and refinement of evaluation procedures."[206]

Preparations for AIR ASSAULT II were complex and often difficult. One of the biggest problems was forming the Exercise Director Headquarters. The solution was to temporarily convert the TEC Group into the Exercise Director Headquarters. This was done, and on 1 August 1964, the Exercise Director Headquarters (Field) (Project TEAM) (Provisional) was established by HQ Third U.S. Army General Order No. 123 with control over some 425 officers and 1,614 enlisted personnel.[207] At the same time, the Third U.S. Army commanding general, Lt. Gen. Charles W. G. Rich became the exercise director.

Another problem arose from the fact that the 11th AAD commander, General Kinnard, and the test director, General Williams, disagreed on the test methodology. As Dr. Ed Raines has explained:

> General Kinnard wanted a free-play force on force maneuver to fully demonstrate the revolutionary potential of the air mobile concept to militarily sophisticated senior officers of the U.S. Army, many of whom had publicly expressed doubts about its feasibility. On the other hand, General Williams argued for a controlled maneuver, better able to generate measurable data, which he knew would be absolutely essential to convince Secretary of Defense Robert S. McNamara of the military and cost effectiveness of the new organization.[208]

In the end, the "controlled maneuver" method involving the carefully constructed, timed scenario favored by General Williams was selected by the secretary of the Army and the Army chief of staff.[209]

The weather also posed serious problems. During AIR ASSAULT II, weather conditions were abominable and often created flying conditions well below normally acceptable conditions.[210] Despite the many difficulties, even Maj. Gen. Robert H. York, commander of the 82d Airborne Division "Aggressor Forces," was impressed by the performance of the 11th AAD and its attached units, commenting:

> Air assault operations as pioneered on Exercise AIR ASSAULT II have a dynamic potential. Seldom do we see a new military concept which can contribute so decisively throughout the entire spectrum of warfare. Certain air assault techniques used during Exercise AIR ASSAULT II would be unacceptably hazardous in actual combat. However, these deficiencies can be corrected and do not detract from the validity of the overall concept.[211]

Other data-collection activities were conducted concurrently with exercises AIR ASSAULT I and II. The first of two main concurrent activities consisted of three functional field tests conducted between December 1963 and June 1964 designed to obtain detailed data used to establish measurements standards in the areas of reconnaissance and surveillance, combat support, and mobility.[212] The second concurrent activity was a series of seven field training exercises conducted by the 11th AAD between mid-March and late August 1964 that emphasized training and freedom of tactical employment.[213] The TEC Group also supported 11th AAD field training exercises conducted in the period March–June 1964 and known as HAWK ASSAULT I and II, HAWK THRUST II, and HAWK STAR I.[214]

The Post-Test Period

The conclusion of Exercise AIR ASSAULT II on 14 December 1965 marked the end of the Air Assault Division tests, and the TEC Group then proceeded to wind up its business by preparing a final report on AIR ASSAULT II, conducting a functional test on 11–17 December 1964 of the strategic deployability of certain 11th AAD elements by Air Force transports, preparing for Joint Exercise GOLD FIRE II, and performing certain other CDC missions related to the overall Army airmobility test and evaluation program.[215] During late May and June 1965, the TEC Group personnel and facilities were phased out, and TEC Group was formally discontinued on 30 June 1965, pursuant to HQ Third U.S. Army General Order No. 128, dated 28 May 1965.[216]

Joint Testing of the Airmobile Concept

Given the Air Force's opposition to the air assault division concept, Army leaders were concerned lest they be forced into joint tests before completing the Army's own testing and evaluation of the 11th AAD.[217] The Air Force, meanwhile, was eager for joint tests of a modified ROAD infantry division without organic fixed-wing Army aviation units but supported by dedicated Air Force close air support and C–130 transport assets as an alternative to the Air Assault Division concept.[218]

In January 1963, the Joint Chiefs of Staff conceived plans for a comparative evaluation of the competing Army and Air Force approaches to airmobility, and the U.S. Strike Command, commanded by Army General Paul D. Adams, an Army aviation supporter, was designated to carry out the tests.[219] Army Maj. Gen. William B. Rosson was named by General Adams as director of the Joint Test and Evaluation Task Force, STRICOM, and charged with preparing and conducting the required joint tests. However, on 5 March 1964, Secretary of Defense McNamara decided to permit the Army to proceed with its unilateral test program during late 1964.[220] STRICOM continued to plan for a joint test and evaluation exercise, and in fact Joint Army–Air Force Exercise GOLD FIRE I was conducted in the fall of 1964 at about the same time as AIR ASSAULT II. GOLD FIRE I took place at Fort Leonard Wood, Missouri, and involved elements of the 1st Infantry Division and C–130 transports and fighter-bombers from the Tactical Air Command.[221] The exercise provided few surprises, being simply several improvements on the long-standing Air Force concepts of close air support and air transport boosted by the use of dedicated Air Force assets.[222] Army Chief of Staff General Harold K. Johnson's reaction was to note that the Army and Air Force concepts of airmobility were like a gazelle compared to an elephant.[223]

The Air Force also provided limited support to the Army during Exercise AIR ASSAULT II in the form of 103 C–130 transport sorties in support of the three airborne operations, fifty-nine C–130 sorties in support of the air line of communications, 198 close air support sorties, and 132 reconnaissance sorties.[224] The Air Force refused, however, to provide Air Force escort support for the helicopter assault columns. In December 1964, the TEC Group reorganized in preparation for participation in Joint Exercise GOLD FIRE II, but in January 1965 DOD decided that GOLD FIRE II would not be conducted.[225]

ARCSA I and II

Even as the air assault division concept was being tested in Georgia and the Carolinas, Army Chief of Staff General Harold K. Johnson ordered the establishment of a study group in the Pentagon to determine the number of helicopters and fixed-wing aircraft required by the Army and to lay out a rationale for Army aviation.[226] The Aviation Requirements for the Combat Structure of the Army I (ARCSA I) study group was organized in January 1964 and ended its work in July 1964. The study group was directed by Brig. Gen. E. L. Mueller, and the experience gained by the Research Analysis Corporation through its participation in the Howze Board and the air assault test and evaluation program, made RAC a logical choice as the principal ORSA contractor for the study. Thus, Dr. Philip H. Lowry, a RAC employee—assisted by Ben Schemmer (a RAC consultant) and J. H. Henry (a former RAC employee)—became the principal scientific adviser and the author of the final report. RAC also established three study teams to support the ARCSA I study: a war-gaming team under Dr. Joseph A. Bruner, a logistics team under Lee Stoneback, and a costing team under Oliver Bryk. The three RAC study teams maintained close contact and exchanged data with two other study teams working on ARCSA I: a team from the Planning Research Corporation, physically located at the RAC offices in McLean, Virginia; and a team from CORG at Fort Belvoir. The conclusions reached in the ARCSA I study were subsequently adopted by the Army and, although modified by further study and development during the war in Vietnam, became the basis for the continued determination of Army aviation requirements.

Final Reports on the Air Assault Test and Evaluation Program

On 1 December 1964, General Rich forwarded his interim report on AIR ASSAULT II to the CG CDC.[227] A final report on AIR ASSAULT II and the

overall final report on the Air Mobility Concept test program were combined and followed on 15 January 1965.[228] In the final report, General Rich made two important recommendations:

> *First*, I urge that the two years of effort, the experience of the people on hand, and the equipment on hand not be lost by the dissipation, fragmentation, or dispersal of the tested units.
>
> *Second*, I strongly recommend that:
>
> The 11th Air Assault Division or a division strength unit with the airmobility capability of the 11th AAD, be included in the Army's force structure, with a full parachute capability for its non-aviation elements; and,
>
> The 10th Air Transport Brigade be retained intact and included in the Army's force structure.
>
> The significant question is not whether we can afford such organizations, but whether this nation, with its rapidly expanding population and ever-increasing GNP, can afford *NOT* to have them. The tested organizations are prototypes, in being, of the most versatile forces that we can add to the United States Army. The *movement* capability of all divisions, including the 11th Air Assault Division, has been enhanced by Air Force aircraft. However, the integration of Army aircraft into these tested units has provided the crucial *maneuver* capability of light mobile forces to close with and destroy the enemy. In combination with ROAD divisions and other standard Army organizations, air mobile units offer a balance of mobility and an increased Army combat readiness on a theater scale that is applicable to the entire spectrum of warfare.[229]

On 15 January 1965, one month after receiving General Rich's report, the CG CDC, General Dwight E. Beach, rendered his final report on the airmobility test and evaluation program to the Army chief of staff.[230] General Beach noted that his report on the test and evaluation of the Air Assault Division and Air Transport Brigade was based on "analytical studies, war games, field experiments and troop tests, map analyses, cost effectiveness studies and the field exercise, AIR ASSAULT II," all of which had, of course, received dedicated, direct support by the Army's ORSA community.[231]

The conclusions reached by HQ CDC were summarized in Section III of the Abstract of the ARAME Final Report and included:

> 1. Air mobility contributes substantially to the tactical effectiveness of Army forces. It affords the Army advantages over conventional infantry forces by permitting:
>
> a. More rapid achievement of the objective
>
> b. More rapid acquisition of important terrain
>
> c. Achievement of the objective with fewer casualties and a more favorable friendly-to-enemy casualty ratio.
>
> 2. Corps forces with substantially greater air mobility than is currently available are found on a cost effectiveness basis to be superior to conventional corps organized around ROAD infantry division.
>
> 3. A division-sized airmobile organization should be included in the Army force structure. This organization should be either the air mobile division or a division with an airmobile capability similar to the air assault division.
>
> 4. If an airborne division is used as the trade-off for incorporating air mobility into the Army force structure, the order of desirability among the organizational alternatives is . . . [as first choice, the] Air Mobile Division.
>
> 5. If a ROAD division other than airborne is used as the basic trade-off for incorporating air mobility into the Army force structure, the order of desirability among the organizational alternatives is . . . [as first choice, the] Air Assault Division.
>
> 6. The 10th Air Transport Brigade (Test) or an equivalent type unit should be included in the Army force structure.
>
> 7. The ABC system of aircraft maintenance has proven to be an effective system and is compatible with the current system.
>
> 8. No further large-scale tests of the air assault division and air transport brigade which pertain to the Army Air Mobility Concept are required. To realize the full potential of these units, continued efforts should be made to refine and improve their doctrine (tactics), materiel and organization. This can be done by programming for the organization adopted to participate in scheduled exercises and to submit reports and recommendations based on experience, both in exercises and normal garrison type training and other activity.[232]

General Beach's recommendations followed directly from the conclusions reached.

Formation of the 1st Cavalry Division (Airmobile)

As a result of the positive results of the Howze Board and the subsequent twenty-one-month testing and evaluation of the airmobile concept, a tentative decision was made in March 1965 to convert the 11th Air Assault Division (Test) and the 10th Air Transport Brigade (Test) into regular parts of the Army force structure.[233] At the same time, the decision was made to return the colors of the 1st Cavalry Division from Korea, and on 1 July 1965, the 1st Cavalry Division (Airmobile) was activated at Fort Benning pursuant to HQ Third U.S. Army General Order No. 185, using personnel and equipment from the 11th Air Assault

Division (Test) and the 2d Infantry Division.[234] The process of organizing the new airmobile division was complicated by the fact that many of the personnel who had participated in the 11th AAD tests had already been reassigned, and nearly half of the remaining personnel were ineligible for overseas deployment.[235] Consequently, new personnel had to be assigned and the division reequipped and retrained. The division structure also had to be modified, and CDC hastily revised the TOEs for 15,787 officers and enlisted personnel in three brigade headquarters, eight maneuver battalions, and an air cavalry squadron plus divisional headquarters, combat support, and combat service support units; 434 aircraft; and 1,600 vehicles.[236] The recommended air transport brigade was downgraded to an air transport group.[237] To further complicate the transition from the test organizations to the new permanent configurations, on 28 July 1965 President Lyndon B. Johnson announced that the new 1st Cavalry Division (Airmobile) would be deployed for active combat in the central highlands of South Vietnam. The division subsequently staged out of Mobile, Alabama, and Jacksonville, Florida, and the division's advance party arrived in Vietnam on 25 August 1965.[238]

The airmobile concept subsequently passed its final and most important test—the test of actual combat—in Vietnam. The aircraft and other equipment, organization, and tactical doctrine of the airmobile division continued to be the subject of tests conducted in-country by the Army Concept Team in Vietnam and other organizations, and all were modified and refined as time went on. On the whole, however, the airmobile structure and concepts proposed by the Howze Board and tested during the 1963–1965 period proved remarkably sound and laid the foundation for the Army's continued use of the airmobile concept.

Other Airmobility Study and Analysis Activities

Although the ORSA elements supporting AMC, CDC, and other Army major commands, as well as the Army's ORSA contractors, devoted a considerable amount of their time and effort to supporting directly the Howze Board and the subsequent testing of the 11th AAD and 10th ATB, they continued to produce studies and analyses on Army aircraft and aviation matters not directly tied to the ongoing airmobility test and evaluation program. This activity began well before the deployment of the 1st Cavalry Division (Airmobile) to Vietnam in the summer of 1965 and continued throughout the Vietnam War period.

In FY 1963 alone, CDC, supported by CORG analysts, conducted some twenty-five tests in support of the Howze Board; supervised the test and evaluation unit at Fort Benning supporting the Howze Board; conducted war games for the 11th AAD and 10th ATB; ran eight field experiments; and participated in several joint testing activities.[239] CDC also supported tests of the airmobile concept and special warfare problems being conducted by the Army Concept Team in Vietnam, of which there were seventeen under way in FY 1963, and another twelve in the planning stage.[240] Overall, in FY 1963, CDC conducted some forty-seven DA-directed studies; completed and forwarded to HQDA four QMDOs, fifteen QMRs, and three SDRs; and, as of March 1963, still had requirements for the preparation of some additional 171 QMDOs, 340 QMRs, and sixty SDRs, of which HQ CDC was considering recommending for deletion some seventy QMRs and ten SDRs; and dispatched some 129 ROAD TOEs and fifty-six other TOEs to HQDA for approval and had under preparation some seventy-one TOEs for the Howze Board as well as thirty-three ROAD Separate Brigade TOEs and seventy-one MTELs.[241] In March 1963 Lt. Gen. John P. Daley noted as especially worthy of praise CDC's speed in producing MTEL for the Air Assault Division.[242]

CORG and its parent organization, Technical Operations, Incorporated, were heavily involved in direct support of the airmobility test and evaluation efforts of both the TEC Group at Fort Benning and the Tactical Air Mobility Division of HQ CDC. Although many of the CORG studies and war games supported the ongoing test and evaluation efforts directly, CORG also prepared a number of other, independent studies on Army aviation and airmobility. Representative samples of such CORG studies prepared during the 1962–1969 period are listed in Table 8–4.

HQDA's principal ORSA contractor, RAC, also produced a number of studies of Army aviation and airmobility topics during the 1960s. Some of those studies were prepared in support of the Howze Board and the airmobility test and evaluation efforts that followed, but others were generated independently.

Table 8–4—Representative CORG Studies on Army Aviation and Airmobility

CORG Number	*Author and Title*	*Date*
CORG-M-141	Flanagan and others, A Preliminary Study of Helicopter Operations	Jan 1962
CORG-M-160	Lavallee and others, Survivability of Army Aircraft	Jul 1962
CORG-M-161	Rapp, Waltz, and Batchelder, Air Traffic Control Communication and Navigation	n.d. [1962]
CORG-M-162	Combs, Estimated Survivability of the Mohawk	Oct 1962
CORG-SP-168	Woodall and others, Limited Observations on Vulnerability of Airmobile Forces	Jan 1963
CORG-M-205	CORG Tactical Analysis Division, A Comparative Analysis of the Tactical Use of Army Aviation in Southeast Asia (1967–1968)	May 1965
CORG-M-214	Lavallee and others, Utility/Tactical Transport Requirements Study	Jul 1965
CORG-M-243	Love and Barker, Utility/Tactical Aircraft Analysis	Feb 1966
CORG-M-308	Grover and Hansen, A Method for Analysis of Army Aviation Requirements	Apr 1968
CORG-M-358	Smith and Williams, Army Aviation Active Defense Measures	Feb 1969
CORG-M-371	Fogelsanger, The State of the Art in Helicopter Air to Air Vulnerability Analysis	Nov 1969

Source: Technical Operations, Incorporated, Combat Operations Research Group, *Final List of CORG Publications* (Alexandria, Va.: Combat Operations Research Group, Technical Operations, Inc., for Headquarters, Combat Developments Command, Jun 1970).

A representative sample of such studies completed between 1964 and 1970 is shown in Table 8–5.

Other Vietnam-Related ORSA Activity in CONUS

In addition to the studies, analyses, war games, tests, evaluations, and other ORSA activities in support of Army counterinsurgency and airmobility already mentioned, the Army's various ORSA contractors and in-house ORSA organizations continued to produce a variety of work on other topics pertinent to the situation in Southeast Asia throughout the 1960s and early 1970s. Some other Army organizations, although not focused on ORSA methods, did use ORSA techniques to perform their own missions. One example is the United States Army Limited War Laboratory (LWL). LWL was activated on 15 June 1962 at Aberdeen Proving Ground, Maryland, and reported directly to the Army's chief of research and development.[243] In FY 1963, the LWL was expanded from a skeleton cadre to an operational activity with the assigned mission of providing "a centralized Research and Development activity with a quick-reaction capability for meeting Army operational requirements relating to limited war, particularly to war of low intensity in underdeveloped or remote areas of the world."[244] LWL had an integrated team of military officers and skilled civilian scientists, engineers, and craftsmen and was organized with four main operating divisions.[245] The Operations and Analysis Division, staffed by experienced combat arms officers, was the focal point for contact with using Army units and supported the other LWL divisions with studies of weapons, communications systems,

Table 8–5—Representative RAC Studies on Army Aviation and Airmobility

RAC Number	*Title*	*Date*
RAC-T-422	RAC Air Assault Concept Studies, 1963	Feb 1964
RAC-TP-173	Analysis of the Cost of the Air Assault Concept Compared with That of ROAD Divisions	May 1965
RAC-TP-154	Helicopter Operations in the French-Algerian War	Jun 1965
RAC-T-464	An Evaluation of Helicopter Pop-Up Tactics	Nov 1965
RAC-T-472	Aviation Materiel Management: An Evaluation of Aircraft Logistic-Support Concepts for an Airmobile Division	Dec 1965
RAC-TP-189	A Field Comparison of Helicopter Antiarmor Tactics	Jan 1966
RAC-T-480	A Concept for an Airmobile Parts Supply System	May 1966
RAC-T-488	Concept for and Analysis of the Surveillance and Target Acquisition Aircraft System, Vol. I of STAAS Report	Nov 1966
RAC-TP-301	An Examination of Data on Close Air Support of Ground Forces in South Vietnam	Feb 1968
RAC-R-48	An Evaluation of a Heavy-Lift Helicopter in the Logistics Role	Aug 1968
RAC-R-99	Family of Army Aircraft Study: Time Frame 1970–85 (FASS-85), Supplementary Effort	Mar 1970

Source: Research Analysis Corp., *RAC Publications List* (McLean, Va.: Research Analysis Corp., Feb 1972).

and so forth. The Development Engineering Division with a staff of sixty-nine provided the laboratory's quick-reaction product design capability. The Applied Research Division "applied known techniques to fit particular military requirements," and the Technical Support Division built and tested prototypes. The LWL research program soon grew to more than sixty tasks, most of which involved exploratory development of such items as special types of lightweight radios, counterambush devices, area-oriented survival kits, the Long-Range Reconnaissance Patrol ration packet, and special clothing.[246] The emphasis was on small, simple items that could be developed in a matter of months rather than years. The development and testing of such items frequently involved the use of ORSA techniques.

The Role of the OSD Systems Analysis Office

Although Dr. Enthoven and the Whiz Kids in the Systems Analysis Office in OSD had a profound impact on Army management, force structure, and planning, they had very little influence on the direction of the war in Southeast Asia or on the use of ORSA by Army commands in Vietnam.[247] As Clark Murdock noted, "As late as mid-1966, there was no formal discussion in the Systems Analysis Office on the war; and when they did become involved, their activities, mostly data-collection or 'bean-counting,' had little impact upon policy."[248] Even Dr. Enthoven himself freely admitted, "The Systems Analysis office did not have a prominent, much less a crucial, role in the Vietnam war. Prior to

June 1965 it had no role at all, and afterward it was never closely involved with the development of strategy or operations."[249]

Such disclaimers of influence must be taken with a grain of salt inasmuch as they also serve to separate the Systems Analysis Office from what came to be regarded as a failed war.[250] The problem as Dr. Enthoven saw it was that

> [t]he controversy over basic strategy and tactics was never limited to those who opposed the war in principle. But without an organized analytic effort there was no legitimate place or procedure in the government to air disagreements, to build on pilot studies, and to provide objective information to inform the judgments that had to be made. As a result, this most complex of wars never got serious and systematic analysis.[251]

Although its influence on the strategy and conduct of the war was small, the OSD Systems Analysis Office did produce a few studies and tried to promote the use of ORSA methods in the theater. Among other projects, the OSD analysts developed and maintained a single, authoritative plan for manpower, logistics, procurement, and financial planning; developed a model for estimating aircraft attrition; tried to stimulate analysis by making pilot studies of various aspects of the war; and, beginning in February 1967, published an unofficial monthly document called the *Southeast Asia Analysis Report* that contained the results of the pilot studies, statistics, and other data pertinent to the conduct of the war.[252]

The OSD Systems Analysis Office's first analytical effort was the development of a Southeast Asia cost model to estimate the cost implications of additional deployments.[253] The model was developed in 1966 with the assistance of RAC and proved useful for estimating the cost of various deployment actions and for giving an overview of resource allocations connected to the Vietnam War. The few pilot studies done by the OSD Systems Analysis Office tended to involve them in the ongoing controversies such as the efficacy of the bombing campaign against North Vietnam, the "body count" debacle, measurement of pacification efforts, and the use of unobserved air and artillery strikes.[254]

With few exceptions these efforts had no significant impact on major decisions regarding the Vietnam War, with the possible exception of the OSD analysts' critique of MACV's attrition strategy in February–March 1968 and work on the Vietnam pacification program in the fall of 1968 after Ambassador Robert Komer took over that program in May 1967.[255] Some of their efforts were even viewed as counterproductive by senior Army leaders. For example, General Chesarek, the Army's assistant vice chief of staff during the mid-1960s, later recalled that the OSD Whiz Kids

> got involved in a long technical review as to how many people should be in a pipeline, and why give people leave. If you just chopped out the leave, you could reduce the pipeline, the people, and thereby reduce the draft and so forth and so on. They had no feel for morale or human relations. Are you going to send a guy over there to fight for a year, and be so goddamn chintzy that you won't even let him go home for two weeks because you want to reduce that pipeline, and this sort of thing? It's ridiculous, but they were for it, and they did it.[256]

The OSD Systems Analysis Office was also concerned with the integrated use of systematic analysis in-country and tried to stimulate it, but in the end Enthoven had to admit that "for a number of reasons, there were limits to what we could accomplish."[257] Some senior military leaders opposed the use of ORSA, and the OSD Systems Analysis Office was not really organized to support analytical efforts in Vietnam, had no independent sources of information from the field, lacked the specific military knowledge required, and already had its hands full with DOD management and force-structuring problems.[258]

In his 1971 book, Dr. Enthoven stated flatly:

> U.S. military commanders [in Southeast Asia] need, but for the most part either do not have or have and do not use, operations analysis organizations that provide them with a systematic method of learning by experience. There are organizations whose titles suggest such a responsibility—for example, in 1967, General Westmoreland formed an evaluation group in his headquarters—but they have not had a significant impact on the conduct of the war. On the contrary, U.S. military operations in Southeast Asia have been notable for a lack of systematic learning by experience.[259]

Enthoven also concerned himself with the design of an organization that would meet the needs of the military commanders in the field for systematic analytical support. The type of organization needed would, he wrote, have certain characteristics:

> First, a successful operations analysis organization must be an integral part of the military command, working with and accepted by all the other elements of the command. It must not be seen as an externally imposed group of outsiders. Second, its head must report directly to the appropriate military commander so that the organization's findings can be presented without prior compromise. Third, such an organization must have field representatives with the operating units, able to gather data and relay it back through their own channels. Fourth, it must be intimately tied into the real operational decision making so that there will be a systematic process of data gathering, analysis, conclusions, decisions, and dissemination of orders for new operating doctrines. Such a pattern was achieved by operations researchers working with American and British forces in World War II. It has not been achieved in Vietnam.[260]

For Enthoven,

> [t]he problem was not overmanagement of the war from Washington; it was undermanagement. The problem was not too much analysis; it was too little. The President and his key advisers sought candid assessments of the war, but they would not pay the political costs in terms of friction with the military to get them.[261]

Conclusion

In his study of tactical and materiel innovations during the Vietnam War, Lt. Gen. John H. Hay, Jr., noted:

> For the U.S. Army, the war in Vietnam presented a new type of battle fought with new weapons and new tactics against a very different enemy. In many respects, the area war without front lines together with the guerrilla tactics were out of our nation's beginnings, while the sophisticated hardware presaged the future automated battlefield management systems.[262]

The new tactics included various methods of combating insurgency and subversion, nation-building techniques, the extensive employment of Special Operations forces, the air assault concept, riverine warfare, and the use of new kinds of control measures. Changes in the organization of Army units also took place. The introduction of airmobile infantry and cavalry units; aerial fire support, resupply, and medevac helicopter units; and the addition of a fourth maneuver element for many Army infantry battalions were just a few of the major organizational changes that took place. The introduction of new weapons systems was even more dramatic. As General Hay has written:

> A Korean War veteran would recognize the steel helmet, the pistol, the mortars, the towed howitzers, and the jerry can. The rest of today's hardware is new. The old mess kit is gone; troops are fed on trays or paper plates. The lightweight M16 rifle has replaced the old M1, and the M79 grenade launcher, the light antitank weapon, and the claymore mine have increased the infantryman's firepower. The helicopter, improved communications, and the management of available fire support have greatly magnified the combat power of U.S. units. The armored personnel carrier, the Sheridan, and the Huey helicopter are newly developed vehicles. The latest sensors, automatic data processing systems, and advanced management techniques are steps into the future.[263]

Few of the tactical and materiel innovations of the Vietnam era would have been possible without the assistance to decision makers provided by Army ORSA analysts. The many complex and lengthy studies and analyses conducted by Army ORSA contractors and in-house ORSA analysts as well as their participation in the major Army boards and test programs of the period, such as CONARC's Special Warfare Board, the Howze Board on Army aviation requirements, and the subsequent tests of the Air Assault Division, were the foundation upon which the new tactics and new weapons systems were built.

CHAPTER EIGHT NOTES

[1] Roswell B. Wing, "Role of the Army in U.S. Counterinsurgency Programs," in *Proceedings of the [Second] United States Army Operations Research Symposium, 26, 27, 28 March 1963, Durham, North Carolina, Part I* (Durham, N.C.: Operations Research Technical Assistance Group, U.S. Army Research Office-Durham, 1963), p. 276.

[2] Brig Gen Richard G. Stilwell and others, *Army Activities in Underdeveloped Areas Short of Declared War* (Washington, D.C.: Office of the Secretary of the Army, HQDA, 13 Oct 1961), I (with cover memo dated 13 Oct 1961). Stilwell was assisted by Lt. Col. Ralph Kinnes (Special Warfare Division, ODCSOPS, HQDA), Lt. Col. John L. Mohl (War Plans Division, ODCSOPS, HQDA), and Lt. Col. Jesse G. Ugalde (HQ, Fort Carson, Colo.). Stilwell noted, however, that "the findings and recommendations are unilaterally mine; so also is the responsibility for the defense thereof."

[3] Ibid., cover memo, pp. 1–2.

[4] Ibid., cover memo, pp. 2–3.

[5] Ibid., cover memo, p. 3.

[6] Ibid., vi–xix passim.

[7] Ibid., p. 41.

[8] The report of the board is contained in U.S. Army Continental Army Command Special Warfare Board, *United States Army Continental Army Command Special Warfare Board Final Report* (Fort Bragg, N.C.: Special Warfare Board, CONARC, 1962) (cited hereafter as *CONARC Special Warfare Board Final Report*) together with Ltr, Lt Gen Hamilton H. Howze (president, CONARC Special Warfare Board) to CG, CONARC, Fort Bragg, N.C., 28 Jan 1962, sub: A Study to Inquire Into All Aspects of Special Warfare Operations.

[9] Ltr, Gen Herbert B. Powell (CG, CONARC) to Lt Gen Hamilton H. Howze (CG, XVIII Abn Corps), Fort Monroe, Va., n.d. [early January 1962], sub: Directive for the Conduct of a Study to Inquire Into All Aspects of Special Warfare Operations (see *CONARC Special Warfare Board Final Report*, pp. 219–22, Incl 25, sec. VII).

[10] *CONARC Special Warfare Board Final Report*, p. 223 (Incl 1 to Incl 25, sec. VII). In addition to Lt. Gen. Howze, the members of the board were Maj. Gen. Louis W. Truman (DCSOPS, plans and training, HQ CONARC), Maj. Gen. Ben Harrell (CG, The Infantry Center, Fort Benning, Ga.), Maj. Gen. T. F. Van Natta (DCS for combat developments, HQ CONARC), Brig. Gen. C. B. DeGavre (DCS for personnel and administration, HQ CONARC), Brig. Gen. Bruce Palmer, Jr. (assistant division commander, 82d Airborne Division), Brig. Gen. Beverley E. Powell (CG, XVIII Airborne Corps Artillery), Brig. Gen. William P. Yarborough (CG, Special Warfare Center, Fort Bragg, N.C.), Col. William R. Peers (OACSI, HQDA), and Col. N. E. Martin (HQ CONARC). The board secretariat included Col. Francis Mills (assistant commandant, Special Warfare School) as secretary, Lt. Col. R. C. Kendrick (HQ CONARC), and Maj. J. A. Lillard (XVIII Airborne Corps).

[11] Ibid., p. 1.

[12] Ibid., p. 6, par. 13.

[13] Ibid., pp. 4–5, par. 9.

[14] Ibid., pp. 27–29.

[15] Ibid.

[16] Ibid., pp. 11–18 (sec. III: Major Conclusions) and pp. 19–25 (sec. IV: Major Recommendations).

[17] Ibid., pp. 11–25.

[18] Ltr, Lt Gen Hamilton H. Howze (president, CONARC Special Warfare Board) to CG, CONARC, Fort Bragg, N.C., 28 Jan 1962, sub: A Study to Inquire into All Aspects of Special Warfare Operations, par. 2.

[19] Ltr, Gen. Herbert B. Powell (CG, CONARC) to DCSOPS, HQDA, Fort Monroe, Va., 9 Feb 1962, sub: The Howze Board Report on Special Warfare Activities, par. 4.

[20] Ltr, Lt. Gen. Ben Harrell (ACSFOR, HQDA) to CG, CDC, Washington, D.C., 23 Jul 1964, sub: Doctrine for Counterinsurgency.

[21] The symposium proceedings were subsequently published in William A. Lybrand, ed., *Proceedings of the Symposium "THE U.S. ARMY'S LIMITED-WAR MISSION AND SOCIAL SCIENCE RESEARCH," 26, 27, 28 March 1962* (Washington, D.C.: Special Operations Research Office, American University, Jun 1962).

[22] Lybrand, ed., *Proceedings*, pp. xiii–xiv.

[23] Elvis J. Stahr, Jr., "The U.S. Army's Limited War Mission and Social Science Research," in Lybrand, ed., *Proceedings*, pp. 4–8.

[24] Col William H. Kinard, Jr., "The New Dimensions of Special Warfare," in Lybrand, ed., *Proceedings*, pp. 56–63.

[25] E. K. Karcher, Jr., "Army Social Science Programs and Plans," in Lybrand, ed., *Proceedings*, pp. 344–59.

[26] Lybrand, ed., *Proceedings*, p. xii.

[27] U.S. Army Research Office-Durham, Operations Research Technical Assistance Group, *Proceedings of the [Third] United States Army Operations Research Symposium, 25, 26, 27 May 1964, Rock Island, Illinois, Part III—Special Warfare Panel* (Durham, N.C.: Operations Research Technical Assistance Group, U.S. Army Research Office-Durham, 1964), pp. 4–7.

[28] "Executive Summary," in *Proceedings of the [Third] United States Army Operations Research Symposium . . . Part I: Unclassified Papers*, p. 5.

[29] Hugh M. Cole, "Remarks," in *Proceedings of the [Third] United States Army Operations Research Symposium . . . Part III—Special Warfare Panel*, pp. 41–43.

[30] Ibid., p. 44.

[31] "Executive Summary," in *Proceedings of the [Third] United States Army Operations Research Symposium . . . Part I: Unclassified Papers*, p. 10.

[32] Seymour J. Deitchman, "Applications of Operations Research to Internal War," in *Proceedings of the [Fourth] United States Army Operations Research Symposium, 30–31 March, 1 April 1965, Redstone Arsenal, Alabama, Part I—Unclassified Volume* (Durham, N.C.: Operations Research Technical Assistance Group, U.S. Army Research Office-Durham, 1965), p. 204.

[33] Ibid., pp. 204–25 passim.

[34] The history of SORO is discussed in vol. I, ch. 3, and in ch. 6 above.

[35] U.S. Department of the Army, Office of the Chief of Staff, Director of Special Studies, *The Army Study System: A Staff Study by the Director of Special Studies, Office of the Chief of Staff, United States Army* (Washington, D.C.: Director of Special Studies, Office of the Chief of Staff, HQDA, May 1964), I, an. C, Incl 1, p. 41, and an. B, p. 112 (cited hereafter as Bonesteel Study).

[36] Ibid., an. C, Incl 3, atch. 5, p. 63.

[37] U.S. Department of the Army, *Department of the Army Pamphlet No. 550–100: United States Army Handbook of Counterinsurgency Guidelines for Area Commanders, An Analysis of Criteria* (Washington, D.C.: HQDA, Jan 1966).

[38] The counterinsurgency war games and simulations produced by Army and DOD activities in the 1960s are described in B. Fitzgerald, A. Stathacopoulos, and D. Walker, *War Gaming and Combat Simulation Activities Potentially Useful for Counterinsurgency Studies* (Santa Barbara, Calif.: Defense Research Corp., May 1966), which forms the basis for the following discussion.

[39] Other agencies that produced games applicable to Army counterinsurgency operations included the War Games Division, Landing Force Development Center, U.S. Marine Corps School, Quantico, Va., and the CDC Communications-Electronics Agency

at Fort Huachuca, Ariz. (see Fitzgerald and others, *War Gaming and Combat Simulation Activities Potentially Useful for Counterinsurgency Studies*, pp. 8–9).

[40] Fitzgerald and others, *War Gaming and Combat Simulation Activities Potentially Useful for Counterinsurgency Studies*, p. 6. *See also* Research Analysis Corporation, *TACSPIEL War-Game Procedures and Rules of Play for Guerrilla/Counterguerrilla Operations,* RAC-TP-223 (McLean, Va.: Research Analysis Corp., Aug 1966).

[41] Ibid., pp. 17–19.

[42] Ibid., pp. 5–6 and 12–17.

[43] Ibid., pp. 7–8 and 19–26. STAG was supported by contracts with Booz-Allen Applied Research, Inc., and Computer Concepts, Inc.

[44] Ibid., pp. 19–23.

[45] Ibid., pp. 23–24.

[46] Ibid., pp. 32–35.

[47] Ibid., p. 32.

[48] Ibid., pp. 31–32.

[49] The history of Army aviation and of the concept of airmobility have been the subject of many important books and articles. Of particular value to this study have been Lt. Gen. John J. Tolson, *Airmobility, 1961–1971* (Washington, D.C.: U.S. of the Army, 1973); Jacob A. Stockfisch, *The 1962 Howze Board and Army Combat Developments* (Santa Monica, Calif.: RAND Corp., 1994); Frederic A. Bergerson, *The Army Gets an Air Force: Tactics of Insurgent Bureaucratic Politics* (Baltimore, Md.: Johns Hopkins University Press, 1980); Lt. Col. Thomas L. Hendrix (USA Ret.) with Richard J. Sommers and David A. Keough, *Air Assault on the Pentagon: Army Airmobility, the Howze Board, and Implementing Change* (Carlisle Barracks, Pa.: U.S. Army Military History Institute, 19 Dec 1997); Robert A. Olson, "Air Mobility for the Army: A Case Study of Policy Evolution in Relation to Changing Strategy," *Military Affairs* 28, no. 4 (Winter 1964–1965), pp. 163–72; and the series of three articles on the Howze Board by Gen Hamilton H. Howze (USA Ret.) in *Army* 24, no. 2 (February 1974), pp. 8–14; *Army* 24, no. 3 (March 1974), pp. 18–24; and *Army* 24, no. 4 (April 1974), pp. 18–24. Although works of fiction, the books in the "Brotherhood of War" series by W. E. B. Griffin—in particular the volume entitled *The Aviators*—are true romans à clef and give some sense of the development of Army aviation after World War II and of the dedicated men who promoted it.

[50] Tolson, *Airmobility*, p. 3. As a junior officer, General Tolson was involved in the first tactical air movement of U.S. Army troops in June 1939, served with the 503d Parachute Infantry Regiment during World War II, and became an Army aviator in 1957. He subsequently served as the director of Army aviation, commandant of the U.S. Army Aviation School, and commanding general of the 1st Cavalry Division (Airmobile) in Vietnam from April 1967 to July 1968. He finished his career as deputy commanding general, CONARC.

[51] Ibid., pp. vii–viii.

[52] Stockfisch, *The 1962 Howze Board and Army Combat Developments*, p. 30.

[53] A brief chronology of the development of Army aviation is provided in Bergerson, *The Army Gets an Air Force*, pp. 159–60.

[54] Tolson, *Airmobility*, pp. 3–4.

[55] On the move of the Aviation School to Fort Rucker and General Hutton's role in the subsequent development of the armed helicopter, see Bergerson, *The Army Gets an Air Force*, pp. 100–03.

[56] Stockfisch, *The 1962 Howze Board and Army Combat Developments*, pp. 8–9.

[57] Ibid., pp. 7–8; Tolson, *Airmobility*, pp. 4–5.

[58] Stockfisch, *The 1962 Howze Board and Army Combat Developments*, p. 8; Bergerson, *The Army Gets an Air Force*, p. 72.

[59] Bergerson, *The Army Gets An Air Force*, p. 72.

[60] For a brief description of Colonel Vanderpool's activities at Fort Rucker, see Stockfisch, *The 1962 Howze Board and Army Combat Developments*, pp. 9–10, and Tolson, *Airmobility*, pp. 6–7. General Hutton is often credited with being "the father of the armed helicopter," but such experiments had a long prior history. In 1953, the 24th Infantry Division in Japan conducted experiments with a grenade launcher mounted on an OH–13 helicopter, and the Ballistic Research Laboratories at Aberdeen Proving Ground, Md., armed a YH–32A helicopter with tubes for launching two-inch rockets (see Bergerson, *The Army Gets an Air Force*, p. 71).

[61] The 7292d Aerial Combat Reconnaissance Company (Provisional) was sanctioned by the Department of the Army by approval of a Table of Distribution for the unit on 25 March 1958 (see Tolson, *Airmobility*, p. 6, and Bergerson, *The Army Gets an Air Force*, pp. 76–81 passim). On the "sky cavalry" experiments at both Fort Rucker and Fort Benning, see Bergerson, *The Army Gets an Air Force*, pp. 72–76.

[62] Stockfisch, *The 1962 Howze Board and Army Combat Developments*, p. 11.

[63] See France, Ministère des Armées, *Manual T. T. A. 152: Emploi d'unités hélicoportées en maintien de l'ordre en A. F. N.*, translated and edited by the Office of the Assistant Chief of Staff for Intelligence, HQDA, as *Employment of Helicopter-Borne Units in the Maintenance of Order in Algeria* (Washington, D.C.: OACSI, HQDA, 4 May 1956); France, National Defense Committee for Scientific Action, Operations Research Group, *Report of the Operations Research Mission on H-21 Helicopter Operations in Algeria* (Morton, Pa.: Vertol Aircraft Corporation, Apr 1957); and Vertol Aircraft Corporation, *French Army Helicopter Operations in Algeria, June 1956–September 1959*, Report No. SM–406 (Morton, Pa.: Vertol Aircraft Corporation, 1 Nov 1959).

[64] See A. H. Peterson, G. C. Reinhardt, and E. E. Conger, eds., *Symposium on the Role of Airpower in Counterinsurgency and Unconventional Warfare: The Algerian War* (Santa Monica, Calif.: RAND Corp., Jul 1963); J. Duncan Love and others, *Helicopter Operations in the French-Algerian War,* RAC-TP-154 (McLean, Va.: RAC, Jun 1965); and U.S. Air Force, Air University, Aerospace Studies Institute, Concepts Division, *Guerrilla Warfare and Airpower in Algeria, 1954–1960,* Project No. AU-411-62-ASI (Maxwell AFB, Ala.: Concepts Division, Aerospace Studies Institute, Air University, Mar 1965). For a general discussion of tactical and logistical mobility in the Algerian war, see Charles R. Shrader, *The First Helicopter War: Logistics and Mobility in Algeria, 1954–1962* (Westport, Conn.: Praeger, 1999).

[65] On the restrictions imposed on Army aviation by Secretary of Defense Wilson, see Olson, "Air Mobility for the Army," pp. 165–66.

[66] Olson, "Air Mobility for the Army," pp. 166–67.

[67] Ibid., p. 165, Hendrix, *Air Assault on the Pentagon*, p. 1.

[68] Hendrix, *Air Assault on the Pentagon*, pp. 1–2. On the activities of these and other key Army aviation advocates, see Bergerson, *The Army Gets an Air Force*, pp. 99–104.

[69] Ibid., p. 3; and Olson, "Air Mobility for the Army," p. 167.

[70] Tolson, *Airmobility*, p. 8. General Tolson was then the deputy director of Army aviation and served on the board without vote. His account of the Rogers Board is in Tolson, *Airmobility*, pp. 8–10, and, unless otherwise noted, is the basis for the following brief description of the board's actions and conclusions.

[71] Ibid.

[72] Ibid.

[73] Hendrix, *Air Assault on the Pentagon*, p. 3.

[74] Tolson, *Airmobility*, pp. 9–10.

[75] Gen Hamilton H. Howze (USA Ret.), *A Cavalryman's Story: Memoirs of a Twentieth-Century Army General* (Washington, D.C.: Smithsonian Institution Press, 1996), pp. 235–36, quoting his remarks in Encl I (The Requirement for Air Fighting Units) to sec. VII of the Rogers Board final report.

[76] Tolson, *Airmobility*, p. 10. In 1970, General Westmoreland, then chief of staff of the Army, earned his own wings as an Army helicopter pilot (see Bergerson, *The Army Gets an Air Force*, p. 160).

[77] Olson, "Air Mobility for the Army," p. 167.

[78] Secretary McNamara's interest in airmobility and the steps leading to the formation of the Howze Board are aptly summarized in Tolson, *Airmobility*, pp. 16–18, which I have followed closely here. On the Howze Board in general, see, *inter alia*, Tolson, *Airmobility*, pp. 20–24; Bergerson, *The Army Gets an Air Force*, pp. 110–17; and Hendrix, *Air Assault on the Pentagon*, pp. 5–6.

[79] Hendrix, *Air Assault on the Pentagon*, p. 5; Tolson, *Airmobility*, p. 17.

[80] Hendrix, *Air Assault on the Pentagon*, pp. 5–6.

[81] Ibid., p. 6.

[82] Tolson, *Airmobility*, p. 18; Stockfisch, *The 1962 Howze Board*, p. 13.

[83] Quoted in Hendrix, *Air Assault on the Pentagon*, p. 6.

[84] General Howze and others later noted the role played in the drafting of the two memorandums by Col. (later Lt. Gen.) Robert R. Williams (then assigned to the Office of the Director of Defense Research and Engineering) and Col. Edwin L. "Spic" Powell (then assigned to OCRD) (see, for example, Howze, *A Cavalryman's Story*, p. 236, and Hendrix, *Air Assault on the Pentagon*, pp. 7–8). On the two McNamara memorandums, see, *inter alia*, Tolson, *Airmobility*, pp. 18–19.

[85] U.S. Secretary of Defense, Memo for the Secretary of the Army, Washington, D.C., 19 Apr 1962, sub: Army Aviation. The text of this memo is reproduced in full as Memo 1 in app. A. The OSD staff paper that accompanied the memo listed three major criticisms of the Army aviation program. In the view of the OSD analysts, the Army had failed to take full advantage of new aviation technology to overcome the traditional limitations of surface mobility; to recognize that "that air vehicles operating close to the ground offered a possible quantum increase in effectiveness"; and to recognize that air transportation was less costly than rail or water transportation in peacetime and even less so in time of war (see Tolson, *Airmobility*, p. 18).

[86] Ibid.

[87] Ibid.

[88] U.S. Secretary of Defense, Memo for Mr. Stahr, Washington, D.C., 19 Apr 1962, no subject. The text of the second memo is reproduced in full as Memo 2 in app. A.

[89] Ibid.

[90] Ibid.

[91] Ibid.

[92] On 30 June 1962, Secretary of the Army Stahr resigned in protest over what he considered McNamara's meddling in the details of Army management. He was replaced by Cyrus R. Vance, a McNamara protégé. Several senior Army general officers continued to oppose any substantial growth in Army aviation.

[93] Tolson, *Airmobility*, p. 19.

[94] Ltr, Office of the Adjutant General, HQDA, to CG CONARC, Washington, D.C., 28 Apr 1962, sub: Army Aviation Requirements, with enclosure titled "Guidelines, U.S. Army Tactical Mobility Requirements Board" (reproduced in full as Incl 1 to U.S. Army Tactical Mobility Requirements Board [Howze Board], *Final Report* [Fort Bragg, N.C.: U.S. Army Tactical Mobility Requirements Board {Howze Board}, 20 Aug 1962] [cited hereafter as Howze Board Final Rpt]).

[95] Ibid.

[96] Ibid.

[97] Tolson, *Airmobility*, p. 19.

[98] Ltr, Gen Herbert B. Powell (CG, CONARC) to Lt Gen Hamilton H. Howze (CG, XVIII Abn Corps), Fort Monroe, Va., 3 May 1962, sub: Appointment of an Ad-Hoc Board to Conduct a Re-examination of the Role of Army Aviation and Aircraft Requirements (reproduced in Incl 1 to Howze Board Final Report). Hamilton Hawkins Howze was the scion of an old Army family. Born at West Point on 21 December 1908, he graduated from the Military Academy in 1930, was commissioned in the cavalry, and saw action in Europe during World War II. He qualified as an Army aviator in 1955 while serving as the first director of Army aviation (1955–1958). He subsequently commanded in turn the 82d Airborne Division and the XVIII Airborne Corps at Fort Bragg, during which time he served as the president of both the CONARC Special Warfare Board and the Army Tactical Mobility Requirements Board. He ended his Army career as commander-in-chief, United Nations Command/U.S. Forces in Korea. He died on 8 December 1998 (see the brief biographical sketch at www.aviation.army.mil/bios/howze.html; copy in possession of the author).

[99] Howze Board Final Rpt, an. A (Board Membership), pp. 12–13. General Howze later offered the opinion that the membership of the board was too large, generated too many ideas and variations in point of view, and made meetings too long, thus requiring him to stifle debate and force a decision (see Howze, *A Cavalryman's Story*, p. 239).

[100] Ibid., an. A, p. 1.

[101] Ibid., an. A, pp. 14–16.

[102] Ibid., pp. ix–x, and an. A, pp. 14–16.

[103] Ibid., an. A, p. 1.

[104] Hendrix, *Air Assault on the Pentagon*, pp. 12–13.

[105] Ibid., p. 10.

[106] Gen Hamilton H. Howze (USA Ret.), "Howze Board II: Airmobility Becomes More Than a Theory," *Army* 24, no. 3 (March 1974), p. 19. Actually, General Howze was notified verbally on 25 April that he was to head the board, and work was already under way by the time the directive was issued on 3 May (see Tolson, *Airmobility*, p. 20).

[107] Howze, *A Cavalryman's Story*, p. 237.

[108] Stockfisch, *The 1962 Howze Board and Army Combat Developments*, pp. 15–16.

[109] Ibid., p. 16.

[110] Howze Board Final Rpt, p. 1.

[111] Ibid., p. 3.

[112] Ibid., p. 9.

[113] Stockfisch, *The 1962 Howze Board and Army Combat Developments*, pp. 16–17. It should be noted that many of the helicopters used in the Howze Board tests were obsolete models lacking the performance and capabilities of the newer models being proposed for use by Army airmobile forces (see Bergerson, *The Army Gets an Air Force*, p. 112).

[114] Howze Board Final Rpt, p. 3.

[115] Stockfisch, *The 1962 Howze Board and Army Combat Developments*, p. 17. Brig. Gen. (later Lt. Gen.) Edward Leon Rowny was born on 3 April 1917 and graduated from the U.S. Military Academy in 1941. He served as an engineer officer in Europe during World War II and during the Korean War. Following his service on the Howze Board, he was the chief of the Army Concept Team in Vietnam (ACTIV) and later commanded the 24th Infantry Division in Germany and the I ROK Corps in Korea. He subsequently served in a number of high-level international positions, particularly in the field of arms control. In 1981, he was appointed by President Ronald Reagan as chief negotiator and head of the U.S. delegation to the Strategic Arms Reduction Talks with the rank of ambassador. On his career and accomplishments, see www.aog.usma.edu/AOG/AWARDS/DGA/93-ROWNY.TXT, downloaded 23 April 2005; copy in possession of the author).

[116] Ibid.

[117] Lt Gen Edward L. Rowny (USA Ret.), *Oral History Interviews with Barry W. Fowle* (Alexandria, Va.: Office of History, Headquarters, U.S. Army Corps of Engineers, 1986–1990), p. 73.

[118] Howze, "Howze Board II: Airmobility Becomes More Than a Theory," p. 21; Howze, *A Cavalryman's Story*, p. 242.

[119] Howze Board Final Rpt, p. 3.

[120] Ibid., pp. 4–6; Howze, *A Cavalryman's Story*, pp. 240–41.

[121] Howze Board Final Rpt, p. 3.

[122] Ibid., p. 6. It should be recalled that the Howze Board's small Operations Research Committee/Group was led by Frank A. Parker, the president of RAC, and was manned by RAC personnel. For a very brief summary of RAC participation in the Howze Board, see Charles Alexander Holmes Thomson, *The Research Analysis Corporation: A History of a Federal Contract Research Center* (McLean, Va.: RAC, Jun 1975), p. 53.

[123] Howze Board Final Rpt, p. 6.

[124] Stockfisch, *The 1962 Howze Board and Army Combat Developments*, p. 17.

[125] Howze Board Final Rpt, p. 4.

[126] Ibid., pp. 5–6.

[127] Howze, "Howze Board II: Airmobility Becomes More Than a Theory," p. 21; Howze, *A Cavalryman's Story*, p. 241. General Howze visited the RAC offices on 15 June 1962 to review RAC's THEATERSPIEL, TACSPIEL, CARMONETTE, and "quick-gaming" activities (see "Army Studies Tactical Air Mobility," *The RAConteur*, Old Series 1, no. 2 [July–August 1962], pp. 1 and 22).

[128] Howze Board Final Rpt, p. 7.

[129] See Papers of Maj Gen George W. Putnam (USA Ret.), Archives, U.S. Military History Institute, Carlisle Barracks, Pa. Colonel (later Major General) Putnam was the deputy executive officer to the president of the Howze Board. An Army aviator from 1956, he served as deputy director of Army aviation and in 1965 he became the commandant of the Army Aviation School at Fort Rucker. He subsequently served as the division artillery commander, assistant division commander, and chief of staff of the 1st Cavalry Division (Airmobile) in Vietnam and later as commander of the 1st Aviation Brigade and aviation officer, U.S. Army, Vietnam, in 1970–1971. He retired from active duty as a major general in June 1981.

[130] Published as U.S. Army Tactical Mobility Requirements Board [Howze Board], *Final Report* (Fort Bragg, N.C.: U.S. Army Tactical Mobility Requirements Board [Howze Board], 20 Aug 1962). The 3,500-page final report included a sixteen-page "Briefing by the President of the Board" and eighteen separate annexes (A-Roster of Board Members; B-Southeast Asia Trip Report; C-Not Used; D-Intelligence; E-Not Used; F-Not Used; G-Programs and Budgets; H-Objective Force Structure; I-Long Range Concepts and Requirements; J-Special Warfare Concepts and Requirements; K-Tactical Concepts and Requirements; L-Logistics Concepts and Requirements; M-War Games; N-Aircraft Maintenance and Supply; O-Field Tests; P-Industry Inputs; Q-Personnel; and R-Communications and Electronics. As to the pace of the board's work, one officer recalled, "Many of us just ran ourselves into the ground; we worked so darned hard we almost couldn't think straight" (quoted in Bergerson, *The Army Gets an Air Force*, p. 112).

[131] Ltr, Lt Gen Hamilton H. Howze (President, Army Tactical Mobility Requirements Board) to the Secretary of the Army, Fort Bragg, N.C., 20 Aug 1962, sub: Report of Army Tactical Mobility Requirements Board, pars. 4–5.

[132] Howze Board Final Rpt, p. 95.

[133] Ibid., Briefing by the President of the Board, p. 8.

[134] Ibid., p. 6.

[135] Ibid., p. 8.

[136] U.S. Department of Defense, Office of the Assistant Secretary of Defense (Comptroller), Systems Analysis Office, *Army Tactical Mobility: Issues and Opportunities* (Washington, D.C.: Systems Analysis Office, Office of the Assistant Secretary of Defense [Comptroller], n.d. [1963]), app., Table A, Board Recommended Force Structure, Unit Aircraft TO&E, and Personnel (based on Howze Board Final Rpt, an. G, app. 5, tab 11, and an. H, pp. 16–17).

[137] Stockfisch, *The 1962 Howze Board and Army Combat Developments*, p. 18 (based on Howze Board Final Rpt, an. I, Long Range Concepts and Requirements); Howze Board Final Rpt, pp. 9–10. The cost for new aircraft systems and ammunition alone was projected to be around $3.784 billion over five years, with some $1.6

billion in savings over the same period from cancellation of programs for the development and procurement of ground transport systems (see Howze Board Final Rpt, Briefing by the President of the Board, pp. 9–10).

[138] Tolson, *Airmobility*, p. 23.

[139] Howze Board Final Rpt, pp. 36–37.

[140] OSD Systems Analysis Office, *Army Tactical Mobility: Issues and Opportunities*, app. A, p. 57.

[141] Ibid.

[142] Ibid.

[143] Howze Board Final Rpt, pp. 46–47. The OSD Systems Analysis Office critique of the Howze Board (*Army Tactical Mobility: Issues and Opportunities*, app., p. 57, and Table A) lists eight helicopters more for the ATB than does the Howze Board Final Rpt.

[144] Ibid., Briefing by the President of the Board, pp. 12–13.

[145] Ibid., p. 13.

[146] Ibid., pp. 14–15.

[147] Report of the Army Tactical Mobility Requirements Board, 1st Indorsement, HQ CONARC, 20 Aug 1962, pars. 1 and 3.

[148] Ibid., pars. 4c and 4e.

[149] Ibid., par. 4d.

[150] Ibid., par. 8.

[151] Hendrix, *Air Assault on the Pentagon*, pp. 15–16.

[152] Tolson, *Airmobility*, p. 24.

[153] OSDSA, *Army Tactical Mobility: Issues and Opportunities*, pp. 2–3.

[154] Ibid.

[155] Ibid., pp. 55–56.

[156] Ibid., p. 55.

[157] Hendrix, *Air Assault on the Pentagon*, p. 16.

[158] Rowny, *Oral History Interviews with Barry W. Fowle*, p. 73.

[159] Howze, *A Cavalryman's Story*, p. 239.

[160] Howze Board Final Rpt, p. 72. The Air Force and Navy reaction to the recommendations of the Howze Board were, of course, much more complex than portrayed in this brief outline. For a more detailed account of the Air Force reaction to the Howze Board Final Rpt, see Tolson, *Airmobility*, pp. 10–15.

[161] Stockfisch, *The 1962 Howze Board and Army Combat Developments*, p. 25.

[162] OSDSA, *Army Tactical Mobility: Issues and Opportunities*, p. 45. Eventually, during the Vietnam War, the Army would cede control of the Caribou transport to the Air Force, but the Mohawk remained a thorn in the Air Force's paw for some time.

[163] Rowny, *Oral History Interviews with Barry W. Fowle*, p. 73; and Olson, "Air Mobility for the Army," p. 169. The Navy expressed similar concern over the increased role of helicopters that Navy leaders believed might eventually supplant carrier-based fixed-wing aircraft.

[164] Bergerson, *The Army Gets an Air Force*, p. 113; and Howze, "Howze Board II: Airmobility Becomes More than a Theory," p. 24.

[165] Hendrix, *Air Assault on the Pentagon*, p. 16.

[166] Ibid.; Tolson, *Airmobility*, p. 24.

[167] Hendrix, *Air Assault on the Pentagon*, p. 16; and Tolson, *Airmobility*, p. 24.

[168] Ltr, CG CDC to CG CDC, Combined Arms Group, and CO CDC, Combat Service Support Group, Fort Belvoir, Va., 2 Nov 1962, sub: Implementation, Final Report USATMRB.

[169] Tolson, *Airmobility*, p. 24.

[170] Howze, *A Cavalryman's Story*, pp. 255–56. General Howze opposed additional testing as a waste of time and money.

[171] Stockfisch, *The 1962 Howze Board and Army Combat Developments*, p. 26. The testing and evaluation of the 11th Air Assault Division (Test) (11th AAD) and 10th Air Transport Brigade (Test) (10th ATB) between 1963 and 1965 are summarized in, *inter alia*, Tolson, *Airmobility*, pp. 51–57; U.S. Army Project TEAM, Test, Evaluation, and Control Group (TEC Group), *History of the Test, Evaluation and Control Group* (Fort Benning, Ga.: TEC Group, Project TEAM, 30 Jun 1965) (cited hereafter as TEC Group History); U.S. Army Project TEAM, TEC Group, *Field Test Program Army Air Mobility Concept*, vol. I: *Basic Report* (Fort Benning, Ga.: TEC Group, Project TEAM, 1965); U.S. Army Combat Developments Command, *Report, Army Air Mobility Evaluation [*short title: *ARAME]*, 2 vols. (Fort Belvoir, Va.: CDC, 15 Feb 1965) (cited hereafter as ARAME Final Rpt); and Edgar Raines, *The Role of Analysis in the Approval of the Army's Airmobile Concept* (Washington, D.C.: U.S. Army Center of Military History, 20 Mar 2003). See also Lt Gen Harry W. O. Kinnard (USA Ret.), *Oral History Interview with Lt. Col. Jacob B. Couch*, USAWC/USAMHI Senior Officers Oral History Program, Carlisle Barracks, Pa., 20 Jan 1983; Lt Gen Harry W. O. Kinnard (USA Ret.), *Oral History Interview with Col. Glenn A. Smith and Lt. Col. August M. Cianciolo*, USAWC/USAMHI Senior Officers Oral History Program (The History of Army Aviation Project), Carlisle Barracks, Pa., 31 Mar 1977; and Lt Gen Robert R. Williams (USA Ret.), *Oral History Interview with Col. Ralph J. Powell and Lt. Col. Philip E. Courts*, USAWC/USAMHI Senior Officers Oral History Program (The History of Army Aviation Project), Carlisle Barracks, Pa., n.d. [1977]. Transcripts of all three oral histories can be found in Archives, USAMHI, Carlisle Barracks, Pa.

[172] TEC Group History, p. 1.

[173] Ibid.; Tolson, *Airmobility*, p. 51. See Ltr, HQDA DCSOPS to CG, USAIC, Washington, D.C., 7 Jan 1963, sub: Plan for Initial Organization, Training and Testing of Air Mobile Units, with change dated 22 January 1963.

[174] Raines, *The Role of Analysis in the Approval of the Army's Airmobile Concept*, p. 1.

[175] Ibid.; Tolson, *Airmobility*, p. 52. Stockfisch (*The 1962 Howze Board and Army Combat Developments*, pp. 26–27) states that the initial cadre for the 11th AAD alone was 291 officers, 187 warrant officers, and 3,114 enlisted men. The 11th AAD was activated with one infantry battalion, a reduced-size division headquarters, and limited combat support and combat service support elements. The 10th ATB was activated as a battalion-size unit. The strength of both the 11th AAD and 10th ATB remained at cadre levels until the last three months of the testing program, when they were finally brought up to full strength. In fact, during July and August 1964, both the 11th AAD and the 10th ATB were levied for complete units for deployment to Vietnam, thereby skimming off some of their best personnel and a good deal of their equipment (see Tolson, *Airmobility*, p. 54).

[176] Ibid., p. 51.

[177] TEC Group History, pp. 1–2. Unless otherwise noted, I have used the TEC Group History as my principal source for the following account of the airmobile test and evaluation program.

[178] Ibid., p. 2. The Training, Evaluation and Control Group was later redesignated the Test, Evaluation, and Control Group (TEC Group).

[179] In February 1963, Maj. Gen. Charles W. G. Rich replaced Maj. Gen. Ben Harrell as CG USAIC and test director.

[180] TEC Group History, p. 46 (app. C–I [Initial Organization]). The fourth quarter FY 1963 personnel authorization was to increase to 258 (seventy-six officers, one warrant officer, 165 enlisted men, and sixteen civilians), but actual receipt of the authorized personnel lagged two to three months behind. On facilities available to the TEC Group, see TEC Group History, pp. 33 and 35. Anyone assigned to or visiting Fort Benning in the mid-1960s will remember the dusty Harmony Church area and its World War II temporary buildings.

[181] Ibid., pp. 3 and 43–45 (app. C [Organizations]). AMC was represented by a field office, ACSFOR by the Air Mobility Liaison Office, and STRICOM by a liaison officer. TEC Group thus gained access to the ORSA resources of AMC, the Army Staff, and the JCS.

[182] On the successive reorganizations, see TEC Group History, app. C.

[183] TEC Group History, pp. 52–55 (app. C–IV [TEC Group/Exercise Director Headquarters Staff Relationship] and C–V [TEC Group Transition to Exercise Director Headquarters]). The TEC Group was phased in as the Exercise Director Headquarters and then phased out again to its former configuration as TEC Group at the conclusion of Exercise AIR ASSAULT II in November 1964.

[184] Ibid., pp. 56–57 (app. C–VI [Dec 1964 Reorganization]); and Tolson, *Airmobility*, p. 53.

[185] Raines, *The Role of Analysis in the Approval of the Army's Airmobile Concept*, p. 2.

[186] Ibid., pp. 2–3. A sixth cell, aircraft maintenance, was added later but aircraft maintenance was integrated into the other five functional areas in the final test and evaluation report.

[187] Ibid., p. 2. The Air Mobility Studies and War Gaming branches focused on studies and games that supported the cost-effectiveness studies that were a part of the test and evaluation program.

[188] The support provided by Army ORSA elements for the air assault test and evaluation program is succinctly and admirably summarized in Raines, *The Role of Analysis in the Approval of the Army's Airmobile Concept*, which I have followed closely here.

[189] Raines (*The Role of Analysis in the Approval of the Army's Airmobile Concept*, p. 2) cites Abraham Golub as the leader of the CORG Scientific Support Team, but E. B. Vandiver (director, Center for Army Analysis) indicated to the author at Fort Belvoir on 29 August 2005 that the team was led by Hunter Woodall.

[190] TEC Group History, p. 45 (app. C [Organizations]).

[191] Raines, *The Role of Analysis in the Approval of the Army's Airmobile Concept*, p. 2.

[192] Tolson, *Airmobility*, p. 51.

[193] The development and phasing of the air assault test and evaluation program is outlined in TEC Group History, pp. 3–6, and in Raines, *The Role of Analysis in the Approval of the Army's Airmobile Concept*, pp. 1–2. On the methodology of the overall CDC air mobility test and evaluation program, see ARAME Final Rpt, I, Abstract, p. AB–2 and Figure AB–1.

[194] TEC Group History, p. 4.

[195] Ibid. Accordingly, TEC Group was reorganized on 5 July to facilitate the functional test design.

[196] Tolson, *Airmobility*, p. 53.

[197] Ibid., pp. 53–54.

[198] TEC Group History, p. 6.

[199] The process followed by both the Tactical Air Mobility Division, HQ CDC, and the TEC Group is explained in detail in Raines, *The Role of Analysis in the Approval of the Army's Airmobile Concept*, pp. 3–9, which is the basis for the brief summary given here.

[200] Raines, *The Role of Analysis in the Approval of the Army's Airmobile Concept*, p. 7.

[201] Ibid., p. 3. The sixteen primary areas of evaluation (PAEs) developed by TEC Group were the basis for evaluation of AIR ASSAULT II (see TEC Group History, p. 18).

[202] Raines, *The Role of Analysis in the Approval of the Army's Airmobile Concept*, p. 9.

[203] On Phase I and Exercise AIR ASSAULT I, see TEC Group History, pp. 9–11, and Raines, *The Role of Analysis in the Approval of the Army's Airmobile Concept*, pp. 1–2.

[204] TEC Group History, p. 10. See U.S. Army Test, Evaluation, and Control Group, *Phase I Test Report—Air Assault Infantry Battalion (Reinf)* (Fort Benning, Ga.: U.S. Army Test, Evaluation, and Control Group, 1 Dec 1963).

[205] Ibid., p. 13. On the revised Phase II/Phase III test program and Exercise AIR ASSAULT II, see TEC Group History, pp. 13–15, and Raines, *The Role of Analysis in the Approval of the Army's Airmobile Concept*, pp. 1–2.

[206] Ibid., p. 18.

[207] Ibid., p. 17.

[208] Raines, *The Role of Analysis in the Approval of the Army's Airmobile Concept*, p. 2.

[209] Ibid.; Tolson, *Airmobility*, p. 54.

[210] Tolson, *Airmobility*, pp. 54–55.

[211] Quoted in Tolson, *Airmobility*, p. 55.

[212] TEC Group History, pp. 14–15.

[213] Ibid., p. 14.

[214] Ibid., pp. 15–16.

[215] Ibid., p. 23. For the post-test period, see TEC Group History, pp. 23–27. The AIR ASSAULT II Exercise Director Headquarters was discontinued on 15 December 1964, and TEC Group reverted to its former configuration (see TEC Group History, p. 23).

[216] Ibid., p. 27.

[217] Tolson, *Airmobility*, p. 52. On the joint test program, see Tolson, *Airmobility*, pp. 57–61.

[218] The Disosway report preferred such an arrangement because—as General Tolson later wrote (*Airmobility*, p. 57)—it represented "a more effective and flexible approach to tactical mobility than would the air assault division."

[219] Tolson, *Airmobility*, p. 57.

[220] Ibid.

[221] Ibid., p. 58, and Stockfisch, *The 1962 Howze Board and Army Combat Developments*, p. 27.

[222] Tolson, *Airmobility*, p. 58.

[223] Quoted in Tolson, *Airmobility*, p. 58. The Air Force concept, of course, represented the elephant.

[224] TEC Group History, p. 21.

[225] Ibid., p. 25.

[226] The ARCSA I study is summarized in a note entitled "Aviation Requirements for the Combat Structure of the Army (ARCSA I)" found in Research Analysis Corporation Papers preserved in the Archives of the U.S. Army Military History Institute, Carlisle Barracks, Pa. ARCSA II was a more limited effort headed by Maj. Gen. J. M. Wright, Jr., who was assisted by W. W. Walton, a RAC staff member.

[227] See TEC Group History, pp. 23–24, and U.S. Army Project TEAM, Test, Evaluation, and Control Group, *Interim Report, AIR ASSAULT II, Field Test Program Army Air Mobility Concept* (Fort Benning, Ga.: Test, Evaluation, and Control Group, U.S. Army Project TEAM, 1 Dec 1964).

[228] The ARAME Final Report was submitted under cover letter (Lt. Gen. C. W. G. Rich [test director, Project TEAM] to CG CDC, [Fort Benning, Ga.], 15 Jan. 1965, sub: Test Report on Air Mobility Concept) as U.S. Army Project TEAM, Test, Evaluation, and Control Group, *Field Test Program, Army Air Mobility Concept, Final Report*, vol. I: *Basic Report and Annexes A–D* (Fort Benning, Ga.: Test, Evaluation, and Control Group, Project TEAM, 15 Jan 1965). As Lt. Gen. Rich noted in the Final Rpt (p. 1): "This report incorporates all the experience derived from field testing and functional tests conducted by the Test, Evaluation, and Control Group (TEC Group) since its inception in February, 1963. However, this document is primarily a report of AIR ASSAULT II. . . ."

[229] Project TEAM, TEC Group, *Field Test Program, Army Air Mobility Concept, Final Report*, I, pp. 42–43.

[230] See ARAME Final Rpt.

[231] ARAME Final Rpt, I, Abstract, p. AB–1. The full range of sources upon which the evaluations were based is cited in ARAME Final Rpt, I, pp. I–1 to I–3.

[232] Ibid., I, Abstract, pp. AB33–AB34.

[233] Tolson, *Airmobility*, p. 61.

[234] Ibid.

[235] Ibid. The tumult and sense of urgency at Fort Benning during the transition period will be remembered by anyone there at the time. On a personal note, I was then a fairly senior infantry second lieutenant assigned to the 5th Infantry Division (Mechanized) at Fort Carson, Colo., but was TDY to Fort Benning in the spring and summer of 1965 to attend the Infantry Officer Basic Course and Airborne School. Several of my Basic Course classmates, including at least one aviator, were pulled out early to fill positions in the new 1st Cavalry Division (Airmobile). I myself avoided becoming part of the combat testing of the division in Vietnam by virtue of being already assigned to the 5th Infantry Division, which was itself a candidate for deployment. An evocative, if impressionistic, account of the atmosphere at Fort Benning during the period of the testing of the 11th Air Assault Division and the subsequent activation of the 1st Cavalry Division (Airmobile) is conveyed by the beginning of the book *We Were Soldiers Once and Young* by Lt. Gen. Harold G. Moore (USA Ret.) and Joseph Galloway and of the movie made from the book, which starred Mel Gibson.

[236] Stockfisch, *The 1962 Howze Board and Army Combat Developments*, p. 28. Moreover, all but six of the armed Mohawk aircraft were eliminated, the remaining six to be used only for reconnaissance and surveillance; the "Little John" rocket battalion was deleted; and the personnel of one brigade had to be qualified as parachutists (see Tolson, *Airmobility*, pp. 61–62). Stockfisch (*The 1962 Howze Board and Army Combat Developments*, p. 28) has commented that the Mohawks "were sacrificed" by Army Chief of Staff General Harold K. Johnson "on the altar of interservice peace."

[237] Raines, *The Role of Analysis in the Approval of the Army's Airmobile Concept*, p. 9.

[238] Tolson, *Airmobility*, p. 62. The subsequent history of the 1st Cavalry Division (Airmobile) and of the concept of airmobility in general as it applied in the Vietnam War are summarized admirably in Tolson, *Airmobility*.

[239] Lt Gen John P. Daley, *Status Report on U.S. Army Combat Developments Command* (Washington, D.C.: U.S. Army Combat Developments Command, 20 Mar 1963), pp. 8–9. The "Air Assault Division" and "Offensive Operations in Vietnam" war games began in January 1963 and ran for an extended period. As noted above, the TEC Group became a CDC agency in March 1965 not long before its discontinuation.

[240] Ibid., p. 9.

[241] Ibid., pp. 6–8.

[242] Ibid., p. 8.

[243] Donald D. Blackburn, "Punch and Counterpunch," *Army Information Digest* 19, no. 4 (April 1964), p. 8.

[244] Ibid., p. 9; U.S. Department of the Army, Office of the Secretary of the Army, "Annual Report of the Secretary of the Army for Fiscal Year 1963," in U.S. Department of Defense, *Annual Report of the Secretary of Defense and the Annual Reports of the Secretary of the Army, Secretary of the Navy, Secretary of the Air Force, for Fiscal Year 1963* (Washington, D.C.: Government Printing Office, 1964), p. 166.

[245] The operating divisions are described in Blackburn, "Punch and Counterpunch," pp. 9–10.

[246] Ibid., p. 8.

[247] On the lack of influence of the OSD Systems Analysis Office, see Clark A. Murdock, *Defense Policy Formation: A Comparative Analysis of the McNamara Era* (Albany, N.Y.: State University of New York Press, 1974), pp. 94–95; and Alain C. Enthoven and K. Wayne Smith, *How Much Is Enough? Shaping the Defense Program, 1961–1969* (New York, Evanston, and London: Harper & Row, 1971), pp. 270–71 and passim.

[248] Murdock, *Defense Policy Formation*, p. 94.

[249] Enthoven and Smith, *How Much Is Enough?* p. 270.

[250] As one former OSD analyst told Clark Murdock (quoted in *Defense Policy Formation*, p. 95), the Systems Analysis Office included not a few antiwar people who were eager to avoid being tied to the Johnson administration's conduct of the war.

[251] Enthoven and Smith, *How Much Is Enough?* p. 293.

[252] Ibid., pp. 270–71.

[253] Ibid., pp. 293–94.

[254] Ibid., pp. 303–06.

[255] Ibid., pp. 292–93.

[256] Gen Ferdinand J. Chesarek (USA Ret.), *Oral History Interviews with Lt. Col. Richard Lawrence and Lt. Col. James Agnew*, USAWC/USAMHI Senior Officer Oral History Program, Carlisle Barracks, Pa., 1971, vol. I, Interv no. 1, 25 Feb 1971, pp. 51–52.

[257] Enthoven and Smith, *How Much Is Enough?* p. 292.

[258] Ibid. Enthoven alleged that on two occasions the chairman of the JCS tried to get Secretary McNamara to limit distribution of the monthly unofficial *Southeast Asia Analysis Report*, presumably because it might "frighten the natives."

[259] Ibid., p. 291.

[260] Ibid.

[261] Ibid., p. 307.

[262] Lt Gen John H. Hay, Jr., *Tactical and Materiel Innovations*, Vietnam Studies Series (Washington, D.C.: U.S. Department of the Army, 1974), p. 3.

[263] Ibid., pp. 8–9.

CHAPTER NINE

ORSA in Vietnam, 1961–1973

The bulk of the formal Army operations research and systems analysis (ORSA) studies, analyses, war games, tests, and evaluations pertaining to counterinsurgency, airmobility, and other aspects of the war in Southeast Asia were conducted by Army ORSA contractors and in-house organizations in the continental United States. In 1971, Dr. Alain C. Enthoven, the assistant secretary of defense (systems analysis), described the efforts of his office to promote the use of ORSA by the military forces in Southeast Asia as a failure and concluded, "U.S. military operations in Southeast Asia have been notable for a lack of systematic learning by experience."[1] In fact, ORSA techniques were used at every level by U.S. forces in the combat zone, from Headquarters, United States Military Assistance Command, Vietnam (HQ MACV), down even to company level.

HQ MACV was a joint headquarters and had its own Research, Development, Test, and Evaluation (RDTE) and ORSA elements, of which Army analysts and organizations using ORSA techniques, such as the Army Concept Team in Vietnam, were a part. The Army's principal ORSA contractors, such as the Research Analysis Corporation and the Human Resources Research Office, maintained field offices in Thailand and Vietnam and conducted studies and analyses using ORSA methods, and the Combat Developments Command (CDC) Combat Operations Research Group (CORG) conducted two major studies in Vietnam, one dealing with Army combat operations in general and another dealing with the employment of mechanized and armor units, as well as other studies using ORSA techniques. At field force (corps) and division levels, ORSA methods were employed in the classic mode to improve the performance of weapons and equipment and to find more effective organizations and tactics. Even at the company level, Army officers frequently employed what amounted to ORSA techniques to answer specific questions, such as how best to organize a defensive perimeter, schedule guard forces, optimize convoy loading procedures, and plan vehicle maintenance. Although usually not identified as such, ORSA methods were pervasive.

There was a dark side to the use of statistical and analytical techniques in Southeast Asia, and some activities in the war zone proved impervious to scientific analysis. For example, the use of the "body count" as a measure of success in operations against the enemy was widely condemned as counterproductive, and attempts to measure the success of rural pacification efforts also proved inaccurate and misleading. The inadequacies and negative effects of such failed methods have often been blamed on the ORSA community. In fact, they were the product of civilian leaders, commanders, and staff officers who lacked a proper understanding of the capabilities and limitations of statistical and analytical techniques, selected poor measurement standards, or manipulated the data. Army ORSA managers and analysts generally opposed such abuses and normally were not involved in committing them, but in the public mind, the manipulation of statistical data and its use to support false claims of efficiency and progress came to be associated, however inaccurately, with ORSA. As a result, the reputation of ORSA as a useful aid to military decision making was unjustly sullied and took some time to recover.

ORSA at HQ MACV Level

In the late 1950s and early 1960s, the Communist insurgency in South Vietnam grew substantially and began to threaten the existence of the generally pro-Western government of the Republic of Vietnam. The United States had for some time provided military advisers and materiel support to the South Vietnamese government, and soon after President John F. Kennedy's administration took office in January 1961, Kennedy approved a significant increase in that support, particularly the number of advisers, and U.S. command arrangements were altered to reflect the growing U.S. commitment. In February 1962, the Joint Chiefs of Staff established the United States Military Assistance Command, Vietnam, as the senior U.S. military headquarters in South Vietnam and appointed General Paul D. Harkins as commander (COMUSMACV).[2] HQ MACV eventually took on all of the functions of a theater headquarters, including supervision of its own ORSA element and of a wide-ranging program of research, development, testing, and evaluation of weapons and equipment applicable to counterinsurgency warfare. Moreover, HQ MACV also controlled all U.S. combat and support units in South Vietnam, and each of those units aggressively pursued both formal and informal programs to develop more effective tactics suitable to the environment and enemy faced in Southeast Asia. The effort to improve weapons, equipment, and tactics naturally involved a good deal of study and analysis using ORSA techniques. Thus, while Dr. Enthoven's claim that "there was no organized critical analysis of the strategy and operations of the Vietnam war—cost-effectiveness or otherwise" may have been true with respect to higher-level strategy and operational doctrine, there was certainly no lack of ORSA-type work being done by U.S. military forces in Southeast Asia in other areas.[3]

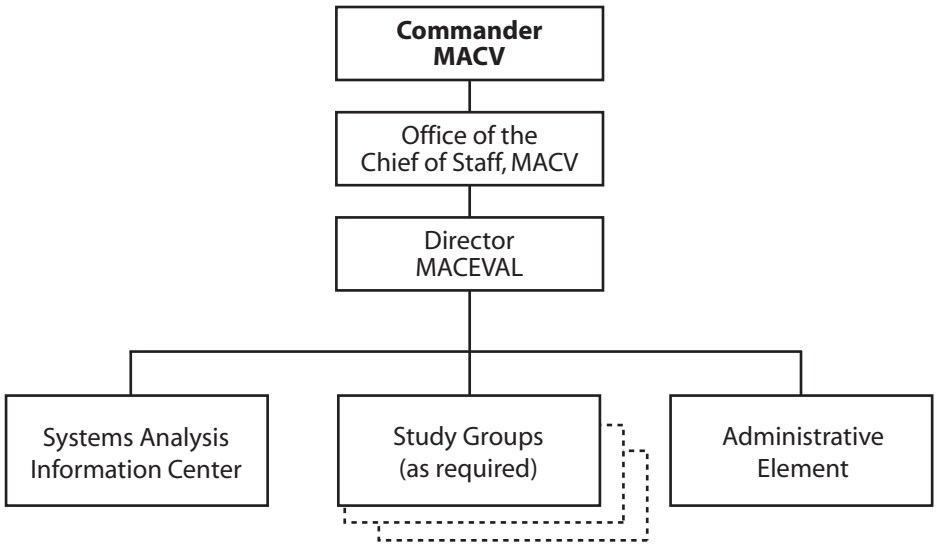
Although the MACV Science Advisor and the Joint Research and Test Activity had some ORSA responsibilities and personnel assigned, the principal ORSA organization at HQ MACV level was the MACV Operations Research and Systems Analysis Office (MACEVAL), established in the Office of the MACV Chief of Staff on 13 September 1967 by direction of the deputy commander, MACV (DEPCOMUSMACV).[4] A personnel complement of eighteen military and civilian analysts headed by a colonel (USA or USAF) or captain (USN) was approved, and MACEVAL became operational on 2 November 1967.[5] Two specific areas of research were designated for the new organization: (1) the analysis of statistical indicators to evaluate current indicators for measuring the progress of the war effort as well as research for new systems; and (2) the analysis of resource allocations to determine if a better distribution of effort could be found.[6] And on 14 November 1967, the formal functions and responsibilities of MACEVAL were established by MACV directive as the following:

> (1) *Functions*:
> a) Conducting in-depth studies as directed by the Command Group which employed the techniques of operations research.
> b) Reviewing studies as directed by the Command Group to insure the adequacy of approach and significance of findings.
> c) Monitoring the overall systems analysis effort within MACV.
> (2) *Responsibilities:*
> a) To be the principal advisor to COMUSMACV on matters concerning systems analysis.
> b) Supervise and coordinate the conduct of studies as directed.
> c) Monitor the overall systems analysis effort within MACV.[7]

As of mid-October 1968, MACEVAL had four civilian positions (three GS–15 operations analysts and one GS–7 technical information specialist), all of which were vacant.[8] At that time, MACEVAL was organized as shown in Figure 9–1.

The Systems Analysis Information Center monitored the ORSA study efforts within the MACV staff and component commands; assisted the director in the assignment of study tasks; accredited and monitored ORSA study groups not organic to MACV operating in South Vietnam; maintained a filing system for ORSA study abstracts; and was the focal point for information on ORSA within MACV.[9] Study groups were organized as required and conducted studies employing ORSA methods; reviewed studies as directed by the Command Group to ensure objectivity of conclusions and adequacy of recommendations; provided computer systems analysis and programming support for in-house studies; and coordinated with the MACV Data Management Agency for computer

Figure 9–1—Organization of MACEVAL, September 1968



Source: U.S. Military Assistance Command, Vietnam, *Organization and Functions Manual*, with Changes 1–13 (APO SF 96222: HQ MACV, 16 Sep 1968), pp. XXVI–1 and XXVI–2 and organizational chart.

time and assistance in using the computer as a research tool.[10]

As soon as it was organized, MACEVAL was tasked to conduct a study to develop a methodology for measuring the relative combat capability of U.S. combat forces and those of the Army of the Republic of Vietnam (ARVN).[11] Phase I of the study was briefed to the DEPCOMUSMACV on 19 December 1967, and concluded, not surprisingly, that

1) US capability exceeded ARVN by a factor of 3.
2) ARVN was at the least relative disadvantage in III CTZ.
3) ARVN was at a relative firepower disadvantage against NVA [North Vietnamese Army].[12]

The Army Concept Team in Vietnam

Throughout the war in Southeast Asia the U.S. armed forces maintained active RDTE and combat developments programs in South Vietnam.[13] U.S. Army teams large and small conducted a wide variety of studies, analyses, and field tests to find new weapons, equipment, and concepts suitable to the unique physical and operational environment and to improve and adapt existing weapons, equipment, and concepts. Some teams were permanently assigned to Army headquarters in-country and others performed their tasks on temporary duty from stations in CONUS. The largest such organization, and the focal point of Army RDTE and combat developments efforts in Vietnam, was the Army Concept Team in Vietnam (ACTIV), which served in theater from October 1962 to April 1972.[14] Although ACTIV was focused on RDTE efforts, the team also made significant use of ORSA analysts and ORSA techniques.

Initial Deployment of ACTIV

In early October 1962, not long after the completion of the Howze Board report on Army aviation requirements, Secretary of the Army Cyrus R. Vance selected Brig. Gen. Edward L. Rowny, who had headed the Field Test Group of the Howze Board, to lead a team to South Vietnam to "test and evaluate new Army concepts for countering insurgency in the operational environment of South Vietnam."[15] Secretary Vance's intent was that General Rowny should assemble a team of some twenty-five Army officers (and a few Navy and Air Force officers as liaison personnel) and twenty-five civilian scientists who would go to Vietnam specifically

to test the concept of using armed helicopters in counterinsurgency operations.[16]

General Rowny quickly assembled his team, which included a respected armor officer, Col. Frank Clay, as deputy team chief; Col. Robert Kinkor, chosen for his writing skills; Col. William Tyrell; and a number of outstanding civilian scientists, some of whom General Rowny had met through his work on the Army Scientific Advisory Committee.[17] The team, which arrived in Saigon on 8 October 1962, was officially designated the Department of the Army Test Team (DATT) and was attached to the newly created HQ MACV on a temporary-duty basis.[18] In November 1962, the DATT was redesignated the Army Concept Team in Vietnam (ACTIV) and was reorganized as a Class II field activity assigned to the Army DCSOPS but under the operational control of COMUSMACV.[19]

Despite numerous administrative problems and general opposition from Navy and Air Force officials, General Rowny and his team quickly pressed forward with their assigned tasks and developed a program of thirty to forty experiments of two types: those designed "to assist the Vietnamese nation-building concept" and those designed "to help counterinsurgency operations."[20] The initial focus of ACTIV was on the tactical employment of armed helicopters, fixed-wing reconnaissance aircraft, aerial supply vehicles, and armored personnel carriers but soon expanded to include a wide variety of equipment and concepts, including such topics as special warfare, civic action and nation building, and psychological operations.[21] ACTIV subsequently produced approximately fifteen evaluation reports per year.[22] In all, between October 1962 and April 1972, ACTIV undertook approximately 660 projects, of which about 55 percent were completed and received a final report.[23] The projects that remained were canceled for one reason or another. ACTIV also assisted the South Vietnamese in improving village infrastructure and agricultural productivity, tried various methods for village defense against the Viet Cong, trained South Vietnamese militia forces, and generally worked to raise the morale and security of pro-government villages and hamlets.[24]

ACTIV was based in Saigon where it could work closely with the MACV staff and other U.S. government agencies, and team members were organized into small groups focused on a certain piece of equipment or a certain concept. ACTIV team members, and General Rowny in particular, spent much of their time in the field observing operations and consulting with U.S. advisers to the South Vietnamese forces, taking special care not to interfere in ongoing operations. They did not control operations, but "simply observed, evaluated results, and made suggestions for improvement."[25]

General Rowny's tour as chief of ACTIV ended on 2 June 1963. During his tenure, ACTIV established itself on the ground in Vietnam, initiated an ambitious program of testing and evaluating weapons, equipment, and concepts, and grew substantially. He later reviewed the successes and failures of the original manifestation of ACTIV and concluded:

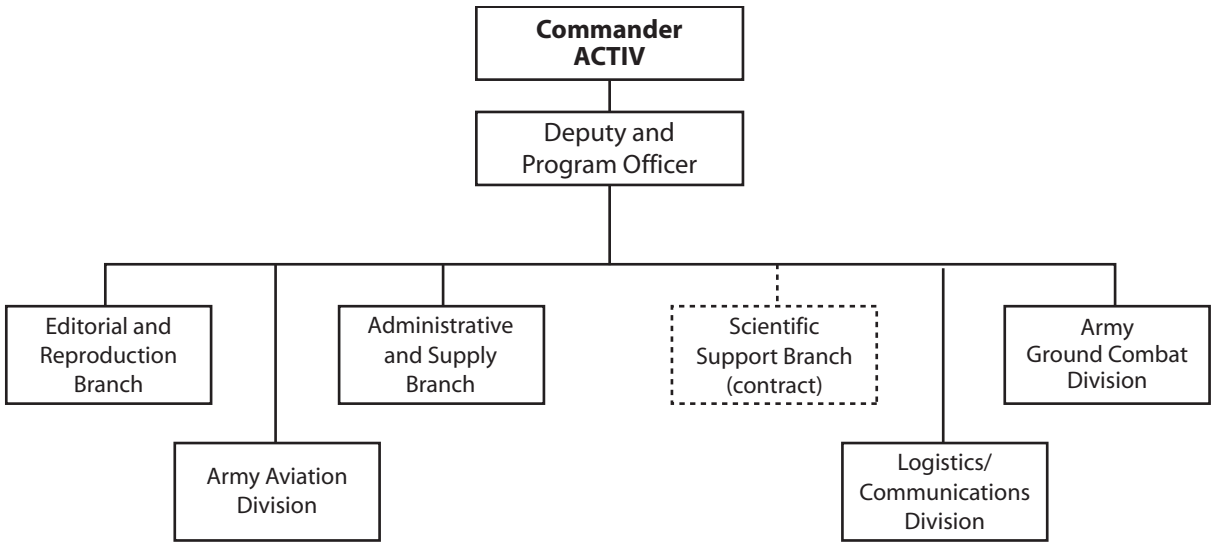
> I think we brought several innovative ideas on nation-building to Vietnam. But our biggest success was the work we did in demonstrating that the air mobility concept was a good one for fighting a counterinsurgency war. I believe our studies were the necessary link which led to the formation and deployment of the air mobile division in Vietnam.[26]

Organization and Functions of ACTIV, June 1963–April 1972

Following the departure of General Rowny in June 1963, ACTIV continued to expand both in size and in the scope of its RDTE and combat developments activities. In April 1964, ACTIV became a subordinate element of the Joint Research and Test Activity (JRATA), as discussed above. With the discontinuance of JRATA in November 1966, ACTIV was reassigned as a subordinate command of HQ USARV, and in February 1967, ACTIV relocated to HQ USARV at Long Binh Post outside Saigon, where it remained until it was deactivated in April 1972.[27]

As of 31 October 1966, ACTIV was authorized fifty-three permanent party personnel (twenty-seven officers, one warrant officer, and twenty-five civilians) plus another thirty-five TDY personnel and had on hand seventy-four permanent party personnel (thirty-four officers, one warrant officer, and thirty-nine civilians) and forty TDY personnel (twenty officers, two warrant officers, and eighteen civilians).[28] In November 1966, when it was transferred to HQ USARV control, ACTIV was organized as shown in Figure 9–2. In

Figure 9–2—Organization of ACTIV, November 1966



Source: U.S. Army, Vietnam, *Organization and Functions Manual* (APO SF 96375: HQ USARV, 26 Dec 1970), app. A, p. A–1.
Note: The Scientific Support Branch was manned by contractor personnel.

October 1970, HQ USARV was reorganized and ACTIV became an appendage of the HQ USARV Deputy Chief of Staff, Operations, Plans, and Security (USARV/DCSOPS) under the chief of the USARV DCSOPS Doctrine, Systems Analysis, and Evaluation Division (ACTIV), who was also designated as the commander of ACTIV.[29]

Although ACTIV was reorganized and changed locations several times between 1962 and 1969, its missions remained essentially the same: to

- Conduct evaluations of new or improved Army operational and organizational concepts, doctrine, tactics, techniques, procedures, and materiel.
- Recommend improvements to increase the combat effectiveness of Army units of the U.S., Army of the Republic of Vietnam (ARVN), and Free World Military Assistance Forces (FWMAF) operating in RVN.[30]

On 1 September 1969, ACTIV was assigned the additional mission of performing certain R&D functions previously supervised by JRATA and the MACV Science Advisor's Office.[31] The new functions included the following:

- Coordinate and direct all US Army R&D activities in the operational environment of RVN, including management of the Vietnam Laboratory Assistance Program, Army (VLAPA).
- Serve as the Army point of contact between MACV and DA on CD&ME [Combat Developments and Materiel Evaluation] and R&D matters.[32]

In December 1969, HQ MACV and HQ USARV agreed upon procedures that extended U.S. Army RDTE and combat developments support to the Army of the Republic of Vietnam, and ACTIV was designated as the nucleus of that effort under President Nixon's Vietnamization program.[33] Materiel and concepts developed for U.S. Army use were subsequently evaluated by both ACTIV and ARVN units for possible adoption by ARVN. With the reorganization of HQ USARV on 1 October 1970, ACTIV also assumed responsibility for the doctrine and materiel systems functions formerly assigned to the USARV deputy chief of staff, operations (G–3), including management of the Expedited, Nonstandard Urgent Requirement for Equipment (ENSURE) program and the compilation, analysis, and publication of the Operations Reports/Lessons Learned (ORLL) reports on U.S. Army concepts and techniques derived from operations in Vietnam.[34]

ACTIV was inactivated in April 1972, at which time all of its formal and informal projects had been completed except for Project No. ACG–83F, the final

evaluation of Army RDTE/CD activities in Vietnam, which was being prepared in CONUS.[35] ACTIV's residual functions were transferred to DCSOPS, HQ USARV, on 1 May 1972.[36]

Contractor Support of ACTIV

During FY 1968 (1 July 1967 to 30 June 1968), ACTIV was supported by a team of scientists and analysts from Litton Systems, Inc.[37] On 1 July 1968, the contract to furnish scientific support to ACTIV passed to Booz-Allen Applied Research, Inc., and the one-year contract was subsequently extended three times and terminated on 21 June 1972, following the inactivation of ACTIV.[38] Under the terms of the contract's statement of work, Booz-Allen was obligated to provide "the necessary skills, materials, services, and support to perform such scientific analysis projects as assigned by the Commanding Officer, ACTIV."[39] The actual support provided by Booz-Allen between 22 July 1968 and 21 June 1972 was concerned primarily with

- Developing guidelines for planning, conducting and reporting on evaluations
- Assistance in preparation of documents associated with evaluations, particularly the Plan of Research
- Participation in ACTIV reviews of documents
- Technical editing and writing of documents.[40]

Booz-Allen also provided day-to-day assistance with specific problems, answered queries from Army and other U.S. government agencies in CONUS and in Vietnam, and provided advice to ACTIV on data collection, analysis, and presentation.[41]

During most of the period in which Booz-Allen provided scientific support for ACTIV, its onsite team consisted of five persons: a senior scientist as team leader, an aeronautical engineer, an operations analyst (ground combat), an operations analyst (electronics/logistics), and a technical editor.[42] Some thirteen Booz-Allen employees filled the various positions at various times during the four-year period, but Booz-Allen Senior Scientist J. C. McGuire remained in place for the entire period.[43]

The activities of the Booz-Allen team in support of ACTIV over a four-year period produced a number of lessons learned that were recapitulated in the Booz-Allen report. They included such observations as

(1) A team of civilian analysts is essential to the conduct of a CD&ME [Combat Developments and Materiel Evaluation] program such as that carried out by ACTIV and often represented the most effective source of continuity in an evaluation where there was a turn-over of project officers.
(2) Close coordination and good rapport between the civilian analysts and the project officer are needed throughout the entire course of an evaluation.
(3) More careful thought and greater effort should have gone into the preparation of evaluation plans than was often the case.
(4) More formal indoctrination of new project officers was needed.
(5) Greater care should have been given to the definition of evaluative criteria.
(6) Data collection requires close supervision by the project officers and evaluators.
(7) The total length of time involved in an evaluation was often excessive.
(8) Review boards [,] though often lengthy and not always as productive as was possible, served a vital role in the overall production of a high quality report.
(9) The ACTIV library should have been developed more extensively and completely.
(10) The number of large evaluations, formal or informal, assigned to one analyst in a given fiscal year should not exceed three and these should be phased through the year to permit adequate attention to be given to each.
(11) Data collected for a project must be preserved until the final report is approved and published. Each new project officer should be indoctrinated with this rule when he reports for duty.[44]

ORSA Contractor Operations in Southeast Asia

Almost every Army ORSA contractor participated to some degree in the conduct of studies, analyses, tests, and evaluations in-country. As just noted, Litton Systems, Inc., and Booz-Allen Applied Research, Inc., provided extensive direct support to the Army Concept Team in Vietnam. HumRRO sent teams to Vietnam to study training and operational needs for use of night-vision devices and for other projects, and SORO/CRESS also conducted some projects in-country.[45] CORG conducted two major studies in Vietnam and contributed to several others.[46] Perhaps the greatest contribution to Army ORSA work in Vietnam, in terms of manpower and number of studies produced, was made by RAC.

In August 1962, RAC opened the Southeast Asia Field Office (RACSEAFO) in Bangkok, Thailand, with a suboffice in Saigon, South Vietnam.[47] The RACSEAFO resulted from a special study conducted by RAC in coordination with OCRD and the DOD Advanced Research Projects Agency (DARPA) that assessed "the desirability and feasibility of undertaking operations analysis studies of guerrilla and antiguerrilla warfare in Vietnam, Thailand, and Laos."[48] RACSEAFO operated under a contract with DARPA to conduct ORSA studies on ground operations, logistics, and mobility. Initially, the RAC office in Bangkok was staffed with four analysts (Mark Eisner, Dick Burke, Bob Ryan, and Charlie Warner) and one secretary (Ruby Herb), but plans for the office's work program projected the need for around ten analysts either in the field or as backup in Washington.[49] Eventually, the resident staff in Bangkok was augmented by so-called safari teams that worked on problems in the field.[50]

RACSEAFO operated under the aegis of the DARPA Field Unit in Bangkok, a part of DARPA's Project AGILE, a worldwide effort to record, develop, evaluate, and improve the equipment and ideas to counter insurgencies.[51] The DARPA Bangkok Field Unit comprised the U.S. side of the joint Thai–U.S. Military Research and Development Center, which had a staff of 220 Thai military and civilian personnel, a four-man Australian R&D team, two British representatives, and 130 American military and civilian personnel, of whom ninety-five were representatives of various contractors, including SRI, Booz-Allen Applied Research, Inc., and RAC.[52] The focus of most RACSEAFO studies was on counterinsurgency, and the initial task of the RAC analysts in Bangkok was to study Thai logistical systems and mobility in counterinsurgency operations. Some fifteen separate studies were conducted as part of the main project, and RACSEAFO also contributed to projects sponsored by the U.S. Overseas Mission, Military Assistance Command-Thailand, and the Southeast Asia Treaty Organization.[53]

In April 1964, RACSEAFO was split into two independent field offices: RAC Field Office-Thailand (RACTHAI) in Bangkok and the RAC Field Office-Vietnam (RACVN) in Saigon.[54] Charles A. Warner, who had served as the director of the Bangkok office from 1962, remained until 15 May 1964, when he was replaced by R. William Rae.[55] From 1966 to 1969, the director of RACTHAI was Roswell ("Roz") B. Wing.[56] With the winding down of the war in Southeast Asia, the American analysts and support personnel of the RAC office in Bangkok were replaced by Thais. In May 1970, there were five Thai analysts and one Thai secretary in the Bangkok office and only one remaining American, Dick Sharp.[57] Their work was focused on the Royal Thai government programs in rural Thailand.

Between 1962 and 1970, RACSEAFO/RACTHAI produced a number of important studies relating to insurgency and counterinsurgency in general and in Thailand in particular. Representative samples of those studies are listed in Table 9–1.

The RAC Field Office-Vietnam in Saigon was established in 1962 as part of RACSEAFO and became an independent field office on 6 April 1964.[58] James W. Johnson, who had been the coordinator of the Saigon office under RACSEAFO since 1962, was appointed director of the newly independent Saigon office.[59] RACVN was co-located with the Saigon Combat Developments Test Center adjacent to the Navy Yard in downtown Saigon, and office facilities were shared with the DARPA Saigon Field Unit, other contractors, and their Vietnamese counterparts.[60] The RAC staff in Vietnam initially focused on a study of ambushes and defenses against them, and their recommendations were "sometimes implemented with incredible speed—even before the ink is dry on the briefing chart!"[61] Other elements of the work program of the RAC Saigon office included in-depth studies of medical problems, assessments of enemy capabilities, and various other aspects of insurgency and counterinsurgency operations in South Vietnam. One of the major projects undertaken was a four-month study for DARPA of the security of inland waterways in South Vietnam conducted by Harry Handler, Dorothy Kneeland Clark, David C. Bowie, and Glen J. Vanderwerker.[62]

In addition to those studies already listed above in tables 8–1, 8–5, and 9–1, RAC analysts produced a substantial number of other studies and analyses on topics related to U.S. Army combat and support operations in Southeast Asia. Some were prepared by analysts at the RAC office in McLean, Virginia, but most were prepared in-country, and all involved some in-country data collection. Some representative RAC studies are listed in Table 9–2.

Table 9–1—List of Representative RAC Studies on Counterinsurgency in Thailand

RAC Number	*Title*	*Date*
RAC-FP-2	The Highway System of Thailand	Aug 1964
RAC-FP-3	The Railway System of Thailand	Sep 1964
RAC-FP-4	The Inland Waterway Transport System of Thailand	Sep 1964
RAC-FP-7	Supply Requirements for Royal Thai Government Deployment in Advanced Insurgency in Northeast Thailand	Dec 1964
RAC-FP-8	Crime Statistics as an Indicator of Insurgency in Thailand: A Preliminary Survey	Mar 1965
RAC-FP-9	Royal Thai Government Transport Capability in Advanced Insurgency in Northeast Thailand	Apr 1965
RAC-FP-10	Mobility in Counterinsurgency Response Type Operations	Apr 1966
RAC-FP-11	Border Patrol Police Capabilities and Potential for Counterinsurgency in Thailand	Jun 1965
RAC-FP-12	Counterinsurgency Search and Intercept Operations	Sep 1965
RAC-FP-15	Vulnerability of Thailand's Electric Power System to Insurgent Sabotage or Attack	Oct 1966
RAC-FP-17	A Vulnerability Analysis of the Lines of Communication for RTG Counterinsurgency Operations in Northeast Thailand	Sep 1967
RAC-FP-19	Proposed Criteria for Indicators of Incipient Insurgency	Sep 1967
RAC-FP-20	Insurgent Psychological Operations, Recruitment, and Training in Thailand: A Descriptive Survey	Jan 1969
RAC-FP-21 (FOT)	Insurgent Base and Support Systems of Northeast Thailand	Sep 1968
RAC-FP-23 (FOT)	Revolution in a Non-Revolutionary Society: An Exploratory Analysis of Insurgent-Villager Interactions in Thailand	Jul 1969
RAC-TP-101 (SEA)	Counterinsurgency Organizational Structure in Thailand	Dec 1963
RAC-TP-163 (FOT)	Concept of Insurgency Conflict	Aug 1965
RAC-TP-203 (FOT)	Border Patrol Police Capabilities and Potential for Counterinsurgency in Thailand	Apr 1966
RAC-TP-284	Water Supply for Counterinsurgency Operations in Northeast Thailand	Mar 1968
RAC-TP-312	Insurgent Network Analysis in Northeast Thailand	Apr 1968
Unnumbered	Counterinsurgency Organizations and Programs in Northeast Thailand, 7 volumes	Dec 1969

Source: Research Analysis Corporation, *RAC Publications List* (McLean, Va.: Research Analysis Corp., Feb 1972).

Note: Studies marked SEA were prepared by RACSEAFO and those marked FOT were prepared by RACTHAI.

Table 9–2—Representative RAC Studies on Combat and Support Operations in Southeast Asia

RAC Number	*Title*	*Date*
RAC-SP-2 (SEA)	Statistical Analysis of Medical Records of Joint Task Force 116 in Thailand in Spring and Summer of 1962	Apr 1963
RAC-SP-4 (SEA)	River and Canal Ambush Problems, Republic of Vietnam, 1962	Apr 1963
RAC-SP-3 (SEA)	Counter-Ambush Techniques to Protect Military Vehicular Traffic on Major Highways in South Vietnam	May 1963
RAC-TP-91	Civic-Action and Support Roles of Medical Personnel in Countering Insurgency	Jun 1963
RAC-T-420 (SEA)	Spike Wounds in the Vietnamese Guerrilla War	Feb 1964
Unnumbered	Riverine Minecountermeasures in Viet-Nam, 1964	Apr 1964
RAC-T-457 (FOV)	Power-Line Security for the Da Nhim Transmission Line in Vietnam	Aug 1965
RAC-T-467	Night-Vision Devices for Counterinsurgency: An Appraisal of the Effect of Varying Optical Parameters	Aug 1965
RAC-TP-186 (FOV)	Security of the Vietnamese Railway System	Oct 1965
RAC-TP-205 (FOV)	Aspects of Viet-Cong-Initiated Activities, January 1967–July 1965	Jan 1966
RAC-T-474	Analysis of Cross-Country Surface Vehicles for South Vietnam	Mar 1966
RAC-TP-247	Strategic Analysis of the South Vietnam Conflict	Mar 1967
RAC-TP-251	Viet Cong Force Projections: Manpower and Weapons	Apr 1967
RAC-FP-16 (FOV)	The Hamlet Evaluation System in the Republic of Vietnam	Jul 1967
RAC-TP-275	Environmental Factors Affecting the Location of Viet Cong Tunnels	Jan 1968
RAC-TP-303	An Evaluation of the NCR 500 Computer System in Vietnam	Feb 1968
RAC-TP-305	Viet Cong Control in the Saigon Gia Dinh Special Zone	May 1968
RAC-R-82	Feasibility of Collecting Repair Parts Demand Data in Vietnam	Nov 1969
RAC-R-131	Combat Operations Loss & Expenditure Data-Vietnam (COLED-V)	Aug 1971

Source: *RAC Publications List* (Feb 1972).

Note: Studies marked SEA were prepared by RACSEAFO and those marked FOV were prepared by RACVN.

The ARCOV and MACOV Studies

In 1966 and 1967, the U.S. Army conducted two major studies of combat operations in Vietnam. The first, titled "Evaluation of United States Army Combat Operations in Vietnam (ARCOV)," evaluated the four types of Army infantry battalions operating in Vietnam and was completed in April 1966. The second, titled "Evaluation of United States Army Mechanized and Armor Combat Operations in Vietnam (MACOV)," evaluated the performance of Army mechanized infantry, tank, armored cavalry, and air cavalry units in Vietnam and was completed in April 1967. Both studies involved extensive in-country data collection and analysis by a mixed team of military personnel and ORSA analysts provided by CORG. Both studies were systematic in-depth analyses of weapons, equipment, organization, and tactics using classic ORSA techniques and had a profound impact on the organization and operations of Army forces in the Vietnam War and after.

The ARCOV Study

On 7 October 1965, Army Chief of Staff General Harold K. Johnson wrote to General William C. Westmoreland, COMUSMACV/CG USARV, suggesting that a study be made of the comparative combat effectiveness of the four types of maneuver battalions in Vietnam.[63] Further discussion ensued, and on 27 December 1965, the CG CDC forwarded to General Westmoreland a draft plan for the evaluation.[64]

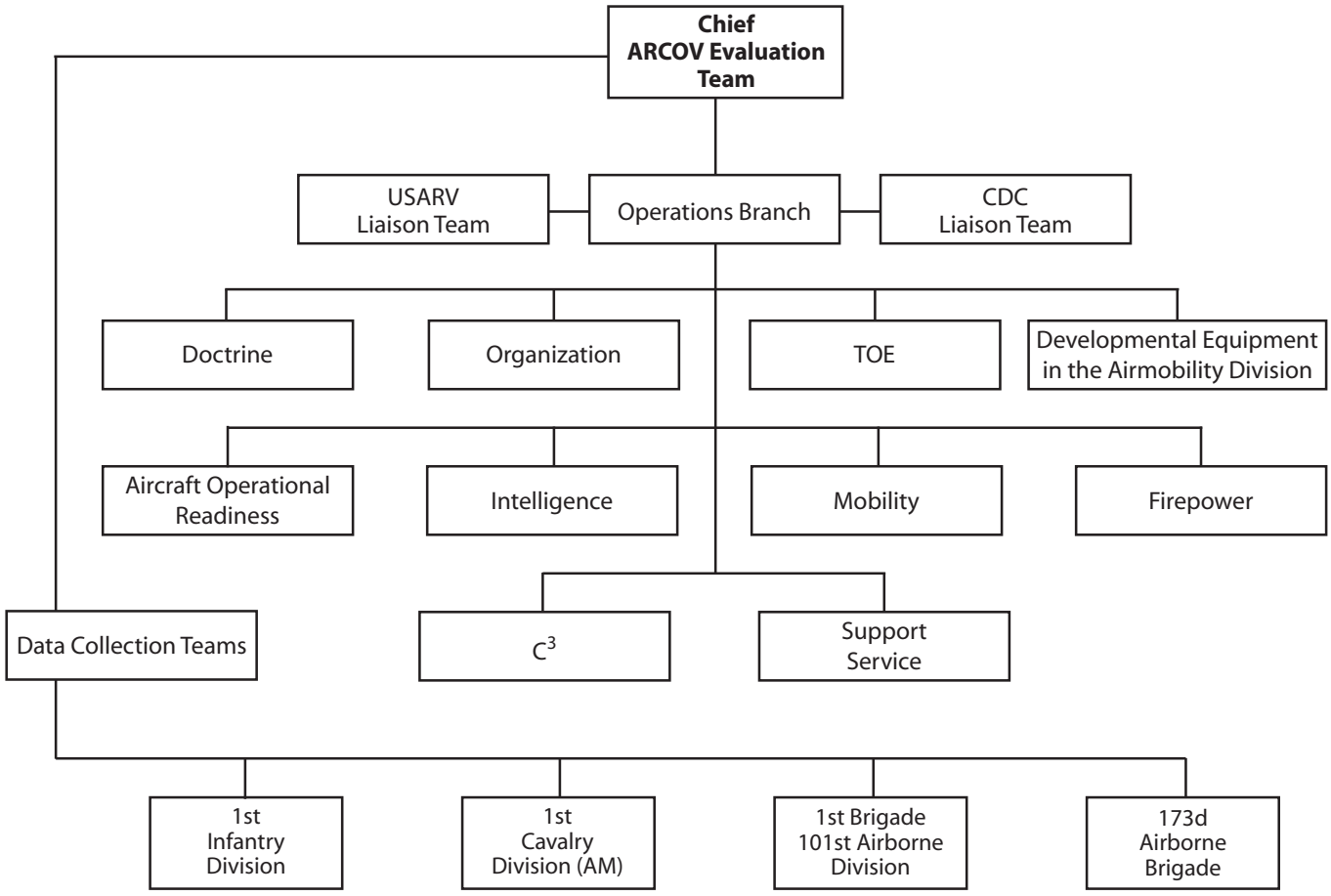
Organization of the ARCOV Evaluation Team

In early January 1966, Brig. Gen. George L. Mabry, Jr., was sent to Vietnam as a special assistant to CG USARV for the purpose of heading the ARCOV Evaluation Team.[65] At the same time, ten officers from ACTIV were placed on TDY to HQ USARV to provide an initial planning and coordinating cell and to get things rolling. A group of six OR analysts from CORG were sent to Vietnam from Fort Belvoir in early January 1966 to provide ORSA support, and a liaison team from CDC, led by Col. R. A. Winfield, Jr., who also acted as General Mabry's deputy, was also dispatched.[66] Meanwhile, fifty-one officers, ranging in grade from lieutenant to colonel, were selected from units in CONUS and United States Army Pacific (USARPAC) and sent TDY to HQ USARV to act as data collectors in the field. By early February 1966, fifty of the fifty-one TDY officers were in the field organized in two teams of nineteen officers each with the 1st Infantry Division and the 1st Cavalry Division (Airmobile) to collect and evaluate data at the division, brigade, and battalion level and two teams of six officers each with the 173d Airborne Brigade and the 1st Brigade of the 101st Airborne Division to collect and evaluate data at the separate brigade and battalion level.

The central element of the ARCOV Evaluation Team was organized into five sections corresponding to the five "functions of land combat" prescribed by HQ CDC (intelligence, mobility, firepower, C^3, and service support).[67] A CORG analyst was assigned to each of the five main sections, and an officer from ACTIV was assigned to each of the five principal and five additional sections (doctrine, organization, TOE, aircraft operational readiness, and developmental equipment for the airmobile division). The task of each section was to plan the data-collection effort and then assemble and analyze the data forwarded to them from the officers in the field and to write the functional area annexes to the team's report. An operations section, including the senior CORG analyst, Wesley E. Curtis, coordinated team activities under the direction of General Mabry. The resulting organization of the ARCOV Evaluation Team was as shown in Figure 9–3.

The ARCOV Evaluation Team was provided office facilities in the ACTIV headquarters in downtown Saigon, and uniformed team members were billeted in various military Bachelor Officers Quarters (BOQs) in the Saigon area while the civilian CORG team members found accommodations in private apartments.[68] The officers assigned to the data-collection effort, of course, lived in the field with the unit which they were to observe. Meals were taken in various military mess facilities or "on the economy," Saigon having a number of fine restaurants. Team members, including the CORG civilians, were provided post exchange and commissary privileges. Local transportation was provided by military bus service or the occasional taxicab or "cyclo" ride. The work day usually ran about ten hours, Monday through Saturday and some Sundays. Personal security, or

Figure 9–3—Organization of the ARCOV Evaluation Team, 1966



Source: U.S. Army Vietnam, *Evaluation of U.S. Army Combat Operations in Vietnam (Short Title: ARCOV)* (APO San Francisco 96307: HQ USARV, 25 Apr 1966), Incl 6 (Composition of ARCOV Evaluation Team), p. 6–4, Figure 6–1.

what is now called "force protection," was not a major preoccupation, for as E. B. Vandiver recalled, "we were too young and foolish to think about it. We probably should have, but we didn't."[69]

Study Scope, Tasks, and Methodology

The ARCOV study encompassed the collection and analysis of data from a wide range of sources, including after-action reports, observer reports, questionnaires, interviews with key personnel, commanders' evaluations, and several other types of reports and statistical accumulations. These provided the data needed to draw conclusions and make recommendations concerning improvements in doctrine, organization, and materiel for the four types of infantry battalions operating in Vietnam. The specific research tasks carried out by the ARCOV Evaluation Team included the following:

(1) Task 1. To determine the comparative effectiveness of maneuver battalion organizations of the 1st Cavalry Division (AM), the 1st Infantry Division, the 173rd Airborne Brigade, and the 1st Brigade of the 101st Airborne Division, and of the brigade and division echelons as they influence the effectiveness of battalion operations; and to provide recommendations for changes to doctrine, materiel, and organization to increase the efficiency of those organizations.

(2) Task 2. If the Task 1 evaluation discloses changes so extensive that a new type organization is required, to provide recommendations in the form of draft TOE's for the new type organization (never implemented).

(3) Task 3. To prepare a critical appraisal of developmental items of equipment now organic to the airmobile division under TOE 67T.
(4) Task 4. To provide appropriate recommendations for changes to doctrine, materiel, or organization required to increase the efficiency of the aircraft maintenance systems of the airmobile division.[70]

The data-collection and evaluation effort was organized around the five principal functions of land combat (intelligence, mobility, firepower, C^3, and service support) and included the preparation of a list of questions, the Essential Elements of Analysis (EEA), designed to obtain the data needed to solve a particular problem or make an evaluation of it. Special care was taken to ensure that the data-collection effort did not interfere with ongoing combat operations, and there were no extra reports or special data collections required of the combat units.

The collected data was forwarded to the functional sections in Saigon for synthesis, analysis, and evaluation. The process was described in the ARCOV Basic Report:

(1) A methodological approach to the comparative analysis was used by the five functional areas [Intelligence, Mobility, Firepower, C^3, and Service Support] to integrate the data contained in replies to the questionnaires [and other input] from the four type battalions [1st Infantry Division, 1st Cavalry Division (Airmobile), 173rd Airborne Brigade, and 1st Brigade, 101st Airborne Division] engaged in the four type missions [Search and Destroy, Clear, Route and Area Security, and Reserve/Reaction Force]. . . . The tabulated answers were collated by type battalion and by type mission to arrive at a consensus for a particular question and to identify for comparative purposes the differences which might be attributed to mission or to type battalion, its organization, or support. The answers to the series of questions related to a particular EEA and covering the subject of the EEA as completely as possible were then integrated and analyzed to provide the required single answer to the EEA. While it was imperative that quantitative results be obtained whenever possible, judgement was a highly important part of the analysis. Not only was judgement used in the analysis of the objectives of the study to decide which alternatives to consider and which factors were relevant to the evaluation but also in answering many of the questions not amenable to objective analysis and in interpreting the results.
(2) Significant differences by type battalion and by type mission were carefully noted and extracted for the comparative evaluation of battalions.[71]

Once analyzed, the data was evaluated by functional area "to determine what successful tactics, techniques, procedures, or field expedients had been described which might result in desirable changes in doctrine, organization, or equipment."[72]

Study Conclusions and Recommendations

The results of the ARCOV evaluation were published in a nine-volume report dated 20 April 1966.[73] The Basic Report was contained in Volume 1 and was followed by eight other volumes that were annexes to the Basic Report: Volumes 2 to 6 dealt with the five functional areas; Volume 7, with aircraft operational readiness; Volume 8, with developmental equipment for the airmobile division; and Volume 9 contained the recommended Modified Tables of Organization and Equipment pertinent to the recommendations made in Volume 1. The data supporting the analysis of the five principal functional areas was subsequently published separately by CORG in July 1966.[74]

The ARCOV Evaluation Team made five major recommendations:

1. Current doctrine should be expanded to incorporate lessons learned in Vietnam.
2. The assault elements of the rifle company should be foot mobile, the equipment of the assault elements of the maneuver battalion should be mobile by utility helicopter, and the equipment of the brigade force, including combat support and combat service support elements, should be mobile by medium helicopter.
3. The maneuver battalions in Vietnam should consist of a headquarters and headquarters company and four rifle companies.
4. Additional study should be made of the base camp problem to ascertain the best means of providing post, camp, and station type services and equipment, while relieving the combat units of these responsibilities to the extent feasible.
5. In order to bring the 1st Cavalry Division up to its designed lift capability, alternative courses of action should be analyzed using cost effectiveness techniques and production data together with the information contained in this report, to provide the most desirable means of increasing the division's lift.[75]

Recommendation 3 was the heart of the ARCOV evaluation effort and is perhaps the best known of the team's recommendations. As E. B. Vandiver III, the CORG analyst in the C^3 Section of the ARCOV

Evaluation Team and the one who recommended the four-company solution, later explained the problem:

> The way operations were conducted [in Vietnam], the principal type of operation was "search and destroy." The way it was done was with a sweep. You would have infantry on line sweep an area. Then they would either sweep into a group or have a reaction group that would engage when they found somebody. Typically, you needed two companies to get enough frontage for a sweep. You needed another company for a reaction force or an anvil, but you also had to secure a base and operate it, so you needed another company for that.[76]

The obvious solution, already adopted by U.S. Marine Corps units in Vietnam, was to add a fourth rifle company to the maneuver battalion structure.

Another important set of recommendations in the area under Vandiver's purview concerned control and coordination measures. In the early 1960s, the Army's control and coordination techniques were based on a conventional battlefield with a well-defined, continuous front line in contact with the enemy, a well-defined rear area, and fixed boundaries to control the operations of forces at various echelons. The nature of the war in Vietnam, with no fixed front line or rear area and highly mobile units, required different control and coordination measures. The ARCOV team developed a number of such measures suited to the situation in Vietnam. Among them were the concept of the Tactical Area of Responsibility (TAOR), a defined land area for which a given commander was given specific responsibility, and the Area of Operations (AO), a more clearly defined area required for the conduct and administration of military operations. Both measures were subsequently adopted as official Army and DOD control and coordination measures.[77]

Review and Approval of the ARCOV Study

The ARCOV Evaluation Team report was submitted to HQ USARV on 20 April 1966 and was subsequently forwarded to HQ CDC for review on 23 April 1966, with the recommendation that it be approved with only minor exceptions.[78] Combat Developments Command completed its review and forwarded the report to the DA ACSFOR on 30 April 1966.[79] The CG CDC, Lt. Gen. Ben Harrell, recommended approval of most of the recommendations contained in the ARCOV Evaluation Team report, particularly as they pertained to the use of TAOR and AO control measures, the addition of a fourth rifle company to each maneuver battalion, and the need to review the doctrine for operating bases in forward areas.[80] He also noted:

> The USARV ARCOV report is considered to be a definitive analysis of US Army combat operations in Vietnam at battalion level and at the division/brigade level as they affect battalion combat effectiveness. Objective in its approach, comprehensive in its treatment, and valid in its conclusions, the report accomplishes the purpose for which it was intended. Despite certain constraints of time, a limited number of personnel available for the evaluation, and the inevitable difficulties associated with data collection under conditions of combat, the report provides a wealth of doctrinal and statistical information which will be of continuing value to this command and the United States Army.[81]

On 26 October 1966, HQDA issued its approval of the ARCOV study recommendations.[82] All five of the study's major recommendations were approved with only minor modifications recommended by the CG USARV and CG CDC.[83]

The MACOV Study

Based on the success of the ARCOV evaluation effort, subsequent discussion with General Westmoreland, and further study by the Army Staff, Army Chief of Staff General Harold K. Johnson ordered a similar evaluation of the performance of mechanized infantry, tank, armored cavalry, and air cavalry units in Vietnam. Accordingly, on 12 September 1966, the HQDA ACSFOR tasked CG CDC to prepare a plan for an "Evaluation of United States Army Mechanized and Armor Combat Operations in Vietnam (MACOV)."[84] The plan, including study methodology and a draft field data-collection questionnaire, was prepared by HQ CDC, reviewed at a staff planning conference in early December, and subsequently approved and issued by HQDA.[85] On 12 December 1966, HQDA tasked CG USARV to carry out the proposed MACOV evaluation.[86]

Organization of the MACOV Evaluation Team

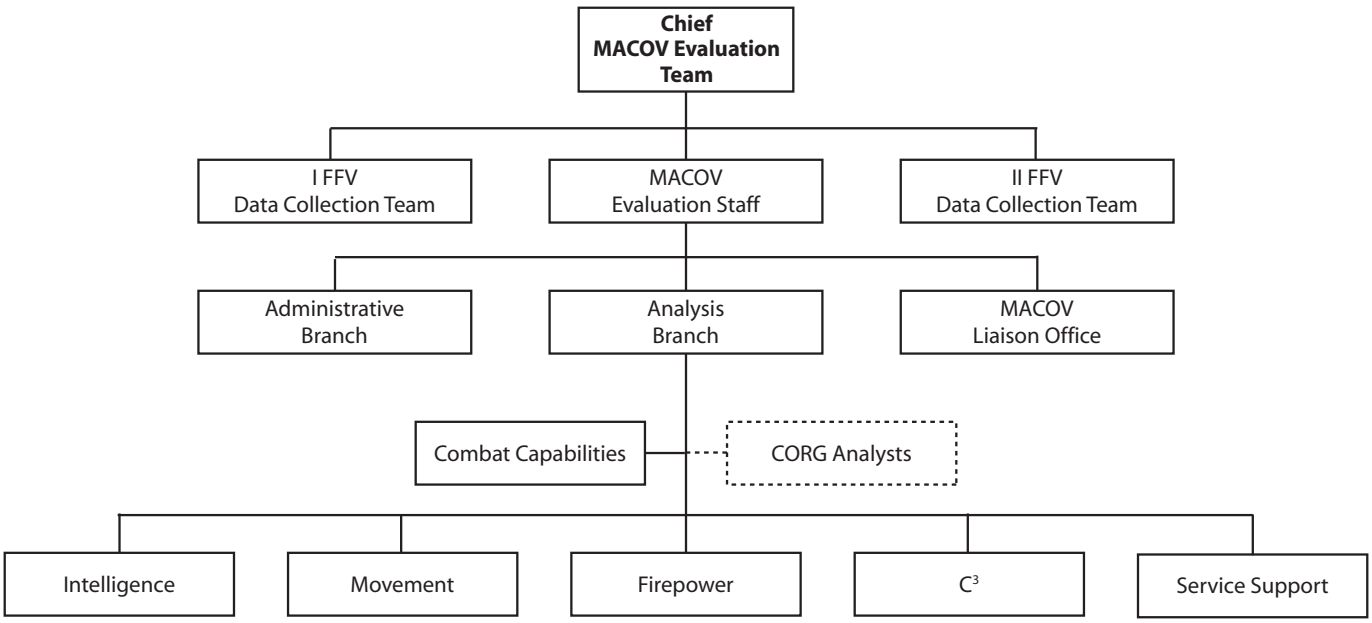
The organization of the MACOV Evaluation Team was very similar to that of the earlier ARCOV Evalua-

tion Team, although somewhat larger. As CG USARV, General Westmoreland was responsible for the overall conduct of the MACOV evaluation project. Maj. Gen. Arthur L. West, Jr., was appointed as the chief of the evaluation team, which consisted of some 100 officers, warrant officers, enlisted men, and civilians organized into an evaluation staff and two data-collection teams, as shown in Figure 9–4.[87] The necessary personnel were assembled in Saigon beginning 6 January 1967, and the data-collection effort was initiated on 11 January.[88]

The evaluation staff consisted of twenty-four officers, one warrant officer, and nineteen enlisted administrative personnel plus a seven-man team of civilian analysts from CORG. The officers were selected from the DA Staff, CDC, AMC, CONARC, ACTIV, and USARV, and 64 percent of them had prior service in Vietnam.[89] The seven-man CORG team was led by Eugene P. Visco and was composed of ORSA analysts knowledgeable in each of the five functional areas of land combat (intelligence, mobility, firepower, C^3, and service support) as well as the techniques and methodology of ORSA. The two data-collection teams were composed of forty-four officers, two warrant officers, and two senior noncommissioned officers.[90] The officer team members were assigned on TDY from staff elements and troop units of major commands in the United States, Hawaii, Korea, and Vietnam. The data-collection team assigned to I Field Force Vietnam (I FFV) consisted of fifteen officers, one warrant officer, and one senior NCO organized into six field teams of two officers each and three maintenance teams of one officer/warrant officer each.[91] The team assigned to II Field Force Vietnam (II FFV) consisted of thirty officers, one warrant officer, and one senior NCO and was organized in a similar manner with twelve two-officer field teams and six one-officer/warrant officer maintenance teams.

The DA-approved MACOV Evaluation Plan charged HQ USARV to provide billets, meals, transportation, and other support for the members of the MACOV evaluation staff in Saigon for the duration of the study, and HQ I FFV and HQ II FFV were tasked to provide similar administrative support for the data-collection teams.[92] The civilians on the CORG team found accommodations in various hotels in the Saigon area.[93] Office space for the MACOV Evaluation

Figure 9–4—Organization of the MACOV Evaluation Team, 1967



Source: MACOV Evaluation Plan, Incl 5, tab B, p. 5–B–1, and Incl 5, tab E, p. 5–E–1. A parallel organization was established at HQ CDC for planning purposes and some of the planning personnel subsequently became full-time members of the MACOV Evaluation Team in Vietnam (see MACOV Evaluation Plan, Incl 7, p. 7–1).

Team was provided in the ACTIV headquarters in downtown Saigon, just as it had been for the ARCOV Evaluation Team.

Study Scope, Tasks, and Methodology

The MACOV study was essentially "an evaluation of the effectiveness of battalions (squadrons) and the armored cavalry regiment—made in the context of brigade, division and field force operations."[94] As Maj. Gen. West noted in the MACOV Basic Report,

> the MACOV analysis was designed to obtain a maximum amount of data from actual field operations. While due consideration was given to after action reports, operational reports (Lessons Learned) and similar data sources, emphasis was placed on obtaining data from units of battalion, squadron and regimental size . . . directed at the type of conflict encountered and anticipated for the immediate future (FY 1967–1968) by U.S. Army units in Vietnam.[95]

The evaluation involved the collection of data principally from U.S. Army mechanized infantry, tank, armored cavalry, and air cavalry units in I FFV and II FFV.[96] Data regarding the experience of III Marine Amphibious Task Force and ARVN units with armor and mechanized forces was also collected and made part of the study database. The objective of the MACOV study was "to provide a basis upon which decisions could be made by the Department of the Army during FY 1967–1968, concerning mechanized infantry and armor units for deployment to and employment in the Republic of Vietnam (RVN)."[97] To further define the study objectives, the MACOV Evaluation Plan prescribed eight specific tasks, to which one additional task (task 9) was added later. The specified tasks were the following:

(1) Task 1. To evaluate the tactics employed by these units in RVN, to determine what changes, if any, in training and doctrine are necessary.
(2) Task 2. To evaluate the battlefield techniques employed in RVN to determine what changes in training are needed.
(3) Task 3. To evaluate the suitability of TOE of the units in the RVN environment and to determine what modifications are necessary.
(4) Task 4. To evaluate the suitability of mechanized infantry and armor equipment, and ancillary equipment directly associated therewith, currently authorized and/or employed, to determine requirements for modifications and/or developments.
(5) Task 5. To evaluate the maintenance system, and the supply system in support thereof, at organizational and supporting levels, to determine what special measures may be required to insure acceptable performance of mechanized infantry and armor equipment.
(6) Task 6. To determine which of the approved recommendations contained in the USARV Report, "Evaluation of U.S. Army Combat Operations in Vietnam (ARCOV)," are applicable to mechanized infantry and armor units in RVN. Particular attention will be given to the requirement for a fourth line company per mechanized infantry and armor units.
(7) Task 7. To determine whether a pattern for mechanized infantry and armor operations in RVN is emerging.
(8) Task 8. To determine the most effective mix of U.S. Army mechanized infantry and armor units for deployment to and employment in RVN.
(9) Task 9. To evaluate operational requirements to determine what changes, if any, in mechanized infantry, tank, air cavalry, and armored cavalry training are needed.[98]

The methodology adopted for the MACOV evaluation was very similar to that of the ARCOV study. A list of Essential Elements of Analysis was prepared to define the data-collection requirements, and the five basic functions of land combat (intelligence, mobility, firepower, C^3, and service support) were used to organize the data and its analysis. The raw data collected by the I FFV and II FFV data-collection teams, which included some 18,500 data questionnaires, written reports, interviews, and more than 1,600 man-days of direct observation in the field by the data-collection teams and evaluation staff, were provided to the MACOV evaluation staff in Saigon.[99] The evaluation staff then organized the data, analyzed and evaluated it, and derived a number of conclusions and recommendations from it.[100] As noted in the MACOV Basic Report:

> To assist in the quantification of the study input, the analysis and comparison of alternatives, and the testing of findings, a series of evaluation models was developed. These models were prepared from mission requirements extracted from the Combined Campaign Plan. . . . To the extent possible, each model was predicated on an actual combat action. This permitted a comparison of optimum forces with the task force actually used. Separate models were designed to correlate and evaluate field data input; to assist in the determination of raw theater

requirements for specified missions; to isolate optimum force mix; to examine theater variables pertinent to the assessment of combat effectiveness of men, equipment and organizations; to identify the unique characteristics of force generation in terms of the enemy threat; and to balance raw requirements against the availability of needed resources. The model concept is considered to contribute significantly to the objectivity and validity of study recommendations.[101]

Study Recommendations

Based on the analysis and evaluation of the data, the MACOV Evaluation Team recommended a number of changes in equipment, organization, and force mix designed to improve the combat capabilities of U.S. Army mechanized infantry and armor units both in Vietnam or scheduled for deployment to Vietnam.[102] In some respects MACOV Evaluation Team simply repeated recommendations already made by the ARCOV Evaluation Team (for example, the addition of a fourth maneuver element to all infantry, airborne, and airmobile battalions).[103] The six "general recommendations" made by the MACOV Evaluation Team were the following:

1. The MACOV Report be used as a basis for a comprehensive review of all tactical doctrine for U.S. Army mechanized infantry and armor units.
2. CONUS training for armor and mechanized infantry units and individuals place increased emphasis on RVN orientation in the areas indicated in the findings of the MACOV Report.
3. Force Development Programs and war plans take into account the increasing utility of armor and mechanized infantry forces in a low intensity warfare environment.
4. The psychological impact of armor and mechanized infantry on enemy forces and the civilian population be considered in assessing the value of these type units in an environment such as RVN.
5. The traditional basis of assignment of armored cavalry (one squadron per division, one regiment per corps, one troop per separate brigade) be reexamined in view of the increasing value of these units in satisfying the most pressing requirement of low intensity warfare—finding and fixing the enemy—and in view of their increasing utility as combat maneuver units against a lightly armed enemy.
6. The basis of assignment of air cavalry (one troop per divisional armored cavalry squadron, one troop per armored cavalry regiment, one squadron per airmobile division) be reexamined in view of the increasing need for units with the primary mission of finding an elusive enemy in low intensity warfare.[104]

Review and Approval of the MACOV Study

On 28 March 1967, the draft of the formal MACOV Evaluation Team report was submitted to CG USARV for review and approval.[105] On 4 April 1967, General Westmoreland forwarded the report through the commander-in-chief, United States Army Pacific (CINCUSARPAC), and CG CDC to the Army chief of staff, noting that the MACOV study independently revalidated the findings of the ARCOV study regarding the fourth-line company for all types of infantry maneuver battalions.[106] CINCUSARPAC concurred in all but a few respects, and the MACOV report then received an extensive review and analysis at HQ CDC.[107] The CDC task group to review the MACOV report consisted of twenty officers, two enlisted men, three DA civilians, and five analysts from CORG and met at Fort Belvoir between 10 April and 15 May 1967. Ironically, Gene Visco, the CORG team chief who had played a key role in preparing the MACOV Evaluation Team report, was tasked to write up the HQ CDC evaluation that was forwarded to the HQDA ACSFOR on 15 May 1967.[108] In general, the CDC task group agreed with the general recommendations made by the MACOV Evaluation Team and recommended that the report receive wide distribution throughout the Army.[109]

On 16 January 1968, HQDA approved the recommendations of the MACOV Evaluation Team report for planning purposes, noting that some of the recommendations had already been acted upon separately and that actual implementation of the remaining recommendations was subject to the availability of resources.[110] But despite widespread approval of the MACOV evaluation report, the requisite resources and authorizations were slow in coming. As General Donn A. Starry later explained, several factors worked against immediate adoption of the MACOV study recommendations. The very bulk of the seven-volume report inhibited its widespread dissemination and study; the Army Materiel Command cited adverse cost and time factors; the Armor School and the CDC Armor Agency at Fort Knox welcomed the proposed troop and equipment table changes but rejected the

proposed changes in doctrine; HQ CONARC rejected the claim that the shock action of mechanized and armored forces had any particular impact on the enemy in Vietnam, who had long ago seen the defeat of French mechanized units at the hands of the Viet Minh; and the Army Staff doubted the effectiveness of the modified M113 armored personnel carrier as an armored assault vehicle.[111] However, the most serious blow against the MACOV recommendations was struck even before the MACOV Evaluation Team arrived in Vietnam to begin its study. In November 1966, Secretary of Defense McNamara imposed an arbitrary ceiling on the total number of troops in Vietnam, thereby precluding the deployment of additional mechanized and armor forces unless some other type of units already scheduled for deployment were dropped.[112] Thus, as General Starry wrote, "the impact of the study was something less than many hoped for."[113]

ORSA in the Field in Vietnam

The use of ORSA techniques, including war games, permeated Army units "in the field" in Vietnam. Army commanders and staff officers at every level applied the proven methods of ORSA to a variety of operational problems, thus returning Army ORSA to its World War II roots. Such usage was seldom formally identified as ORSA or conducted by persons formally qualified as ORSA analysts, but it constituted an authentic application of those principles, methods, and procedures developed since 1942 to aid Army decision makers in solving the pressing operational problems that they faced. It thus reflected the degree to which an awareness of ORSA methods and of the practical utility of those methods had spread and been generally accepted throughout the Army by the 1960s.

ORSA at MACV/USARV Level

In addition to the use of ORSA in the MACV/USARV RDTE programs and major studies (ARCOV and MACOV) described above, HQ MACV and HQ USARV applied ORSA methods to a variety of other problems, often of an operational nature. Some of the projects to which ORSA methods were applied in Vietnam, such as the rural pacification program, the unattended remote-sensor program (including the so-called McNamara Line), proposals for the use of aerial-delivered area-denial antipersonnel mines, and the use of herbicides to clear large areas of jungle and even cultivated terrain, were quite controversial.[114] The program for the use of herbicides to destroy foliage and crops, generally known as Operation Ranch Hand, was particularly controversial, especially so after the RAND Corporation did a study that showed that the program was counterproductive, a conclusion agreed to by the ORSA analysts working for Dr. Enthoven in OSD but doubted by Secretary McNamara and denied outright by the JCS.[115] One theaterwide problem for which ORSA did help provide a viable solution was the high-level, "promiscuous" use of artillery ammunition. General Ferdinand J. Chesarek, Army assistant vice chief of staff and then CG AMC during the Vietnam War period, later recalled that he went to Vietnam twice on behalf of the secretary of the Army and the chief of staff to investigate the excessive use of artillery ammunition, but "It was not until [Maj. Gen. James G.] Jim Kalergis got over there, and was a Corps Artillery officer and started to put some systems analysis techniques in effect there that there started to be a sharp drop, and a better utilization of artillery munitions."[116]

Use of ORSA by U.S. Army Special Forces

The first U.S. Army combat units to deploy to Vietnam were elements of the Army Special Forces.[117] Focused on training, advising, and supporting units of the South Vietnamese armed forces, Special Forces soldiers employed ORSA techniques to improve both the effectiveness of their South Vietnamese charges and their own operations. The defense of the many small, isolated Special Forces camps located in enemy-dominated territory was a special problem. In an article in the May 1968 issue of *Military Review*, Col. Francis J. Kelly, who commanded the U.S. 5th Special Forces Group in Vietnam from April 1966 to April 1967, described a study on the employment of the 5th Special Forces Group conducted by ACTIV in early 1966 that used ORSA techniques to solve the problem of how to improve the combat efficiency of each Special Forces camp "in terms of operations, intelligence, and coordinated action against the enemy."[118] Data on Special Forces camp defensive operations between 1 January 1965 and June 1966 were analyzed and showed that the prevalent Special Forces tactics of sweeping an

entire tactical area of operations around their camps on a scheduled basis was simple, "but did not take advantage of US strengths in combat units, mobility, airpower, and artillery support."[119] Based on the ACTIV study, Army Special Forces in Vietnam revised their combat operating procedures in 1966 with positive results.[120] The usual systematic, scheduled searches of the tactical area of operations were abandoned in favor of offensive strikes against known or suspected enemy locations that had been reported to the camp. As a consequence, "Operations improved, enemy contacts increased appreciably, enemy casualties climbed while friendly casualties did not, morale at the camps rose sharply, and night operations became the rule rather than the exception."[121] As Colonel Kelly observed, "operations research techniques were tried at the cutting edge, and they did help."[122]

ORSA at Field Force Level

ORSA techniques were also used extensively at field force (corps) level in Vietnam, particularly at Headquarters, II Field Force Vietnam (HQ II FFV). HQ II FFV became operational in Vietnam on 15 March 1966, and in early May 1966, General Westmoreland directed that II FFV conduct a series of war games "to determine the worst the Viet Cong (VC) and North Vietnamese Army (NVA) could reasonably do to our forces in Vietnam in the late spring and summer of 1966."[123] The games, conducted under the direction of the II FFV commander, Lt. Gen. Jonathan O. Seaman, were played by a group of II FFV officers, usually four but never more than twelve. Three war games were conducted during the period May–October 1966. The first game was Operation Counterbalance, which identified the five most vulnerable major targets in the III Corps Tactical Zone (III CTZ) and described their weaknesses in detail. The major conclusion of Operation Counterbalance was that "preemptive action is far more damaging to the VC-NVA forces, with less risk to friendly forces, than relief or reaction operations."[124] The second game was called Operation Countermove and was designed to determine the adequacy of the defenses of a major air base (Tan Son Nhut) in the III CTZ. The game resulted in thirteen recommendations on how to improve the base's defenses, and it proved its worth when the base was attacked on 4 December 1966 and thirty of the VC attackers were killed.[125] The third game, Operation Counterstroke, was designed to assess a potential enemy attack in strength on a key III CTZ installation in order to determine the adequacy of the installation's defenses and to update contingency plans.[126]

Col. George S. Webb, Jr., drew several broad conclusions from his study of the HQ II FFV war games. He concluded that a war game:

- Is really only a formal staff presentation of the commander's estimate.
- Can be accomplished at any level down to battalion.
- Should be conducted only when real need is evident; it is not a continuing function.
- Forces staffs and commanders to think about potential situations.
- Should be designed to foresee possible contingencies in the immediate future.
- Should be kept simple (Theater Quick Game model meets the need).
- Have a scenario modeled as closely as possible on the existing situation.
- Have players with accurate and detailed knowledge of both sides and of the terrain.[127]

Lt. Gen. Julian J. Ewell, Lt. Gen. Seaman's successor as commander of II FFV, was a strong advocate of ORSA and had used ORSA techniques extensively to solve operational problems when he commanded the 9th Infantry Division immediately before taking over II FFV.[128] As CG II FFV, General Ewell slowly introduced a simplified version of the systematic review and analysis program he had perfected in the 9th Infantry Division. As he noted:

> Some segments of operations were subjected to straight-on analysis with the remainder being handled by normal military decision methods but subjected to the general philosophy of the "analytic approach." While the improvements in performance were less dramatic than in the 9th, they were substantial enough to justify the added effort.[129]

General Ewell was eventually successful in introducing his review and analysis system in the commands subordinate to HQ II FFV and later noted that his

more adept subordinate commanders were soon able to reap the benefits, including

> (1) The ability to determine more rapidly and clearly the types of operations that were paying off with results and where.
> (2) The efficiency and effectiveness of various units.
> (3) An identification of unproductive expenditures of time and effort.[130]

His overall assessment of the use of ORSA methods at II FFV level was that

> it was much more difficult to apply analytical methods to this much more complex operation. Review and analysis tended to be of the more conventional management type. If one can summarize the approach, it was to use analysis where feasible, use tight management overall, and to try to preserve the questioning, results-oriented analytical approach throughout.[131]

ORSA at Division Level

By far the most extensive, in-depth, and best-known application of ORSA to operational problems at division level in Vietnam was the program of systematic review and analysis undertaken by then General Ewell in the 9th Infantry Division between April 1968 and April 1969.[132] General Ewell first became interested in the use of analytical methods while serving with the 8th Infantry Division in Germany, where he used them to prioritize training and to conduct a profitable study of tank gunnery. His interest in ORSA methods deepened while he was deputy CG CDC where, as he later recalled, "I became quite interested in the analytical approach to military problems and saw some possibilities there."[133]

Soon after taking command of the 9th Infantry Division in April 1968, General Ewell inaugurated a program of systematic review and analysis employing statistics and ORSA techniques. As he later admitted:

> We more or less stumbled into the use of analysis by a process of trial and error. Our first useful idea was to work towards an output or results-oriented statistical approach. . . . We gradually evolved a results or output-oriented approach. . . . This approach showed effort, gross results, results per unit of effort of skill or efficiency and final results on the enemy units. Although this was a very crude way of measuring combat results it seemed to work well both for individual units and as an integrating device. Obviously, military judgment was paramount, the analysis serving mainly as an indicator of good or poor results. In other words, analysis helped to reveal judgments which just didn't pay off.[134]

General Ewell, his staff, and his subordinate commanders first focused on enhancing the combat effectiveness of the division by

> providing the maximum number of fit, motivated, well-equipped and properly supported infantry soldiers to the field on a daily basis, night and day . . . [and] making these fighting infantrymen in the field as efficient as possible. . . . In our twofold quest to optimize our assets and improve combat efficiency, we used operations analysis to reinforce our military judgment and thus "Sharpen the Combat Edge."[135]

Six major actions involving unit management and personnel subsequently increased the number of infantryman "in the rice paddies" on a daily basis: changing the mix between straight infantry and mechanized infantry battalions; introducing a fourth rifle company in each infantry battalion; obtaining a tenth infantry battalion; getting a handle on strength accountability; solving the division's serious foot-disease problems; and discarding so-called static missions.[136]

Diseases of the feet and lower legs were a particular problem for the 9th Infantry Division, which operated in a generally swampy environment. General Ewell set his medical staff to solve the problem (and thereby increase the number of troops available for operations) and they conducted a systematic study—known as Operation Safe Step 9—of the division's experience with pyoderma, a combination of fungal disease, immersion foot syndrome, and infection.[137] Data were collected and analyzed, and it was found that if troops remained in the field for no more than forty-eight hours at a stretch, the problems of "paddy foot" declined significantly.

Having ameliorated the problem of too few infantrymen in the field on a daily basis through solving the "paddy foot problem" and instituting other measures to ensure a maximum turnout, General Ewell turned to the collection of data on combat operations and the careful analysis of that data to find the optimum methods for employing his combat forces effectively against the enemy. In simple terms, the analysis of the data showed that continuous day and night decentralized reconnaissance operations by small units, rather than the usual battalion-size sweeps, were more

effective, and such tactics were subsequently adopted with positive results.[138]

General Ewell and the officers of the 9th Infantry Division also applied ORSA techniques to a wide variety of other operational problems, including the development of several innovative tactical methods, the organization and employment of Army aviation assets, aviation maintenance, the development of riverine warfare techniques, and the testing of surface effects (air cushion) vehicles. In some cases, the results were positive; in others, less so. Overall, General Ewell later concluded:

> Our experience was that large operational or tactical problems overwhelmed the analytic approach. . . . The use of operations analysis was inherently a difficult task in Vietnam. To analyze a problem one should be able to describe the process in some detail, obtain reliable data inputs, and establish an adequate feedback system. These tasks varied widely in difficulty and seemed impossible in some areas. Combined arms operations at all levels (that is Corps, division, brigade, and even battalion) were too large and complex to study in toto by analytical methods. Pacification was similarly complex. The technique employed was to isolate pieces of the problem which could be analyzed. The remainder had to be attacked by means of judgment, professional skill, experience and sometimes intuition. The overall integration always had to be done on this basis. Even in areas such as small unit techniques, which responded well, on the surface, to analysis, the actual cause and effect relationships could not be traced out with confidence.[139]

The 9th Infantry Division was by no means the only division in Vietnam to employ ORSA to find solutions to its most difficult operational problems. For example, the 25th Infantry Division, commanded by Maj. Gen. Ellis W. Williamson from August 1968 to September 1969, consistently used simple OR techniques and also developed the use of computers in operational analysis, particularly in the study of countermine warfare, target acquisition, and operational planning.[140] As Maj. Gen. Harris W. Hollis, who commanded both the 25th and later the 9th Infantry Divisions in Vietnam, noted:

> I am convinced that operational analysis techniques have tremendous potential for application in future combat and particularly in the complex environment of this type of war. I saw how others had used this method with success; particularly General Ewell, when he commanded the 9th Infantry Division prior to my succession to command of that division. In no other war have we been so deluged by so many tidbits of information, for we have been accustomed to an orderliness associated with established battlelines. Here, though, we have had to make our decisions based not upon enemy regimental courses of action, but rather upon the numerous isolated actions of communist squad-sized elements. So with the scale down of the level of operations, we have had to increase our reliance on objective analysis of available information to arrive at logical courses of action.[141]

The use of systematic ORSA-like review and analysis techniques did not stop at division headquarters level. Commanders and staff officers of combat, combat support, and combat service support brigades, battalions, and even companies frequently applied such methods to solve the practical, day-to-day operational problems that they encountered. The use of such methods was seldom identified or even thought of as "ORSA," and those who used them were seldom formally trained ORSA analysts. Nevertheless, the concept of using systematic, often quantifiable, techniques to analyze and find solutions to complex problems permeated the U.S. Army in Vietnam. Operational planning was informed by the use of such methods, and even simple problems such as the organization of a base camp perimeter guard force or the optimum procedure for loading out a convoy benefited from ORSA-like analysis.

At the end of their monograph, Ewell and Hunt listed a number of overall conclusions regarding the use of ORSA at the operational level in Vietnam. They observed:

1. Normal military command and management techniques, aggressively pursued, were adequate in Vietnam to keep military and pacification operations working reasonably well. The "analytic approach" was a useful complementary technique.
2. The judicious use of operations analysis and analytical techniques when melded with military judgment was quite effective in improving performance in many areas of activity.
3. The 9th Infantry Division's analytical results-oriented efforts to optimize resources and increase combat effectiveness (which had as a base the goal to provide the maximum number of fit, motivated, well equipped and properly supported infantry soldiers to the field on a daily basis, night and day) worked.
4. The combination of the Constant Pressure concept, pacification, working against the enemy system, and Vietnamization made the One-War concept a reality and proved to be very effective tactically and strategically in the III Corps Tactical Zone around Saigon in 1969 and early 1970.

5. Analysis worked best at division level; it was more difficult to apply with precision at Field Force or Corps level.
6. The individual commander's ability, skill and knowledge transcended the more tangible factors.
7. Innovation and changes in tactics had to be aggressively pursued while continuing the optimization of ongoing operations which were well understood.
8. Many aspects of the situation resisted analysis.[142]

The Dark Side of ORSA in Vietnam

The widespread use of ORSA techniques by U.S. commanders and staff officers at every echelon in Vietnam was an indicator of the general acceptance of the validity and utility of ORSA as an aid to military decision making. At the same time, however, the application of less rigorous statistical and analytical techniques to some problems of the Vietnam War revived the traditional distrust of ORSA on the part of some military personnel and raised once more the question of the comparative value of quantitative analysis versus military experience and judgment. In a classic case of "guilt by association," Army ORSA analysts and ORSA techniques themselves came to be considered—quite incorrectly—by many to be the cause of several particularly negative features of the American conduct of the war in Vietnam, in particular the "body count" phenomenon and the inability to properly assess the progress of the war with respect to security and prosperity of the rural areas of South Vietnam.[143] As one commentator has stated:

> The inability of the McNamara system to provide effective integrated organization and operations for the war in Viet Nam and the debacle of the TFX and other "cost effective" weapons systems brought the systems analysis and business-oriented approach into open question, particularly as regards such issues as whether the Army needs more "managers" or more "leaders" or whether the "body count" is a really useful measurement of an army's combat effectiveness. As a recent observer of the Army has noted: "Vietnam brought down that house of computer card—crashing—and with it the reputations of many otherwise admired military commanders."[144]

The use of the "body count" as a measure of operational success and the use of statistical data to measure the general progress of the war and the rural pacification program in particular were the two applications of quantitative methods most often criticized. In point of fact, it was not that the methods themselves were at fault; rather, the standards of measurement, always a difficult and key part of any analysis, were faulty. In reality, the number of enemy dead left on the battlefield was not a valid indicator of tactical success, and the number of South Vietnamese villages under so-called government control was not a valid indicator of success in the battle for the loyalty and support of the Vietnamese people. In short, the assessors picked poor means of measurement and were thus unable to accurately and usefully describe the success or failure of the U.S. and South Vietnamese governments in winning the fight against the Communist insurgency. Moreover, whatever misunderstanding or misuse of such techniques may have occurred can be attributed principally to self-serving civilian and military leaders and untutored staff officers rather than to ORSA managers and analysts per se. Secretary of Defense Robert McNamara himself bears responsibility for much the problem by his overemphasis on "measurable results."

The "Body Count"

The most egregious attempt to apply statistics and analytical techniques to the measurement of operational success was without doubt the use of the "body count"—the actual counting of enemy bodies left on the battlefield—as a measurement tool. In the first instance, accurate counting of enemy casualties was almost a physical impossibility given the often difficult terrain and the nature of most engagements in Vietnam. Then, too, the body count was closely tied to the attrition strategy adopted by U.S. forces in Vietnam, a strategy that failed to take into account the enemy's ability to replace his losses. Thus, the number of enemy dead in a given engagement was insignificant unless it could be reliably compared to friendly losses and the enemy's ability to replace his losses in a timely manner. Moreover, the body count had other drawbacks, including the fact that the accuracy of the count tended to vary from unit to unit depending upon the methods and standards established by the unit commander.

Perhaps the greatest criticism of the body count was that it tended to corrupt U.S. and RVN commanders, who were under constant pressure to produce a high

body count in every engagement, or at least an enemy body count substantially greater than the friendly casualties incurred. It was inevitable, of course, that commanders would tend to judge their subordinates by their body count statistics, and commanders at all level soon learned that their careers depended in large measure on turning in high body counts in every engagement. Thus, by most accounts, dishonesty in the body count became widespread and was generally recognized if not accepted. Thus, the basic data on which the analysis relied were usually inaccurate and useless, and the lack of trust engendered by dishonest reporting was morally repugnant to many dedicated officers.[145] If you could not trust a subordinate to report accurately the number of enemy bodies, what else could you not trust him to do?

Even the commander of the 9th Infantry Division, Maj. Gen. Julian J. Ewell, a well-known advocate of statistical analysis and ORSA techniques, was somewhat ambivalent when it came to the body count.[146] On the one hand, he freely acknowledged, "The 9th Infantry Division and II Field Force, Vietnam have been criticized on the grounds that 'their obsession with body count' was either basically wrong or else led to undesirable practices."[147] On the other hand, he generally denied large-scale cheating on the body count in the 9th Infantry Division in 1968–1969 and denied that he ever had to relieve a commander for reasons related to the body count. But, as he later told an oral history interviewer:

> It was a case of somebody not understanding what you're driving at. It was the same way on body count. I think it would be very detrimental to put too much pressure on body count because obviously if some guy was in a very dry area, after two or three months, he might think that his head was on the block.[148]

In general, even General Ewell preferred the "kill ratio" (the ratio of enemy to friendly casualties) as being a better measurement of a commander's skill and a unit's effectiveness.[149]

The Pacification Program

Although it had less direct impact on the integrity of the Army officer corps and on the military conduct of the war in Vietnam, the system erected to evaluate the progress of the rural pacification program was also a striking example of the failure to select proper standards of measurement and of making policy based on faulty analysis of inaccurate data.[150] Until 1966, the system for measuring the progress of the government of South Vietnam in pacifying and securing the population involved a set of statistics that they had developed and that focused on the percentage of the population that was either "secure" or "not secure."[151] From the American point of view, the system had three principal faults: (1) U.S. advisers to the Vietnamese had no way of independently assessing the security status of the various areas; (2) there was a tendency to report progress when none was actually achieved; and (3) the system was constantly "improved," thereby changing the terms of reference and making it impossible to analyze the trends over time.[152] The OSD Systems Analysis Office attempted to rationalize the system in September 1967 and discovered that while the Vietnamese reported an increase of 3 million Vietnamese in the "secured" category from December 1965 to June 1967, the actual number was more like 2 million, and most of those entered the "secured" category by moving into the better-protected urban areas rather than because their home region had been freed from Communist domination.[153]

Even before the OSD analysis, Secretary McNamara had asked the Central Intelligence Agency to come up with a new pacification progress measurement system, and this new system, known as the Hamlet Evaluation System (HES), was inaugurated in January 1967.[154] The HES was a "highly detailed computerized data system" that incorporated data on military operations, enemy activity, and the location of friendly and enemy forces and allowed a "much more systematic understanding of the impact of pacification activities in Vietnam."[155] The HES employed eighteen different criteria, nine dealing with security matters and nine dealing with economic and political development. HES was a quantum improvement over the old system and was further improved as time went on, but it shared many of the faults of the earlier progress reporting system.[156] Ewell and Hunt later sought to defend the HES by pointing out the following:

> [T]he Hamlet Evaluation System has been consistently criticized as a cosmetic device. While one can concede that the absolute meaning of the figures was hard

> to establish, it is an absolute fact that the Hamlet Evaluation System was an invaluable management tool and a meaningful measure of relative progress. Needless to say, its usefulness varied directly with the knowledge and insight of the user. Most press comment was highly critical. However, such comment tended to be quite biased and uninformed as well.[157]

Perhaps the Hamlet Evaluation System was "an invaluable management tool" and "a meaningful measure of relative progress," but the fact remains that, overall, the attempt to define and quantify the progress—or lack of it—in the pacification of the South Vietnamese countryside was one of the striking failures of the war and the source of many bad decisions.

The analysts in OSD were not unaware of the drawbacks of the various measurement systems used in Vietnam, but Secretary McNamara's faith in quantifiable data apparently never wavered.[158] On the other hand, however, many Army leaders at lower levels soon soured on the use of "scientific analysis," or what they usually—and mistakenly—considered to be ORSA. In their 1975 study, Ewell and Hunt, in a classic case of understatement, acknowledged: "There is a tendency in the Army to distrust operations research due to some rather unpleasant experiences with its use (or misuse) during the Robert S. McNamara–Dr. Alain C. Enthoven regime."[159] The Army ORSA community was not responsible for such "unpleasant experiences," although they were all too often blamed for the problems associated with the body count and the rural pacification assessment debacle. Neither ORSA techniques nor Army ORSA managers or analysts were responsible for the abuse of statistical data. Rather, the misapplication of statistical techniques, and more important, the manipulation of the data by self-serving civilian and military leaders and untutored staff officers were what caused quantitative analysis to fall into some degree of ill-repute. By the late 1960s, ORSA may have been generally accepted, but much remained to be done to ensure that its applications and limitations were generally understood.

Conclusion

Some contemporary observers offered the opinion that ORSA was little used in the Vietnam War and had almost no impact. One commentator, Lt. Col. Raymond Maladowitz, observed that the mobilization and deployment of the third largest United States Army force ever committed outside the continental United States, a management feat of epic proportions, was "accomplished without systems analysis and centralized management."[160] And the foremost proponent of the view that ORSA did not play an important role in the Vietnam War—Dr. Enthoven, the assistant secretary of defense for systems analysis from September 1965 to January 1969—held this view:

> There was no systematic analysis in Vietnam of the allocation of resources to the different missions of the war and no systematic analysis of the effectiveness and costs of alternative military operations. Little operations analysis was being conducted in the field or in Washington. And even if all these analyses had been made, there was no good program budget or over-all organization in the Executive Branch of government to put the findings to use, on either the military or the civilian side . . . it was not accepted that systematic analysis should be an important criterion in the strategy or conduct of military operations in Vietnam. Thus, decisions were largely made on the basis of judgment alone.[161]

Enthoven's views were echoed by other distinguished ORSA practitioners. In an address to the attendees at the thirteenth annual Army Operations Research Symposium at Fort Lee, Virginia, in late 1974, Dr. Hugh M. Cole, a former RAC vice president, told his listeners:

> OR was little utilized by the Army in Viet-Nam nor, in contrast with Korea, did the OR community make a concerted, high-level attempt to find an entry to that theater . . . the use of OR techniques and personnel in the Howze Board did contribute to the emergence of the helicopter in Viet-Nam. Costing techniques used by OR types got an accurate fix on the actual dollar value of US military support to specified parts of the South Viet-Nam war effort. And OR-developed reporting systems permitted the Army commanders in the field to evaluate the expenditure of artillery ammunition and isolate the causative agents in the battlefield attrition of equipment. Nonetheless, OR, like its Army partner, cannot point with satisfaction to its role in Southeast Asia.[162]

While there may be an element of truth to the allegations that the overall management of the Vietnam War was not based on the results of systematic analysis or that, as Clayton J. Thomas opined,[163] ORSA did

not make nearly as much contribution in Vietnam as might have been expected, the facts are that the use of ORSA was widespread and highly valued during the Vietnam War. Indeed, ORSA techniques were applied extensively at every echelon from HQDA down to company level, and on the whole, the practitioners of ORSA were successful in demonstrating the usefulness of their craft. Some of the more difficult problems of the war in Southeast Asia fell to determined operational analysis, and important strides were made in improving Army organization, doctrine, and weaponry through the enlightened application of ORSA methods. The failure of the United States to prevail in the war in Vietnam was due to political and social factors far removed from the nitty-gritty of the battlefield and, Dr. Enthoven and the Whiz Kids notwithstanding, there is no substantial reason to believe that the failure can be attributed to a lack of systematic, quantitative analysis of the kind practiced in the Office of the Assistant Secretary of Defense (Systems Analysis).

Admittedly, the story is not entirely one of perpetual happiness and unmitigated success. Misunderstanding and misuse of quantitative methods in Vietnam, particularly the body count system and the ineffective program for assessing the progress of the rural pacification program, unfairly cast doubts on the validity of ORSA methods and the integrity of ORSA analysts. The real fault lay, however, in the insistence of decision makers on what turned out to be poor and misleading standards of measurement and false data submitted from the field. Such problems presaged the need to rebuild the post-war image of ORSA and to strengthen the understanding of ORSA uses and limitations among the Army's decision makers. That process, like the recovery of the United States Army from the trauma of Vietnam, would take both time and effort.

CHAPTER NINE NOTES

[1] Alain C. Enthoven and K. Wayne Smith, *How Much Is Enough? Shaping the Defense Program, 1961–1969* (New York, Evanston, and London: Harper & Row, 1971), p. 291.

[2] MACV gradually took over the functions of the older U.S. Military Assistance Advisory Group, Vietnam (USMAAG-V) and that organization was disestablished in May 1964. For a brief general history of the evolution of MACV and the war in Vietnam, see Maurice Matloff, ed., *American Military History*, rev. ed., CMH Pub 30–1 (Washington, D.C.: U.S. Army Center of Military History, 1989), ch. 28, "The U.S. Army in Vietnam."

[3] Enthoven and Smith, *How Much Is Enough?* p. 306.

[4] U.S. Army Military Assistance Command, Vietnam, Office of the Secretary of the Joint Staff, Military History Branch, *Command History, Volume III: 1967* (APO San Francisco 96222: Military History Branch, Office of the Secretary of the Joint Staff, HQ MACV, 1967), an. J (MACEVAL), p. 1251 (cited hereafter as MACV Command History 1967, III). The MACSA and JRATA were concerned primarily with RDTE but did use ORSA and perform some ORSA-type studies. For a brief description of their organization and functions, see app. B.

[5] Ibid.

[6] Ibid.

[7] Ibid., pp. 1251–52.

[8] Memo, Dr. William G. McMillan (MACSA) to General Andrew J. Goodpaster (DEPCOMUSMACV), APO San Francisco 96222, 11 Oct 1968, sub: Status of Scientific and Technical Manpower for MACSA and MACEVAL, par. 3.

[9] Ibid., p. XXVI–1.

[10] Ibid., pp. XXVI–1 and XXVI–2.

[11] MACV Command History 1967, III, an. J, p. 1252.

[12] *MACEVAL Study 1–67*, 19 Dec 1967, as quoted in MACV Command History 1967, III, an. J, p. 1252.

[13] The MACV RDTE and combat developments organization is outlined briefly in app. B.

[14] Until 21 November 1962, the organization subsequently known as ACTIV was officially designated the Department of the Army Test Team (DATT), but for convenience it is referred to herein as ACTIV throughout. There is no comprehensive history of ACTIV, and thus the story must be pieced together from various sources. Among the most useful are the annual volumes of the MACV Command History and, for the period from July 1968 to April 1972, the brief account in Booz-Allen Applied Research, Inc., *Scientific and Technical Support to the U.S. Army Concept Team in Vietnam (ACTIV)* (Washington, D.C.: Booz-Allen Applied Research, Inc., Jun 1972) (cited hereafter as Booz-Allen Rpt). Also useful is the oral history of Lt. Gen.. Edward L. Rowny (USA Ret.), *Oral History Interviews with Barry W. Fowle* (Alexandria, Va.: Office of History, Headquarters, U.S. Army Corps of Engineers, 1986–1990). See also J. Elmore Swenson, "The Army Concept Team in Vietnam," *United States Army Aviation Digest* (July 1968), pp. 16–18.

[15] U.S. Department of the Army, Deputy Chief of Staff for Military Operations, *Debriefing of Senior and Designated Key Officers Returning from Field Assignments [Maj. Gen. Edward L. Rowny, USA, Special Assistant for Tactical Mobility, HQDA, OACSFOR]*

(Washington, D.C.: Office of the Deputy Chief of Staff for Military Operations, HQDA, 30 Jul 1963), p. 1 (cited hereafter as Rowny debriefing).

[16] Rowny, *Oral History Interviews with Barry W. Fowle*, pp. 77–78.

[17] Ibid., p. 78. Colonel Clay was on particularly good terms with Lt. Gen. Creighton W. Abrams, then the Army assistant chief of staff for force development (ACSFOR), and was left behind in the Pentagon to coordinate the team's activities with the Army Staff.

[18] Rowny debriefing, p. 1.

[19] U.S. Department of the Army General Orders No. 66, Washington, D.C., 21 Nov 1962, subj: Army Concept Team in Vietnam (ACTIV) (9807), cited in Booz-Allen Rpt, p. 1.

[20] Rowny, *Oral History Interviews with Barry W. Fowle*, p. 80.

[21] Ibid., pp. 79–80. The scope of ACTIV projects was truly immense. Between August 1966 and July 1968 alone, ACTIV collected data for projects involving the employment of the armed/armored CH–47 helicopter; low-light-level television (LLLTV); the jungle canopy platform; the man-pack chemical detector; the CAR–15 submachine gun; the Claymorette mine; the hand-held, one-shot flame projector; Army aircraft maintenance and supply; the "Commando" armored car; utility tactical transport requirements; the Vietnamese water supply; ARVN infantry units; employment of the air cavalry troop and the armored cavalry squadron; combat engineer support; U.S. Army advisers with RVN combat units and district advisory teams; combined operations; border denial operations; aerial artillery; M116 units; the ARVN training program; the bullet detection device; the COBRA armed helicopter; the 40-mm. rapid-fire grenade launcher; the employment of U.S. Army civil affairs, psychological operations, and long-range patrol units; and U.S. Army maneuver battalions with four rifle companies (see JRATA Final Progress Rpt, p. 9; U.S. Army Military Assistance Command, Vietnam, Office of the Secretary of the Joint Staff, Military History Branch, *Command History 1966* [APO San Francisco 96222: HQ MACV, OSJS, 1966], pp. 764–67 [cited hereafter as MACV Command History 1966]).

[22] U.S. Department of the Army Study Advisory Committee (ASAC), *Main Report: Army Study Advisory Committee Examination of the Army's Operations Research/Systems Analysis Personnel Requirements* (Washington, D.C.: Office of the Director of Special Studies, Office of the Chief of Staff, HQDA, 30 Aug 1966) (cited hereafter as ASAC *Main Report*), an. B (Operations Research in and for the Army), an. 4, app. 3 (Summary of Current Army Data Generating Activity).

[23] Booz-Allen Rpt, p. 9. The Booz-Allen team assisted on some 132 projects.

[24] Rowny, *Oral History Interviews with Barry W. Fowle*, pp. 80–81.

[25] Ibid., pp. 79–80.

[26] Ibid., p. 86.

[27] Booz-Allen Rpt, p. 1.

[28] U.S. Military Assistance Command, Vietnam, Joint Research and Test Activity, *Final Progress Report, 1 July–31 October 1966* (APO SF 96222: Joint Research and Test Activity, HQ MACV, 15 Nov 1966), app. B, p. B–1 (cited hereafter as JRATA Final Progress Rpt).

[29] U.S. Army, Vietnam, *Organization and Functions Manual* (APO SF 96375: HQ USARV, 26 Dec 1970), p. 13.02 (Organizational Chart, Office of the Deputy Chief of Staff, Operations, Plans and Security) and p. 13.17.

[30] Quoted in Booz-Allen Rpt, p. 2.

[31] Booz-Allen Rpt, p. 2.

[32] Quoted in Booz-Allen Rpt, p. 2.

[33] U.S. Army Center of Military History, *Department of the Army Historical Summary, Fiscal Year 1970*, William Gardner Bell, ed. (Washington, D.C.: U.S. Army Center of Military History, 1973), pp. 127–28.

[34] Booz-Allen Rpt, p. 2.

[35] Ibid., p. 3.

[36] Ibid.

[37] Ibid. The status of contractor support for ACTIV prior to FY 1968 is unclear but almost certainly included some contractor scientific support, either generally or on specific projects, including the provision of ORSA analysts.

[38] Ibid. The scientific support program for ACTIV was sponsored by the U.S. Army Research Office managed by the Army's Chief of Research and Development. The three-year payment under Contract DAHC 19–69–C–0002, dated 17 July 1968, with modifications P001–P007, was $985,541 (see Booz-Allen Rpt, p. vii). The term of the contract began on 21 July 1968, and the first elements of the Booz-Allen team arrived at Long Binh Post on 18 August 1968 (see Booz-Allen Rpt, p. 5).

[39] Ibid., p. 4.

[40] Ibid., p. xi. One of the first tasks undertaken by the Booz-Allen team was a revision of the ACTIV Standard Operating Procedures, which was completed in December 1968 (see Booz-Allen Rpt, pp. 9–11). The team focused particularly on the preparation of the various basic documents required for each evaluation project, namely the project data sheet, the evaluation plan, the plan of research, and the final report (see Booz-Allen Rpt, pp. xiii–xiv and 11–17).

[41] Ibid., pp. xiii and 9.

[42] Ibid., p. xiii. As ACTIV began to phase down its activities in 1970, the number of Booz-Allen personnel was gradually reduced. The specific functions of the various Booz-Allen team members are described in Booz-Allen Rpt, p. 5–8.

[43] Ibid., pp. vii and 8.

[44] Ibid., pp. xv–xvi.

[45] Elton Fay, "Army Evaluates FCRCs against In-House Programs," *Armed Forces Journal* 106, no. 4 (28 September 1968), p. 15.

[46] CORG supported the Army Combat Operations in Vietnam (ARCOV) and Mechanized and Armor Combat Operations in Vietnam (MACOV) studies as described below. For other CORG studies, see, *inter alia*, Stanley R. Lavallee and others, *Combat Operations Frequency Study (Night Actions in Vietnam, 1968)*, CORG-M-372 (1969), and Table 8–4 above.

[47] "RAC Opens Far East Field Office," *The RAConteur* I (Old Series), no. 1 (May–June 1962), p. 4; Raymond E. Bailey, Jr., "Thailand—Research Analysis Corporation," *The RAConteur* 2, no. 23 (15 December 1966), p. 5; and "RAC Highlights, 1961–1971," p. 6.

[48] "RAC Opens Far East Field Office," p. 4.

[49] Ibid.

[50] Each of the RAC field offices deployed "safari teams" to nearby countries. In 1963, the European field office had two such teams in operation, and RACSEAFO had teams in Japan, Korea,

and Okinawa. The safari teams were sent out for short-term, temporary assignments (see "RAC Goes Global," *The RAConteur* II [Old Series], no. 4 [July–August 1963], p. 4).

[51] "Thailand—Research Analysis Corporation," p. 5.

[52] Ibid.

[53] Ibid., pp. 5–6.

[54] "RACSEAFO Split into Two Independent Offices," *The RAConteur* III (Old Series), no. 3 (May–June 1964), p. 1.

[55] Ibid., p. 19.

[56] Thomson, *The Research Analysis Corporation*, p. 108.

[57] "Introducing: RAC–Thailand," *The RAConteur* 6, no. 5 (May 1970), p. 10.

[58] "RACSEAFO Split into Two Independent Offices," p. 1.

[59] Ibid. An ORO/RAC employee since 1950, Johnson had been the ORO field director in the Far East from 1954 to 1956. In mid-February 1966, Dr. Harry E. Handler replaced Johnson as director of the RAC Field Office in Vietnam (see "New Director for RAC Field Office Vietnam," *The RAConteur* 2, no. 3 [31 January 1966], p. 2). Handler, a professor of physics at the Naval Postgraduate School, took a leave of absence to serve as director of the RAC Field Office in Saigon.

[60] "RAC Saigon Reports," *The RAConteur* II (Old Series), no. 1 (January–February 1963), p. 22.

[61] Ibid.

[62] "RAC Team to Study South Vietnam Waterways," *The RAConteur* 2, no. 6 (15 March 1966), p. 7.

[63] U.S. Army Vietnam, *Evaluation of U.S. Army Combat Operations in Vietnam (Short Title: ARCOV)* (APO San Francisco 96307: HQ USARV, 25 Apr 1966), p. P–1 (cited hereafter as ARCOV Basic Rpt). Unless otherwise noted, the Preface of the ARCOV Basic Rpt (pp. P–1 to P–8) is the basis of the following account.

[64] Ltr, CG CDC, to CG USARV, Fort Belvoir, Va., 27 Dec 1965, sub: Draft Plan, Evaluation of Army Airmobility in Vietnam (ARAMIV). The title of the proposed study was subsequently changed (by Msg, DA754650, ACSFOR to CG USARV, DTG 121628Z March 1966, sub: Change of Title of Study) to reflect more clearly the actual focus of the study.

[65] Brig. Gen. (later Maj. Gen.) George Lafayette Mabry, Jr., was born in Stateburg, S.C., on 14 September 1917, and was a 1940 graduate of Presbyterian College in Clinton, S.C. Commissioned as a second lieutenant in the Army Reserve, he volunteered for active duty in 1940 and subsequently landed on Utah Beach on D-Day with the 2d Battalion, 8th Infantry, 4th Infantry Division. During the war, he rose to the rank of lieutenant colonel and command of the 2d Battalion, 8th Infantry. One of the most highly decorated soldiers of the U.S. Army in World War II, he was awarded the Medal of Honor for his actions in the Huertgen Forest on 20 November 1944 and was also awarded the British Distinguished Service Order, the highest decoration that the British government can bestow on a non-British soldier. Following World War II, he served ten years in the Panama Canal Zone, four as commanding general (1970–1974), and was considered an expert on Central America. Following his tour as chief of the ARCOV Evaluation Team, General Mabry returned to Vietnam to serve as chief of staff and assistant deputy commanding general, USARV. He retired from active duty in 1975 and died on 13 July 1990 in Columbia, S.C. (see the brief biography by Irving Smolens at http://members.tripod.com/~msg_fisher/mabry.html [downloaded 14 Jun 2005] and the tributes at http://thomas.loc.gov/cgi-bin/quarty/F?r101:1:./temp/~r101P2Zflt:e0 [downloaded 14 Jun 2005]; copies of both in the possession of the author).

[66] The six-man CORG team included Wesley E. Curtis (senior analyst), William F. Pohlman, William V. Brown, William A. Carswell, E. B. Vandiver III, and George P. Lewett. The names and duty assignments of all of the military and civilian personnel assigned to the ARCOV Evaluation Team are listed in ARCOV Basic Rpt, Incl 6 (Composition of the ARCOV Evaluation Team).

[67] ARCOV Basic Rpt, p. P–2.

[68] The living conditions for ARCOV team members are described in E. B. Vandiver III, *Oral History Interview with Dr. Charles R. Shrader*, USAWC/USAMHI Senior Officer Oral History Program (The Origins of US Army Operations Research Project) (Carlisle Barracks, Pa.: U.S. Army War College/U.S. Army Military History Institute, 2005), pp. 24–35 passim.

[69] Vandiver, *Oral History Interview with Dr. Charles R. Shrader*, p. 34.

[70] ARCOV Basic Rpt, pp. P–2 and P–3. Task 4 was assigned in mid-March 1966 by letter from the Army chief of staff to the CG USARV.

[71] Ibid., p. P–6. As might be expected, an evaluation matrix was used (see ARCOV Basic Rpt, pp. P–7 and P–9, Figure P–1 [Evaluation Matrix]).

[72] Ibid., p. P–7.

[73] U.S. Army, Vietnam, *Evaluation of U.S. Army Combat Operations in Vietnam (Short Title: ARCOV)*, 9 vols. (APO San Francisco 96307: HQ USARV, 25 Apr 1966).

[74] See William F. Pohlman, Evaluation of US ARCOV: Intelligence Operational Data Supplement, CORG-M-266; William V. Brown, Evaluation of US ARCOV: Mobility Operational Data Supplement, CORG-M-267; William A. Carswell, Evaluation of US ARCOV; Firepower Operational Data Supplement, CORG-M-268; E. B. Vandiver III, Evaluation of US ARCOV: Command, Control, and Communications Operational Data Supplement, CORG-M-269; George P. Lewett, Evaluation of US ARCOV: Service Support Operational Data Supplement, CORG-M-270; and David T. H. Campbell and others, Evaluation of US ARCOV: Cost Analysis Operational Data Supplement, CORG-M-271.

[75] ARCOV Basic Rpt, p. IV–1.

[76] Vandiver, *Oral History Interview with Dr. Charles R. Shrader*, p. 30.

[77] See U.S. Joint Chiefs of Staff, *Joint Publication 1–02: Department of Defense Dictionary of Military and Associated Terms* (Washington, D.C.: U.S. Joint Chiefs of Staff, 23 Mar 1994), pp. 33 and 375.

[78] Ltr, Gen William C. Westmoreland (CG USARV) through CG CDC to Chief of Staff, U.S. Army, APO San Francisco, 23 Apr 1966, sub: Letter of Transmittal.

[79] U.S. Army Combat Developments Command, *Review and Analysis of the Evaluation of Army Combat Operations in Vietnam (Short Title: ARCOV)* (Fort Belvoir, Va.: HQ CDC, 30 Apr 1966).

[80] Ibid., pp. 1–4.

[81] Ibid., p. 2.

[82] U.S. Department of the Army, Office of the Adjutant General, *Approval of Evaluation of U.S. Army Combat Operations in Vietnam (ARCOV)* (Washington, D.C.: Office of the Adjutant General, HQDA, 26 Oct 1966).

[83] The principal changes recommended by HQ USARV and HQ CDC were to retain the battalion reconnaissance platoon and battalion mortar platoon, both of which the ARCOV Evaluation Team recommended be eliminated, and to disapprove certain other minor medical, aviation, and transportation recommendations, such as the addition of M113 armored personnel carriers to the motor transport units in Vietnam. For the recapitulation of approvals/disapprovals, see *Approval of Evaluation of U.S. Army Combat Operations in Vietnam (ARCOV)*, Incls 1 and 2.

[84] Ltr, HQDA ACSFOR to CG CDC, Washington, D.C., 12 Sep 1966, sub: Evaluation of U.S. Army Mechanized and Armor Combat Operations in Vietnam (MACOV).

[85] U.S. Department of the Army, *Department of the Army Plan for Evaluation of U.S. Army Mechanize and Armor Combat Operations in Vietnam (MACOV)* (Washington, D.C.: HQDA, Dec 1966) (cited hereafter as MACOV Evaluation Plan).

[86] Ltr, HQDA to CG USARV, Washington, D.C., 12 Dec 1966, sub: Evaluation of U.S. Army Mechanized and Armor Combat Operations in Vietnam (MACOV).

[87] The officer requirements for the MACOV Evaluation Team were prescribed in MACOV Evaluation Plan, Incl 5, tab F.

[88] U.S. Army Vietnam, *Evaluation of U.S. Army Mechanized and Armor Combat Operations in Vietnam (Short Title: MACOV)* (APO San Francisco 96307: HQ USARV, 28 March 1967), vol. I, p. ii (cited hereafter as MACOV Basic Rpt). Unless otherwise noted, the following account is based primarily on the MACOV Evaluation Plan and the MACOV Basic Rpt.

[89] According to Eugene P. Visco, who headed the CORG team, the officers assigned to the MACOV evaluation staff included two very prominent armor officers—Col. (later Gen.) Donn A. Starry and Col. (later Brig. Gen.) George S. Patton III—both of whom worked with Visco to synthesize the study data and prepare a synopsis of it (see Eugene P. Visco, *Oral History Interview with Dr. Charles R. Shrader,* USAWC/USAMHI Senior Officer Oral History Program [The Origins of US Army Operations Research Project] [Carlisle Barracks, Pa.: U.S. Army War College/U.S. Army Military History Institute, 2005], pp. 83–85). General Starry later commented extensively on the MACOV evaluation in *Mounted Combat in Vietnam*, Vietnam Studies Series (Washington, D.C.: U.S. Department of the Army, 1978), pp. 84–90 passim.

[90] MACOV Basic Rpt, p. ii.

[91] The composition and organization of the data-collection teams are described in MACOV Evaluation Plan, Incl 5, tab C, p. 5–C–1, and tab D, p. 5–D–1.

[92] MACOV Evaluation Plan, pp. 5–6.

[93] The living arrangements for the CORG team are described in Visco, *Oral History Interview with Dr. Charles R. Shrader*, pp. 83–96 passim.

[94] MACOV Basic Rpt, pp. I–2 and I–3.

[95] Ibid., ii.

[96] Ibid., pp. I–12 to I–14. The U.S. units evaluated by the MACOV Evaluation Team included **I Field Force Vietnam:** *1st Cavalry Division (Airmobile)*: 1/9th Cav (Air Cav); *4th Infantry Division*: 1/69th Armor, and 1/10th Cav; *1st Brigade, 101st Airborne Division*: Trp A, 2/17th Cav. **II Field Force Vietnam**: *1st Infantry Division*: 2/2d Inf (Mech) and 1/4th Cav; *9th Infantry Division*: 2/47th Inf (Mech), 5/60th Inf (Mech), and 3/5th Cav; *25th Infantry Division*: 4/23d Inf (Mech), 1/5th Inf (Mech), 2/22d Inf (Mech), 3/4th Cav, and 2/34th Armor; *173d Airborne Brigade*: Co. D, 16th Armor; *196th Infantry Brigade*: Trp F, 2/17th Cav; *199th Infantry Brigade*: Trp D, 2/17th Cav; and *11th Armored Cavalry Regiment*.

[97] Ibid., p. I–1; MACOV Evaluation Plan, p. 1.

[98] Ibid., pp. I–1 and I–2; MACOV Evaluation Plan, pp. 1–2.

[99] The data-collection effort took place during a period of major combat activity in Vietnam. Twenty-three data collectors participated in Operation Cedar Falls and nine in Operation Gadsden, the two largest operations in the war up to that time, and four members of the MACOV Evaluation Team were wounded in action. In all, MACOV Evaluation Team members participated in some 981 combat days at battalion level or below (see MACOV Basic Rpt, pp. v–vi).

[100] The MACOV Evaluation Team's methodology is described in MACOV Evaluation Plan, Incl 1 (Methodology) and Incl 2 (Essential Elements of Analysis), and in MACOV Basic Rpt, pp. I–2 and I–3 and I–5 to I–12 and Figure I–2.

[101] MACOV Basic Rpt, pp. iii–iv.

[102] The detailed findings and recommendations were contained in MACOV Basic Rpt, sec III.

[103] Ltr, Maj Gen Arthur L. West, Jr. (Chief, MACOV) to CG USARV, APO San Francisco 96243, 28 Mar 1967, sub: Evaluation of U.S. Army Mechanized and Armor Combat Operations in Vietnam (MACOV).

[104] MACOV Basic Rpt, p. I–163.

[105] U.S. Army, Vietnam, *Evaluation of U.S. Army Mechanized and Armor Combat Operations in Vietnam (Short Title: MACOV)*, 7 vols. (APO San Francisco 96307: HQ USARV, 28 Mar 1967). Only the classified draft of Volume I, containing a summary of the study, was forwarded on 28 March. The remaining volumes containing backup data and descriptions of the study methodology soon followed. The report was also produced in an unclassified version for general distribution, and a draft air cavalry training manual and a training film using actual combat footage and titled "U.S. Army Mechanized and Armor Combat Operations in Vietnam" were also produced (see MACOV Basic Rpt, p. v). Separate cost analysis and data supplements were published separately by CORG. See Coke L. Westbrook, *Evaluation of MACOV: Cost Analysis,* CORG-M-317 (Fort Belvoir, Va.: CORG, HQ CDC, n.d. [1968]), and Headquarters, U.S. Army Combat Developments Command, Combat Operations Research Group, *Evaluation of MACOV: Data Supplement*, CORG-M-338, 6 vols. (Fort Belvoir, Va.: CORG, HQ CDC, Apr 1968).

[106] Ltr, Gen William C. Westmoreland (CG USARV) through CINCUSARPAC and CG CDC to Chief of Staff, U.S. Army, APO San Francisco 96307, 4 Apr 1967, sub: Evaluation of U.S. Army Mechanized and Armor Combat Operations in Vietnam (MACOV).

[107] 1st Indorsement, HQ USARPAC, APO San Francisco 22060, 14 Apr 1967, to Ltr, CG USARV through CINCUSARPAC and CG CDC to CSA, 4 Apr 1967, sub: Evaluation of U.S. Army Mechanized and Armor Combat Operations in Vietnam (MACOV).

[108] Visco, *Oral History Interview with Dr. Charles R. Shrader*, pp. 91–92.

[109] U.S. Army Combat Developments Command, *Review and Analysis of the Evaluation of the U.S. Army Mechanized and Armor Combat Operations in Vietnam (Short Title: MACOV)* (Fort Belvoir, Va.: HQ CDC, 15 May 1967), p. ii and sec. X passim.

[110] Ltr, HQDA, Office of the Adjutant General (AGAM-P), Washington, D.C., 16 Jan 1968, sub: Approval of Evaluation of U.S. Army Mechanized and Armor Combat Operations in Vietnam (MACOV).

[111] Starry, *Mounted Combat in Vietnam*, pp. 86–90 passim.

[112] Ibid., pp. 89–90.

[113] Ibid., p. 86.

[114] *See* MACV Command History 1966, pp. 771–75.

[115] On the herbicidal warfare programs in Vietnam, see H. Lindsey Arison, *The Herbicidal Warfare Program in Vietnam, 1961–1971: Operations Trail Dust/Ranch Hand—Executive Summary* (n.p.: 1 May 1999), at http://members.cox.net/linarison/orange.html, downloaded 29 Nov 2004; copy in possession of the author.

[116] Gen Ferdinand J. Chesarek (USA Ret.), *Oral History Interviews with General Ferdinand J. Chesarek by Lieutenant Colonel Richard Lawrence and Lieutenant Colonel James Agnew,* USAWCUSAMHI Senior Officer Oral History Program (Carlisle Barracks, Pa.: U.S. Army War College/U.S. Army Military History Institute, 1971), vol. I, Interv No. 1 (25 Feb 1971), p. 51.

[117] U.S. Army Special Forces units were deployed to South Vietnam as early as 1957. On Special Forces operations in Vietnam, see Col Francis J. Kelly, *U.S. Army Special Forces, 1961–1971,* Vietnam Studies Series (Washington, D.C.: U.S. Department of the Army, 1973).

[118] Col. Francis J. Kelly, "Operations Research at the Cutting Edge," *Military Review* 48, no. 5 (May 1968), pp. 11–15. The ACTIV study titled "Employment of the 5th Special Forces Group" was published on 20 April 1966.

[119] Ibid., p. 15.

[120] Lorna Jaffe, *Quantitative Analysis and Army Decision Making* ([Washington, D.C.]: U.S. Army Materiel Development and Readiness Command Historical Office, Dec 1984), p. 13.

[121] Kelly, "Operations Research at the Cutting Edge," p. 15.

[122] Ibid.

[123] Col George S. Webb, Jr., "War Gaming and Combat," *Military Review* 49, no. 4 (April 1969), p. 18. Colonel Webb's 1969 *Military Review* article was based his earlier student essay at the Army War College (Lt Col George S. Webb, Jr., *How War Gaming Paid Off in Combat: Evaluation of II FFV War Gaming,* Student Essay [Carlisle Barracks, Pa.: U.S. Army War College, 12 Mar 1968]). The following brief account is based entirely on Colonel Webb's *Military Review* article (pp. 18–23 passim).

[124] Ibid., p. 21.

[125] Ibid., p. 22. An earlier attack, on 13 April 1966, had resulted in significant damage to the base and many friendly casualties.

[126] Ibid., p. 23.

[127] Ibid.

[128] Lt. Gen. Ewell and his 9th Infantry Division chief of staff, Maj. Gen. Ira A. Hunt, Jr., later described the use of ORSA in the 9th Infantry Division and at HQ II FFV in *Sharpening the Combat Edge: The Use of Analysis to Reinforce Military Judgment,* Vietnam Studies Series (Washington, D.C.: Department of the Army, 1975).

[129] Ewell and Hunt, *Sharpening the Combat Edge*, p. 191.

[130] Ibid., p. 193.

[131] Ibid., pp. 194–95.

[132] As noted above, Lt. Gen. Ewell and Maj. Gen. Hunt described the 9th Infantry Division ORSA program in detail in *Sharpening the Combat Edge*. Their efforts are comparatively well-known, and *Sharpening the Combat Edge* is widely available; thus, only a very brief summary is provided here, a summary based almost entirely on *Sharpening the Combat Edge*. General Ewell later summarized his actions and his book in a paper presented to the attendees at the fifteenth annual Army Operations Research Symposium at Fort Lee, Va., in October 1976. See Lt Gen Julian J. Ewell (USA Ret.), "Lessons of Vietnam in an Analytic Sense," in U.S. Army Concepts Analysis Agency, *Final Proceedings of the Fifteenth Annual United States Army Operations Research Symposium [AORS XV], 26–29 October 1976, Fort Lee, Virginia, Volume I* (Bethesda, Md.: U.S. Army Concepts Analysis Agency, 1976), pp. 84–107. Julian J. Ewell, USMA 1939, commanded at the battalion and regimental level in the 101st Airborne Division in World War II and at the regimental level with the 2d Infantry Division in the Korean War. Immediately before commanding the 9th Infantry Division in Vietnam (April 1968–April 1969), he was the deputy CG CDC. He subsequently commanded II Field Force Vietnam from April 1969 to April 1970. Maj. Gen. Ira A. Hunt, Jr., USMA 1945, was an engineer officer and later commanded the 8th Infantry Division in Germany and served as deputy chief of staff for training and schools, Headquarters, U.S. Army Training and Doctrine Command.

[133] Lt Gen Julian J. Ewell (USA Ret.), *Conversations between Lt. Gen. (USA Ret.) Julian J. Ewell and Mr. Robert Crowley and Lt. Col. Norman M. Bissell,* USAWC/USAMHI Senior Officer Oral History Program (Carlisle Barracks, Pa.: U.S. Army War College/U.S. Army Military History Institute, 1977), p. 89.

[134] Ewell, "Lessons of Vietnam in an Analytic Sense," p. 89.

[135] Ewell and Hunt, *Sharpening the Combat Edge*, pp. 13–14.

[136] Ibid., p. 16.

[137] On the conduct and results of Operation SAFE STEP, see Ewell and Hunt, *Sharpening the Combat Edge*, pp. 23–36.

[138] Ewell and Hunt, *Sharpening the Combat Edge*, pp. 94–95.

[139] Ewell, "Lessons of Vietnam in an Analytic Sense," pp. 88–89.

[140] Ewell and Hunt, *Sharpening the Combat Edge*, p. 6.

[141] Quoted in Ewell and Hunt, *Sharpening the Combat Edge*, p. 194.

[142] Ewell and Hunt, *Sharpening the Combat Edge*, p. 237.

[143] The literature on the negative aspects of Secretary of Defense McNamara's enthusiasm for statistical data and quantitative analysis, and in particular the negative effects on the Army, is extensive. A brief discussion of the "measurement of progress" system can be found in Douglas Kinnard, *The War Managers* (Hanover, N.H.: University Press of New England, 1977), pp. 68–72.

[144] Donald Atwell Zoll, "A Crisis in Self-Image: The Role of the Military in American Culture," *Parameters: The Journal of the Army War College* 12, no. 4 (December 1982), p. 28.

[145] As Douglas Kinnard has pointed out (*The War Managers*, p. 74), "A high body count, it was alleged, became a career necessity of ambitious officers and led to falsification of reports, sapping the integrity of the officer corps in the process."

[146] See General Ewell's comments on the attrition strategy and the body count phenomenon in Ewell and Hunt, *Sharpening the Combat Edge*, pp. 225–28.

[147] Ewell and Hunt, *Sharpening the Combat Edge*, p. 227.

[148] Ewell, *Oral History*, p. 100.

[149] Ibid., p. 103.

[150] On the use of statistical data to evaluate the pacification program, see, *inter alia*, Col Erwin R. Brigham, "Pacification

Measurement," *Army Management Views* XV, no. 2 (1970), pp. 128–36, and Enthoven and Smith, *How Much Is Enough?* pp. 300–03. Colonel Brigham was the chief, Research and Analysis Division, Assistant Chief of Staff for Civil Operations Rural Development Support, HQ MACV.

[151] Enthoven and Smith, *How Much Is Enough?* pp. 300–01.

[152] Ibid., p. 301.

[153] Ibid.

[154] Ibid., p. 302.

[155] Ibid.

[156] Brigham, "Pacification Measurement," pp. 132–33.

[157] Ewell and Hunt, *Sharpening the Combat Edge*, p. 216.

[158] See, for example, Enthoven and Smith, *How Much Is Enough?* pp. 295–300 passim. The monthly *Southeast Asia Analysis Report* published by the OSD Systems Analysis Office was often critical of statistical data and analysis conducted in-country (see Kinnard, *The War Managers*, p. 72). Secretary McNamara's faith in statistical analysis was apparently shared by both General Westmoreland and President Johnson (see Kinnard, *The War Managers*, pp. 70–71).

[159] Ewell and Hunt, *Sharpening the Combat Edge*, p. 3.

[160] Lt Col Raymond Maladowitz, *Office of the Assistant Vice Chief of Staff—Parkinson's Law or Progress*, USAWC Case Study (Carlisle Barracks, Pa.: U.S. Army War College, 9 Mar 1970), pp. 59–60.

[161] Enthoven and Smith, *How Much Is Enough?* pp. 307–08.

[162] Hugh M. Cole, "The Impact of ORSA on the US Army—Historical Overview," in U.S. Army Concepts Analysis Agency, ed., *Proceedings of the Thirteenth Annual United States Army Operations Research Symposium (AORS XIII), 29 October–1 November 1974, Fort Lee, Virginia* (Fort Lee, Va.: U.S. Army Concepts Analysis Agency, 1974), I, pp. 11–13.

[163] Clayton J. Thomas and Robert S. Sheldon, "Military Operations Research," in Saul I. Gass and Carl M. Harris, eds., *Encyclopedia of Operations Research and Management Science* (Boston/Dordrecht/London: Kluwer Academic Publishers, 2001), p. 515.

Conclusion

The last official campaign of the United States Army in Vietnam ended on 28 January 1973. By that date most Army combat units and advisers had been withdrawn from South Vietnam, leaving only a small contingent of combat support and combat service support troops who were soon redeployed to the United States. Thus ended one of the most eventful eras in U.S. military history. Indeed, the period from 1961 to 1973 was a tumultuous era in world history, an era marked by worldwide political upheaval, growing distrust of government, and alienation of the young from the hitherto accepted standards and values of political, economic, social, and cultural behavior. The 1960s and early 1970s were also a time of great growth and change in the Army analytical community, a time in which Army operations research and systems analysis (ORSA) managers and analysts faced a number of difficult challenges. The McNamara revolution in defense management emphasized quantitative methods and systematic analysis, and the ever-growing complexities of structuring military forces for the future as well as the problems of fighting a long war in Southeast Asia summoned a maximum effort from Army analysts. The use of ORSA techniques expanded into new areas, such as management and force planning. The reliance on one or two primary Army ORSA contractors was abandoned in favor of a wider range of private contractors and greater reliance on in-house Army ORSA organizations that grew substantially. The increased demand for trained ORSA managers and analysts prompted a number of studies that focused on the Army's need for systematic analysis and ORSA personnel. As a result, a professional program for the selection, training, and utilization of Army officer ORSA specialists was introduced, and measures were taken to improve the preparation and utilization of the Army's civilian analysts as well. The use of ORSA methods became a generally accepted part of the research and development and combat development processes, and Army ORSA analysts participated in the major studies of the day, particularly those dealing with the two most prominent military issues of the 1960s, counterinsurgency and airmobility, and applied their skills to solve the practical problems encountered in the war against the Communists in Southeast Asia. Setbacks were not uncommon, but on the whole the era was one of progress, maturation, and increasing acceptance of ORSA as an important tool in the Army decision-making process.

By 1971 the war in Vietnam was winding down and the sense that the Army and ORSA were about to enter a new era was growing. On 16–28 May 1971, members of the Army analytical community met in Durham, North Carolina, for the tenth Army Operations Research Symposium to consider the theme of "The Challenge to Military OR in the 70's." Many of the Army's leading ORSA managers and analysts offered their assessment of the state of ORSA in the Army and the challenges that lay ahead. Several of the participants cited substantial defects in Army ORSA as it was then practiced and offered solutions thereto. One participant, Donald N. Fredericksen, then the director of land warfare in the Office of

the Director of Defense Research and Engineering, noted:

> The emphasis and reliance on military operations research applied to land warfare by top level decision makers could increase in the next decade. There are several reasons for this.
> First, it appears that the Defense budget will be highly constrained in the foreseeable future. Increasing pressure for greater federal expenditures in the non-Defense segment of our economy will place a higher premium on improving our allocation of resources for defense.
> Secondly, at the same time manpower is expected to take an increasingly larger share of the total military dollar. Thus, there will be a high premium on getting the most for our dollar in our new weapon and support systems—a job for operations research.
> Thirdly, we are shifting to a policy of a credible, conventional deterrent capability in Europe. As a result, there will be more emphasis on tactical warfare systems and capabilities (as opposed to strategic systems). Tactical warfare is much more complex that strategic warfare, and military OR can contribute easily to sorting out these complex problems.
> Finally, advances in computer equipment and the lessons learned in OR methodology in the last decade provide a basis for improving the quality of military operations research and therefore the willingness of decision-makers to trust its results.[1]

Dr. Clive G. Whittenbury, the vice president of the Research Analysis Corporation, told symposium participants that "the challenges to military OR in the next decade fall into two areas: challenges to the profession itself and challenges posed by military problems."[2] With respect to the latter, Dr. Whittenbury observed:

> Military problems which arise from fundamental changes in the defense environment pose the most important challenges to military OR. These problems arise from two main sources: the deteriorated attitude toward the military (its activities and institutions) as expressed by the media and some publicly represented opinion [and] the shrunk budget for defense, particularly research and development. . . . It is in the area of innovation that we may find the most critical application of systematic analysis using OR techniques. Where experience is lacking because of a new concept, such analysis provides the only way of representing future operations, testing alternative ideas and planning field experiments . . . one of the most challenging problems to OR will continue to be the analysis of close combat or its possible replacement in terms of the purpose of the participants, measures of their success, how they achieve success and how the terrain and other environmental characteristics influence the whole operation, in general and in high resolution with all its subtleties. . . . As a last challenge, we face the possibilities of our forces being deployed in CONUS rather than being deployed overseas. How do we meet the readiness problem for the Army in being? This will pose a renewed set of problems for practical OR.[3]

For Dr. Whittenbury, these challenges would be met by an Army ORSA program that since 1945 had achieved a degree of maturity and acceptance. As he stated:

> From a well-defined set of activities in a limited number of places, the practice of OR has experienced widespread growth in technical scope and application since WWII In recent years we have begun to see a weeding of these activities, because of the discipline of tightening budgets and the sharpening test of operations research and related services against well understood technical needs and the importance of actual results. . . . We are moving then, over the next decade, into a period when the challenge to military OR will be met by a set of capabilities which have matured, from the point of view of the practitioner and the client, into quite specific classes of activities.[4]

In the paper that he presented to the symposium, David C. Hardison, who would soon become the deputy under secretary of the Army for operations research, listed twelve "specific near-term challenges to military OR." They were:

> CHALLENGE 1. Develop an arithmetic of information systems.
> CHALLENGE 2. Understanding the main ways in which night operations differ from day operations.
> CHALLENGE 3. Identify the best balance of air mobile and ground mobile forces to oppose a modern armored formation.
> CHALLENGE 4. Develop improved understanding of the robustness of high order systems.
> CHALLENGE 5. Build and use a more widely accepted framework for organizing and extending our knowledge of military systems and operations.
> CHALLENGE 6. Develop a language and logic for describing metasystems and, consistent therewith, build an integrated hierarchical set of models of a theater land forces and its subordinate divisions, units, elements, and items.
> CHALLENGE 7. Practical means for evaluating a wide range of options for a very large scale system.
> CHALLENGE 8. Acquire requisite process knowledge of military operations.
> CHALLENGE 9. Develop a disciplined set of measures of effectiveness (MOE) applicable to Army systems.
> CHALLENGE 10. Expand the use of peer critiques and feedback from service use of Army systems to challenge OR

theories, and dissiminate [*sic*] new knowledge to military OR community.
CHALLENGE 11. Purge the analytic quacks, earn credibility, and transition to reality.
CHALLENGE 12. Use military OR resources more efficiently, especially use computers more efficiently.[5]

In broader terms, the challenge for Army ORSA managers and analysts at the end of the Vietnam War was how to apply their skills and methods to help Army leaders reorganize, revitalize, and reorient a United States Army that had all but disintegrated under the pressures of rapidly developing technology, the continued threat of the Soviet Union, budgetary constraints, and the loss of confidence and focus resulting from the long and contentious war in Vietnam. Meeting that challenge would provide the ultimate proof of the value of ORSA to military decision makers.

CONCLUSION NOTES

[1] Donald N. Fredericksen, "Challenges in Military OR in the 70's," in U.S. Army Research Office-Durham, *Proceedings of the [Tenth] United States Army Operations Research Symposium: "The Next Decade," 26–28 May 1971, Durham, North Carolina* (Durham, N.C.: U.S. Army Research Office-Durham, 1971), p. 177.

[2] Clive G. Whittenbury, "Challenges in Military OR in the 70's," in *Proceedings of the [Tenth] United States Army Operations Research Symposium*," p. 167.

[3] Ibid., pp. 169–70.

[4] Ibid., pp. 168–69.

[5] David C. Hardison, "Challenges in Military OR in the 70's," in *Proceedings of the [Tenth] United States Army Operations Research Symposium*, pp. 171–74.

APPENDIX A

Secretary McNamara's 19 April 1962 Memorandums on Army Aviation

Appendix A

Memorandum 1[1]

THE SECRETARY OF DEFENSE
Washington
April 19, 1962

MEMORANDUM FOR THE SECRETARY OF THE ARMY

Subject: Army Aviation (U)

This is in response to your two November 1, 1961, memorandum which discussed Army Aviation and presented the Army's proposed procurement program.

These studies greatly enhanced by understanding of what the Army is seeking to achieve through its organic aviation. However, the quantitative procurement programs fall considerably short of providing, in the near future, modern aircraft to fill the stated requirements. While it appears to me that the Army can and should turn increasingly to aviation to improve its tactical mobility, your memoranda do not give a clear picture regarding either the optimum mix of aircraft types or the absolute total numbers that will be required.

Attached is an analysis of your studies made by my office. I would like your comments on this analysis with particular emphasis on the proposed increased buy of aircraft for 1964 and on the position that your predicted requirements in this area through 1970 are too low. These comments should be submitted by 15 May 1962.

Furthermore, I would like the Army to completely re-examine its quantitative and qualitative requirements for aviation. This re-examination should consist of an extensive program of analyses, exercises, and field tests to evaluate revolutionary new concepts of tactical mobility and to recommend action to give the Army the maximum attainable mobility in the combat area. It appears to me that air vehicles, operating in the environment of the ground soldier but freed from the restrictions imposed by the earth's surface, may offer the opportunity to acquire quantum increases in mobility, provided technology, doctrine, and organization potentials are fully exploited. I believe further that these mobility increases can be acquired without increased funding by reducing less effective surface transportation systems concurrently. The Army's re-examination should there for give special attention to the following:

(1) To what extent can aviation be substituted for conventional military surface systems of vehicles, roads, bridging, engineer troops, theater supply and hospital complexes, etc?

(2) Should newer concepts of VTOL or STOL fixed-wing aircraft be substituted for helicopters, as a means of avoiding some of the high procurement and operating costs of helicopters?

(3) May we use heavy tactical airlift, combined with new techniques in air dropping and possibly better airlift construction and repair capability, to provide part of the logistic support for ground operations? There should be considered the possibility that Air Force lift may be available, after the first thirty or so days of a strategic airlift, to augment Army tactical lift capabilities.

(4) What qualitative requirements can be defined for immediately developable V/STOL air vehicles optimized for such purposes as surveillance, target acquisition, weapons platforms, command posts, communications centers, or troop and cargo carriers of significantly heavier loads?

(5) What organizations and operational concepts are required to exploit the potential increases in mobility? Consideration should be given to completely airmobile infantry, anti-tank, reconnaissance, and artillery units.

(6) What other concepts and ideas, as well as major limitations, bear on this subject? We should seriously consider fresh, new concepts, and give unorthodox ideas a hearing.

The results of the study should be presented in terms of cost-effectiveness and transport-effectiveness factors. The study should involve the full use of field tests and exercises to test new concepts of mobility.

In addition, the use of operations analysis in planning, observing recording data, and analyzing results for the field test program appears to me to be essential to the effective accomplishment of the entire re-examination.

As a first step in your re-examination of Army aviation requirements, I would like by 15 May 1962 an outline of how you plan to conduct the re-examination program. The actual re-examination should be completed and your recommendations submitted by 1 September 1962.

/s/ Robert S. McNamara

Attachment
Review of Army Acft Req [omitted]

Memorandum No. 2[2]
THE SECRETARY OF DEFENSE
Washington
April 19, 1962

MEMORANDUM FOR MR. STAHR

I have not been satisfied with Army program submissions for tactical mobility. I do not believe the Army has fully explored the opportunities offered by aeronautical technology for making a revolutionary break with traditional surface mobility means. Air vehicles operating close to, but above, the ground appear to me to offer the possibility of a quantum increase in effectiveness, I think that every possibility in this area should be exploited.

We have found that air transportation is cheaper than rail or ship transportation even in peacetime. The urgency of war time operations makes air transportation even more important. By exploiting aeronautical potential, we should be able to achieve a major increase in effectiveness while spending on airmobility systems no more than we have been spending on systems oriented for ground transportation.

I therefore believe that the Army's re-examination of its aviation requirements should be a bold "new look" at land warfare mobility. It should be conducted in an atmosphere divorced from traditional viewpoints and past policies. The only objective the actual task force should be given is that of acquiring the maximum attainable mobility within alternative funding levels and technology. This necessitates a readiness to substitute airmobility systems for traditional ground systems wherever analysis shows the substitution to improve our capabilities or effectiveness. It also requires that bold, new ideas which the task force may recommend be protected from veto or dilution by conservative staff review.

In order to ensure the success of the re-examination I am requesting in my official memorandum, I urge you to give its implementation your close personal attention. More specifically, I suggest that you establish a managing group of selected individuals to direct the review and keep you advised of its progress. If you choose to appoint such a committee, I suggest the following individuals be considered as appropriate for service thereon: Lt. Gen. Hamilton H. Howze, Brig. Gen. Delk M. Oden, Brig. Gen. Walter B. Richardson, Col. Robert R. Williams, Col. John Norton, Col. A. J. Rankin, Mr. Frank A. Parker, Dr. Erwin W. Paxon and Mr. Edward H. Heinemann.

Existing Army activities such as Fort Rucker, STAG (Strategic and Tactics Analysis Group, Washington, D.C.), CDEC (Combat Development Experimental Center, Ft. Ord), and CORG (Combat Operations Research Group, Ft. Monroe), combined with the troop units and military study headquarters of CONARC, and in cooperation with Air Force troop carrier elements, appear to provide the required capabilities to conduct the analyses, field tests and exercises, provided their efforts are properly directed.

The studies already made by the Army of airmobile divisions and their subordinate airmobile units, of airmobile reconnaissance regiments, and of aerial artillery indicate the type of doctrinal concepts which could be evolved, although there has been no action to carry these concepts into effect. Parallel studies are also needed to provide air vehicles of improved capabilities and to eliminate ground-surface equipment and forces whose duplicate but less effective capabilities can no longer be justified economically. Improved V/STOL air vehicles may also be required as optimized weapons platforms, command and communications vehicles, and as short range prime moves of heavy loads up to 40 or 50 tons.

I shall be disappointed if the Army's re-examination merely produces logistics-oriented recommendations to procure more of the same, rather than a plan for implementing fresh and perhaps unorthodox concepts which will give use a significant increase in mobility.

/s/ Robert S. McNamara

APPENDIX A NOTES

[1] From original reproduced in U.S. Army Tactical Mobility Requirements Board [Howze Board], *Final Report* (Fort Bragg, N.C.: U.S. Army Tactical Mobility Requirements Board [Howze Board], 20 Aug 1962), Incl 1, and in Jacob A. Stockfisch, *The 1962 Howze Board and Army Combat Developments* (Santa Monica, Calif: The RAND Corp., 1994), pp. 39–40.

[2] From original reproduced in Howze Board Final Report, Incl 1, and in Stockfisch, *The 1962 Howze Board and Army Combat Developments*, pp. 41–42.

Appendix B

HQ MACV Research and Development Elements

Secretary of Defense Robert S. McNamara recognized the potential contribution of scientific research and analysis to the success of U.S. counterinsurgency efforts in Vietnam and authorized the conduct of research, development, test, and evaluation (RDTE) and combat developments activities in the theater.[1] As stated in *MACV Directive 70–1* and *CINCPAC Instruction 03960.1A*:

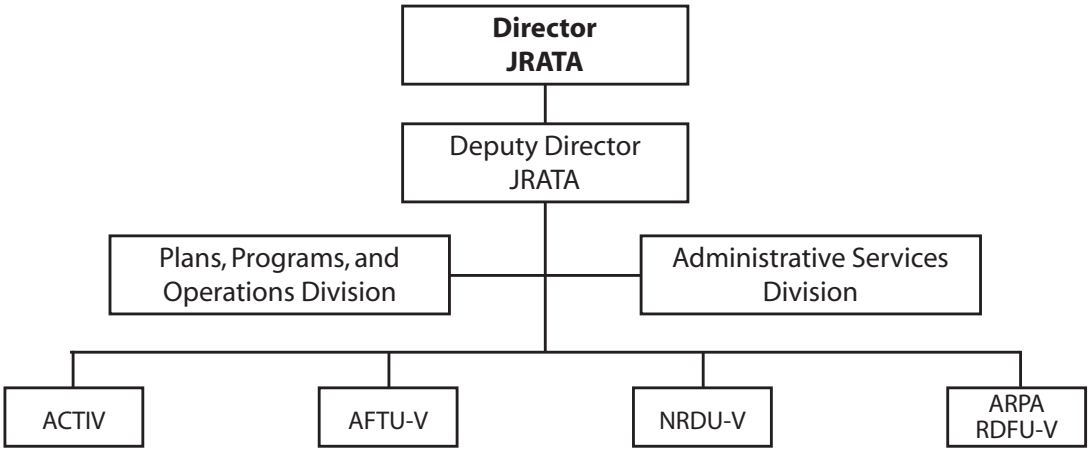
> (1) The objectives of R&D within the Republic of Vietnam are to enhance the combat effectiveness and the counterinsurgency/countersubversion capabilities of the US, Vietnamese, and Free World Military Assistance Forces;
> (2) That R&D Matters of a unilateral service nature will normally be the responsibility of each service component commander reporting through service channels . . . ; and
> (3) That MACV HQ will participate directly in those R&D projects which are of a joint nature, require substantial joint participation, or involve service roles and missions.[2]

The Joint Research and Test Activity

Even before the formation of HQ MACV in 1962, the Department of Defense and each of the Services had a number of RDTE teams active in South Vietnam. Their work was coordinated by the Joint Operations Evaluation Group, Vietnam (JOEG-V). In February 1964, the Joint Chiefs of Staff directed that all RDTE agencies operating in Vietnam be organized in a single command, and in April 1964, Secretary McNamara approved the establishment of the Joint Research and Test Activity (JRATA) under the direction of Army Brig. Gen. John K. Boles, Jr., who had previously commanded JOEG-V.[3] General Boles served as the principal staff adviser to COMUSMACV on RDTE and combat developments and also advised and assisted the South Vietnamese armed forces on such matters through the Republic of Vietnam Armed Forces (RVNAF) Combat Development Test Center, Vietnam (CDTC-V).[4] JRATA was activated on 23 April 1964, and assumed control of the DOD Advanced Research Projects Agency Research Development Field Unit-Vietnam (ARPA RDFU-V), the Army Concept Team in Vietnam (ACTIV), and the Air Force Test Unit-Vietnam (AFTU-V). A naval test unit, the Navy Research and Development Unit-Vietnam (NRDU-V) was added on 26 August 1965.[5] The resulting structure of JRATA was as shown in Figure B–1.

The JRATA Joint Table of Distribution authorized a permanent strength of eighty-five personnel: twelve in the headquarters (six officers and six enlisted men); fifty-one in ACTIV (twenty-six officers and twenty-five enlisted men); nine in AFTU-V (six officers and three enlisted men); and thirteen in ARPA RDFU-V (seven officers, four enlisted men, and two civilians).[6] In addition, the ARPA RDFU-V was authorized ten full-time RAC and RAND civilian contract spaces.[7] Each of the subordinate JRATA elements was also authorized a number of temporary duty (TDY) spaces to help gather data and prepare final reports, thus bringing the total JRATA personnel authorization up to 142, not including locally hired Vietnamese personnel.[8] Project activity increased, and following the establishment of the NRDU-V in

FIGURE B–1—ORGANIZATION OF THE JOINT RESEARCH AND TEST ACTIVITY



Source: Joint Research and Test Activity (JRATA) Final Progress Report, app. A, p. A-1.

August 1965, the JRATA personnel authorization was increased in September to fifty-three officers, forty-four enlisted men, and six civilians plus twenty-eight contract personnel (including ORSA analysts) assigned to ARPA RDFU-V (one from the Public Health Service, four from RAC, nine from the RAND Corporation, six from Battelle, four from Booz-Allen, and four from Simulmatics), for a grand total of 184 spaces.[9]

The principal functions and responsibilities of JRATA were to:

a. Enhance the counterinsurgency capabilities of Vietnamese and U.S. forces.
b. Provide RDT&E and CD support to the Republic of Vietnam Armed Forces (RVNAF).
c. Assist the RVNAF in developing their RDT&E and CD capabilities to include continued support of the combined RVN/US Combat Development Test Center Vietnam (CDTC-V).
d. Provide access to data and test environment for the U.S. scientific and military communities in development of new and improved weapons, equipment concepts, and techniques applicable to countersubversion and counterinsurgency.
e. Provide sound and fully objective military evaluation of new or improved operational and organizational concepts, doctrine, tactics, techniques and materiel in the combat environment of Vietnam.[10]

From its beginnings in the 1930s operations research has always been closely associated with research, development, test, and evaluation projects. Such was the case in Vietnam. JRATA headquarters and each of its subordinate Service components were focused primarily on RDTE, but they had ORSA analysts assigned and used a wide variety of methods, including ORSA techniques, to plan projects, establish measurement standards, gather data, analyze data, form conclusions, and make recommendations to senior decision makers. In some cases, the work undertaken rose to the level of full-blown ORSA studies complete with sophisticated mathematical analysis of the data.

Under the direction of General Boles, JRATA programmed a total of 245 formal projects, of which sixty-five were completed, twenty-nine were canceled, and 151 were still ongoing when General Boles was replaced as director of JRATA by Army Brig. Gen. Alvin E. Cowan on 1 May 1966.[11] Projects undertaken by the Air Force Test Unit-Vietnam included evaluations of the WDU–4/A flechette warhead and of the feasibility and desirability of installing a side-firing M60 machine-gun in the O–1 aircraft.[12] NRDU-V projects included a study of the potential military usefulness of the Patrol Air Cushion Vehicle in various naval missions in coastal and inland waterways, an evaluation of the effectiveness and utility of anti-swimmer nets in Vietnamese harbors and rivers, and an evaluation of the operational effectiveness of the AN/SQS–19 small-boat sonar as a mine detection device.[13] The ARPA RDFU-V research program was more extensive and varied and included direct support of the RVNAF Combat Development Test Center-Vietnam.[14] Among the many ARPA RDFU-V projects

were studies, analyses, and reports on such topics as the nature of the Vietnamese swamp forests; defoliation operations; various ground surveillance and intrusion detection devices and sensors; the air traffic control system in Southeast Asia; Viet Cong tunnel systems; route security; and a host of other topics.[15]

Convinced that RDTE were essentially Service matters, on 29 June 1966, the COMUSMACV, General William C. Westmoreland, recommended to the Commander in Chief Pacific (CINCPAC) that the various elements of JRATA be returned to Service control.[16] In October 1966, Secretary McNamara approved General Westmoreland's recommendation, and on 15 November 1966, JRATA was discontinued.[17] Each of the three Services became directly responsible for its own RDTE efforts, and the ARPA RDFU-V again became a separate unit under the operational control of the MACV Science Advisor.[18] Certain residual joint RDTE functions were assigned to the Operational Requirements Branch, MACV J–3.[19]

The MACV Science Advisor

In March 1966, well before action was taken to discontinue the MACV Joint Research and Test Activity, the Joint Chiefs of Staff recommended to COMUSMACV, General Westmoreland, that he establish on his staff a small group of technical advisers under the direction of a prominent scientist.[20] The Joint Chiefs of Staff envisioned that the new office would function in much the same way as had the Field Service Offices of the Office of Scientific Research and Development in World War II. Discussions among General Westmoreland, the chairman of the Joint Chiefs of Staff, the chief of staff of the Army, CINCPAC, and the director of defense research and engineering (DDRE) continued throughout the spring, summer, and early fall of 1966, and at a staff meeting on 5 October 1966, General Westmoreland announced the appointment of Dr. William G. McMillan of the University of California, Los Angeles, and the RAND Corporation as the MACV Science Advisor.[21] The Office of the MACV Science Advisor (MACSA) was formally established by MACV General Orders on 8 December 1966.[22]

The MACV Science Advisor was the principal adviser to COMUSMACV and his staff on scientific matters, including RDTE, and worked closely with the MACV J–3 who also had responsibilities in the RDTE area. The specific functions of MACSA were prescribed in the *MACV Organization and Functions Manual*, dated 16 September 1968, which stated that the MACV Science Advisor:

a. Monitors and conducts an independent review of development, test and evaluation activities within the command and makes recommendations to COMUSMACV or responsible staff section as appropriate.
b. Reviews results of intelligence and field operations as requested by COMUSMACV and makes recommendations with respect to scientific and technical features.
c. As requested by COMUSMACV, reviews plans for intelligence and field operations exploiting new equipment or scientific and technical innovations and makes recommendations on them.
d. As appropriate, monitors the activities of scientific and technical personnel on duty in Vietnam.
e. Coordinates the activities of scientific and technical personnel on duty in Vietnam who are accredited to Headquarters MACV.
f. Maintains contact with the Director of Defense Research and Engineering on scientific and technical matters, particularly concerning possible new applications of advanced technology deserving increased R&D emphasis. In fulfillment of this function, the Science Advisor will neither transmit official requirements nor make commitments for COMUSMACV.
g. Reviews the requirements of this command for Scientific Advisors. Recommends functions, organizations, and staff relationship most appropriate to this position. Determines qualitative and quantitative requirements for long-term TDY Science Advisors to this command.
h. Exercises staff supervision over OSD/ARPA RDFU-V which is responsible for:
    (1) Conducting approved research, development, test, evaluation and combat development (RDT&E and CD) projects in Vienam to include operational analysis, special studies, and field evaluations related to the counterinsurgency effort in Vietnam.
    (2) Assisting RVNAF in RDT&E and CD matters through participation as appropriate in activities of the Combat Development Test Center-Vietnam.
    (3) Providing access to data and test environment for the US scientific and military communities in development of new improved materiel concepts and techniques applicable to operations in Vietnam.
i. Undertakes such other duties as may be assigned by COMUSMACV.[23]

The MACV Science Advisor also maintained liaison with the Australian Defense Science Liaison Officer at HQ MACV and with the Australian Field Operational Research Section.[24] Although primarily concerned with RDTE matters, by virtue of his responsibility for overseeing all MACV RDTE activities (paragraph a above) and coordinating the activities of scientific and technical personnel accredited to MACV (paragraph e above), the MACSA was involved in ORSA matters as well.

Both CINCPAC and COMUSMACV were concerned with the number of civilian scientific personnel that could be accommodated in the theater, and CINCPAC recommended that no more than three civilians be employed in Vietnam as science consultants.[25] Accordingly, the MACV Science Advisor's Office was initially established with a staff of one civilian (the Science Advisor) and five military personnel (a deputy, an administrative assistant, a project officer, and two enlisted clerical assistants) augmented by a large number of consultants and personnel attached to the office on TDY to perform studies and participate in equipment testing.[26]

On 5 December 1967, Dr. McMillan, the MACSA, submitted a three-part proposal to improve the RDTE effort in the command.[27] First, he proposed the assignment of scientific field advisers down to the level of division and independent brigade. Second, he proposed that the "presently fragmented RDT&E units in South Vietnam" be integrated into a new MACV organization that would have as its mission the development and application of new technology to the prosecution of the war in Vietnam. And third, he proposed that the MACV Science Advisor's Office be enlarged substantially to handle the recommended changes. The MACSA proposals did not receive much support. Field commanders saw little need for a science adviser at lower levels, and as a result when MACV forwarded the proposals to CINCPAC in February 1968, it recommended that science advisers be attached only to senior field commanders with their concurrence.[28] Continued opposition from CINCPAC and the Joint Chiefs of Staff resulted in submission of several revisions before the revised MACSA proposals regarding the assignment of science advisers to senior headquarters was approved. Although the proposal to expand the personnel authorization for MACSA was rejected, by mid-October 1968, the MACV Science Advisor program had expanded considerably and was organized as shown in Figure B–2.[29]

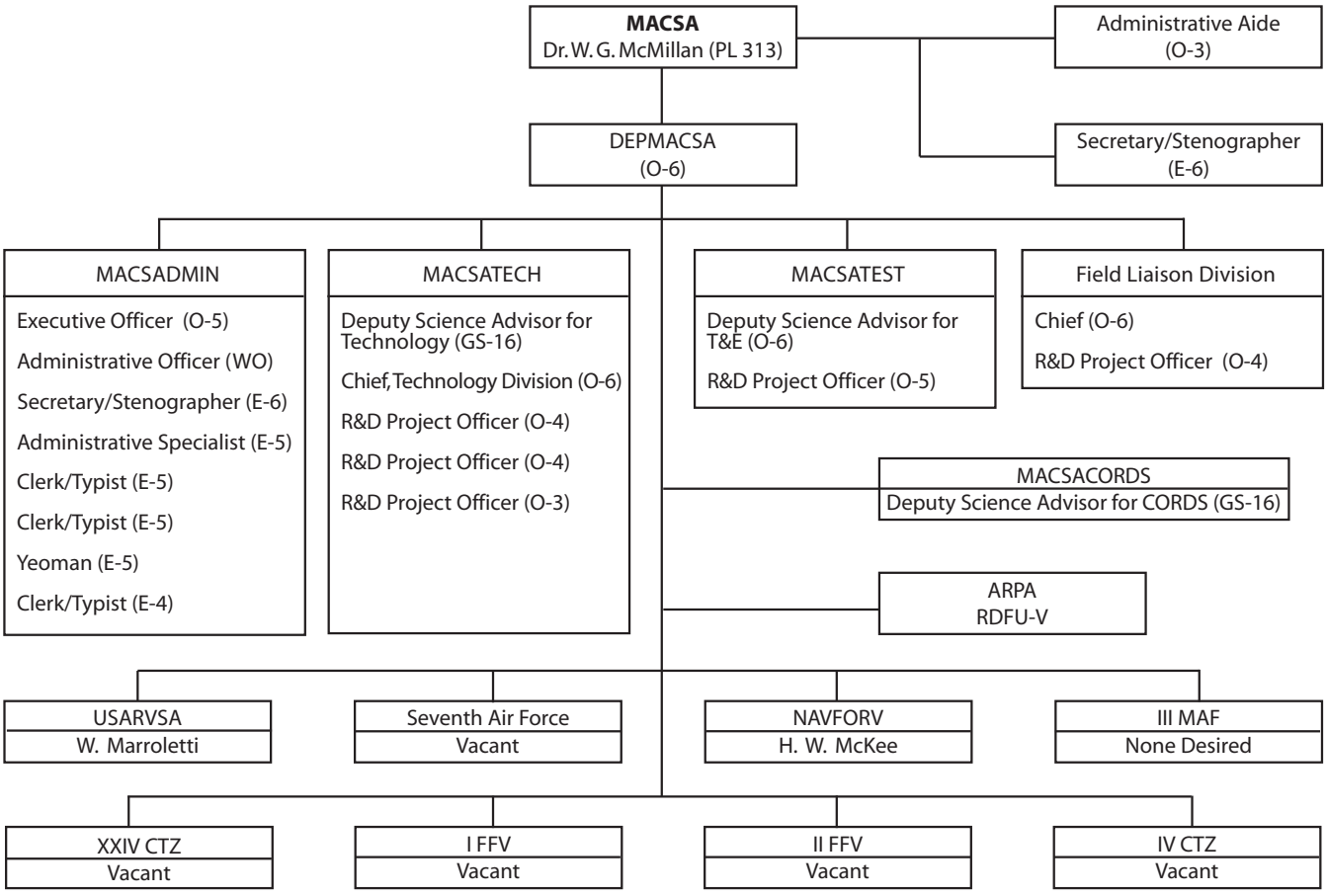
Until 24 March 1969, the MACV Science Advisor also served simultaneously as the Science Advisor to the Commander of the United States Army, Vietnam (USARV), and maintained a resident deputy at HQ USARV.[30] He was also responsible for overseeing the assignment and utilization of science advisers in the major Service component headquarters subordinate to HQ MACV, and on 11 October 1968, Dr. McMillan issued a report on efforts to find suitable personnel for those headquarters.[31] At Headquarters, Seventh Air Force, the head of the Tactical Operations Analysis Division, Dr. Robert Schwartz, reported directly to the Commander, Seventh Air Force, and thus—at least in the operations analysis field—filled some of the functions of a science adviser. At Headquarters, Naval Forces Vietnam (NAVFORV), the commander, Admiral Elmo Zumwalt, had Mr. Herbert W. McKee, a former MACSA consultant, as science adviser and formed a group of operations analysts to deal with Navy matters in-country. The commander of the III Marine Amphibious Force declined the assignment of a qualified science adviser but had "an excellent working relationship" with MACSA through visiting MACSA personnel. In his report, Dr. McMillan also noted vacancies in the science adviser positions at the headquarters of I Field Force Vietnam, II Field Force Vietnam, IV Corps Tactical Zone, XXIV Corps Tactical Zone, and Civil Operations Rural Development Support.

COMUSMACV was especially concerned that ongoing RDT&E projects did not interfere with military operations and that primary emphasis be placed on those projects "which offer direct and significant improvement of combat capability for forces involved in Vietnam."[32] Among those areas identified by HQ MACV in January 1968 for special attention were airborne personnel detectors, night vision equipment for armed helicopters, and seismic intrusion detectors.[33]

Throughout its existence, the MACV Science Advisor's Office performed an important function in coordinating the RDTE efforts of the various services in Vietnam. As noted in a briefing circa 1970, the most important lessons learned from the operation of MACSA were as follows:

1. To be most effective, the role of the Science Advisor must be disassociated from responsibility for the conduct of operations. The Science Advisor must maintain an impartial and critical attitude with respect to equipment and projects. Generally this will not occur if he becomes involved in the design, test and evaluation of projects in which he has a vested or emotional interest.
2. The Science Advisor must recognize and function within the primacy of the service RDT&E role in SEA. RDT&E matters of a unilateral service nature are the responsibility of each service component commander reporting through service channels.
3. The point of greatest impact and the place to influence RDT&E is at the DOD/Service level-not in an operational theatre of war and not after the fact in the R&D cycle.
4. Equipment which is either untested or fails in CONUS tests will not have its performance improved by testing in SEA.[34]

Figure B–2—Organization of the MACV Science Advisor, October 1968



Source: Memo, Dr. William G. McMillan (MACSA) to General Andrew J. Goodpaster (DEPCOMUSMACV), APO San Francisco 96222, 11 Oct 1968, sub: Status of Scientific and Technical Manpower for MACSA and MACEVAL, p. 2.

APPENDIX B NOTES

[1] U.S. Army Military Assistance Command, Vietnam, Office of the Secretary of the Joint Staff, Military History Branch, *Command History 1966* (APO San Francisco 96222: Military History Branch, Office of the Secretary of the Joint Staff, HQ MACV, 1966), p. 763 [cited hereafter as MACV Command History 1966].

[2] U.S. Military Assistance Command, Vietnam, Office of the Science Advisor, *Briefing on Research and Development in Vietnam* (APO San Francisco 96222: Office of the Science Advisor, HQ MACV, n.d. [1970]), pp. 1–2 [cited hereafter as MACV R&D Briefing].

[3] On the history of JRATA, see U.S. Military Assistance Command, Vietnam, Joint Research and Test Activity, *Final Progress Report, 1 July–31 October 1966* (APO SF 96222: Joint Research and Test Activity, HQ MACV, 15 November 1966) [cited hereafter as JRATA Final Progress Rpt]; MACV R&D Briefing; MACV Command History 1966; and U.S. Army Military Assistance Command, Vietnam, Office of the Secretary of the Joint Staff, Military History Branch, *Command History, 1969, Volume III* (APO San Francisco 96222: Military History Branch, Office of the Secretary of the Joint Staff, HQ MACV, 1969) [cited hereafter as MACV Command History 1969, III].

[4] MACV Command History 1969, III, p. XII–1.

[5] Ibid.

[6] Ibid., p. 3.

[7] Ibid.

[8] Ibid. ACTIV was authorized thirty-five TDY spaces, AFTU-V was authorized six, and ARPA RDFU-V was authorized six, for a total of forty-seven.

[9] Ibid.

[10] Ibid., 4; MACV Command History 1969, III, p. XII–1.

[11] JRATA Final Progress Rpt, p. 4. Brig. Gen. Alvin E. Cowan returned to CONUS on emergency leave in July 1966, and on 25 July 1966, USAF Col. Charles E. Hammet, then the deputy director of JRATA, was named acting director.

[12] MACV Command History 1966, pp. 767–68; JRATA Final Progress Rpt, p. 37. ACTIV projects are discussed below in the separate section on ACTIV.

[13] MACV Command History 1966, pp. 768–69; JRATA Final Progress Rpt, p. 79.

[14] On ARPA RDFU-V organization and activities, see, in particular, MACV R&D Briefing, p. 12–16.

[15] MACV Command History 1966, p. 769. Many of the ARPA RDFU-V projects are listed in JRATA Final Progress Rpt, pp. 45–46 and pp. 74–76.

[16] Ibid., p. 763; MACV R&D Briefing, p. 4. At the time JRATA was established in 1964, the Service component headquarters of MACV, such as Headquarters, U.S. Army Vietnam (HQ USARV), had not yet been established.

[17] JRATA Final Progress Rpt, p. 4.

[18] Ibid.; U.S. Department of Defense Advanced Research Projects Agency, Research and Development Field Unit-Vietnam, *Semi-Annual Report, 1 November 1966–15 May 1967* (APO SF 96243: U.S. Department of Defense Advanced Research Projects Agency, Research and Development Field Unit-Vietnam, 1967), p. 1.

[19] JRATA Final Progress Rpt, p. 4; MACV Command History 1966, p. 763.

[20] MACV Command History 1966, p. 764.

[21] MACV Command History 1969, III, p. XII–1 and p. XII–2.

[22] MACV Command History 1966, p. 764; MACV R&D Briefing, p. 4; MACV Command History 1969, III, p. XII–2. Dr. McMillan was succeeded in early January 1969 by Dr. Nels F. Wikner, and Dr. Wikner was replaced in turn by Mr. John E. Kirk in July 1969 (see MACV Command History 1969, III, p. XII–2 and p. XII–6).

[23] U.S. Military Assistance Command, Vietnam, *Organization and Functions Manual*, with Changes 1–13 (APO SF 96222: HQ MACV, 16 Sep 1968), p. XXV–1 and p. XXV–2.

[24] MACV R&D Briefing, pp. 7–8.

[25] MACV Command History 1966, p. 764.

[26] MACV Command History 1969, III, p. XII–2; MACV R&D Briefing, p. 4.

[27] On Dr. McMillan's proposal, see U.S. Army Military Assistance Command, Vietnam, Office of the Secretary of the Joint Staff, Military History Branch, *Command History, 1968, Volume II* (APO San Francisco 96222: Military History Branch, Office of the Secretary of the Joint Staff, HQ MACV, 1968), pp. 746–47 [cited hereafter as MACV Command History 1968, II], and MACV Command History 1969, III, p. XII–2 to p. XII–5.

[28] MACV Command History 1968, II, p. 747.

[29] Later, on 4 April 1969, MACSA recommended a change to the MACV manning documents, which would have reduced the authorized strength of the MACV Science Advisor's Office from eighteen military positions to nine in order to reduce redundancy with the ARPA RDFU-V (MACV Command History 1969, III, p. XII–5 and p. XII–6).

[30] MACV Command History 1969, III, p. XII–4; McMillan memo, 11 Oct 1968, par. 2, sec. a, item i. The Deputy USARV Science Advisor in 1968 was Mr. William Marroletti.

[31] The status of each subordinate headquarters was recapitulated in McMillan memo, 11 Oct 1968, par. 2.

[32] Quoted in MACV Command History 1968, II, p. 745.

[33] MACV Command History 1968, II, p. 745.

[34] MACV R&D Briefing, pp. 5–6.

Selected Abbreviations and Acronyms[1]

AAA	Army Audit Agency
AAD	Air Assault Division
AAF	Army Air Forces
ACCB	Air Cavalry Combat Brigade
ACSFOR	Assistant Chief of Staff for Force Development
ACSI	Assistant Chief of Staff for Intelligence
ACTIV	Army Concept Team in Vietnam
ADPS	Automatic Data Processing System
AERB	Army Educational Requirements Board
AFTU-V	Air Force Test Unit-Vietnam
AIDSCOM	Army Information and Data Systems Command
ALMC	United States Army Logistics Management Center
AM	airmobile
AMC	United States Army Materiel Command
AORSC	Army Operations Research Steering Committee
ARADCOM	United States Army Air Defense Command
ARAME	Army Air Mobility Evaluation
ARCOV	Army Combat Operations in Vietnam
ARCSA	Aviation Requirements for the Combat Structure of the Army
ARO	Army Research Office
ARO-D	Army Research Office, Durham, North Carolina
ARPA RDFU-V	Department of Defense Advanced Research Projects Agency Research and Development Field Unit-Vietnam
ARVN	Army of the Republic of Vietnam

[1] This list of abbreviations and acronyms is highly selective. Most abbreviations and acronyms used in the text are expanded fully at first use in each chapter. Commonly used abbreviations and acronyms, such as those for Army ranks, Army branches, months, and states, are not included here. For terms and acronyms not found here, the reader should consult U.S. Department of the Army, *Army Regulations No. 320–5: Dictionary of United States Army Terms* (Washington, D.C.: Government Printing Office, Apr 1965), or U.S. Joint Chiefs of Staff, Office of the Chairman, *Joint Publication 1–02: Department of Defense Dictionary of Military and Associated Terms* (Washington, D.C.: Office of the Chairman, The Joint Chiefs of Staff, 23 Mar 1994).

ASAC	Army Study Advisory Committee
ASD	Assistant Secretary of Defense
ATB	Air Transport Brigade
BRL	Ballistics Research Laboratories
BSRL	Behavioral Sciences Research Laboratory
C^3	command, control, and communications
CAG	Combat Arms Group; Combined Arms Group
CBR	chemical, biological, and radiological (weapons)
CCIS	Command and Control Information System
CDC	*See* USACDC
CDEC	*See* USACDEC
CDTC-V	Combat Development Test Center-Vietnam
CGSC	*See* USACGSC
CINCPAC	Commander in Chief, Pacific
CINCUSARPAC	Commander in Chief, United States Army Pacific
CMH	*See* USACMH
COA	Comptroller of the Army
COE	Chief of Engineers
COMH	Chief of Military History
COMUSMACV	Commander, United States Military Assistance Command, Vietnam
CONARC	*See* USCONARC
CONUS	continental United States
CORDS	Civil Operations Rural Development Support
CRD	Chief of Research and Development
CRESS	Center for Research in the Social Systems
CSG	Combat Support Group
CSM	Chief of Staff Memorandum
CSR	Chief of Staff Regulation
CSSG	Combat Service Support Group
DCSLOG	Deputy Chief of Staff for Logistics
DCSOPS	Deputy Chief of Staff for Military Operations (1956–1974); Deputy Chief of Staff, Operations, Plans, and Security (HQ USARV)
DCSPER	Deputy Chief of Staff for Personnel
DDRE	Director of Defense Research and Engineering
DMIS	Director of Management Information Systems
DSS	Director of Special Studies; Director of Studies
DUSA (OR)	Deputy Under Secretary of the Army (Operations Research)

ETASS	Evaluation of the Army Study System (DePuy Study), 1969
FASD	Foreign Area Studies Division
FCRC	Federal Contract Research Center
FFV	Field Force Vietnam
FPAO	Force Planning and Analysis Office
GRC	General Research Corporation
HEL	United States Army Human Engineering Laboratory
HQDA	Headquarters, Department of the Army
HumRRO	Human Resources Research Office (1951–1969)
	Human Resources Research Organization (1969–present)
ICAS	Institute of Combined Arms and Support
IDA	Institute for Defense Analyses
ILC	Institute of Land Combat
ILW	Institute for Land Warfare
ISA	Institute of Systems Analysis
ISS	Institute of Special Studies
ISSO	Institute of Strategic and Stability Operations
JOEG-V	Joint Operations Evaluation Group, Vietnam
JRATA	Joint Research and Test Activity
LOI	Letter of Instruction
LWL	*See* USALWL
MAAG	Military Assistance Advisory Group
MACEVAL	MACV Operations Research and Systems Analysis Office
MACOM	Major Command
MACOV	Mechanized and Armored Combat Operations in Vietnam
MACSA	MACV Science Advisor
MACV	United States Military Assistance Command, Vietnam
MIT	Massachusetts Institute of Technology
MORS	Military Operations Research Symposium/ Society
MTEL	Manning Tables and Equipment Lists
MTOE	Modified Table of Organization and Equipment
NAVFORV	Naval Forces Vietnam
NRDU-V	Navy Research and Development Unit-Vietnam
O&F	organization and functions

O&MA	*See* OMA
OAC	Office of the Army Comptroller (1948–1949)
OACSFOR	Office of the Assistant Chief of Staff for Force Development
OACSI	Office of the Assistant Chief of Staff for Intelligence
OAVCSA	Office of the Assistant Vice Chief of Staff of the Army
OCA	Office of the Comptroller of the Army
OCMH	Office of the Chief of Military History, United States Army
OCRD	Office of the Chief of Research and Development
OCSA	Office of the Chief of Staff, Army
ODC&A	Office of the Director of Coordination and Analysis
ODCSLOG	Office of the Deputy Chief of Staff for Logistics
ODCSOPS	Office of the Deputy Chief of Staff for Military Operations
ODCSPER	Office of the Deputy Chief of Staff for Personnel
OMA	Operations and Maintenance, Army (budget category)
OOR	Office of Ordnance Research; Office of Operations Research
OPO	Office of Personnel Operations
OR	operations research; operational research
OR/SA	*See* ORSA
ORI	Operations Research, Incorporated
ORO	Operations Research Office
ORSA	Operations Research and Systems Analysis; Operations Research Society of America
ORTAG	Operations Research Technical Assistance Group
OSD	Office of the Secretary of Defense
OVCSA	Office of the Vice Chief of Staff of the Army
PAG	Project Advisory Group
PCS	Permanent Change of Station
POM	Program Objective Memorandum
PPBS	Planning, Programming, and Budgeting System
PRC	Planning Research Corporation
PRIMAR	Program to Improve the Management of Army Resources
QMDO	Qualitative Materiel Development Objective
QMR	Qualitative Materiel Requirement

R&D	research and development
RAC	Research Analysis Corporation
RACFOE	Research Analysis Corporation Field Office Europe
RACO	Remote Area Conflict Office
RACTHAI	Research Analysis Corporation Field Office-Thailand
RACVN	Research Analysis Corporation Field Office-Vietnam
RAND	The RAND Corporation, Santa Monica, California
RDT&E	*See* RDTE
RDTE	Research, Development, Test, and Evaluation
ROAD	Reorganization Objective Army Division
ROK	Republic of Korea
RVNAF	Republic of Vietnam Armed Forces
SA	Secretary of the Army; Systems Analysis
SAG	Science Advisory Group; Scientific Advisory Group; Study Advisory Group; Systems Analysis Group
SDR	Special Development Requirement
SHAPE	Supreme Headquarters Allied Powers, Europe
SORO	Special Operations Research Office
SRI	Stanford Research Institute
SSG	Strategic Studies Group
SSI	Strategic Studies Institute
STAG	United States Army Strategy and Tactics Analysis Group
STRICOM	*See* USSTRICOM
SWCAG	Special Warfare and Civil Affairs Group
SWG	Special Warfare Group
TAADS	The Army Authorization Document System
TACSPIEL	RAC computer-assisted division-level tactical war game
TASP	The Army Study Program
TDA	Table of Distribution and Allowances
TDY	temporary duty
TEC Group	Training (later Test), Evaluation, and Control Group
TECOM	United States Army Test and Evaluation Command
THEATERSPIEL	RAC theater-level war game
TOE	Table of Organization and Equipment
TOI	Technical Operations, Incorporated
TRADOC	*See* USATRADOC

USACDC	United States Army Combat Developments Command
USACDEC	United States Army Combat Developments Experimentation Center/ Command
USACGSC	United States Army Command and General Staff College
USACMH	United States Army Center of Military History
USAIAS	United States Army Institute for Advanced Studies
USAIC	United States Army Infantry Center
USALWL	United States Army Limited War Laboratory
USAMHI	United States Army Military History Institute
USAPRO	United States Army Personnel Research Office
USAREUR	United States Army, Europe
USARV	United States Army, Vietnam
USATRADOC	United States Army Training and Doctrine Command
USAWC	United States Army War College
USCONARC	United States Continental Army Command
USGPO	United States Government Printing Office
USMA	United States Military Academy
USSTRICOM	United States Strike Command
VC	Viet Cong
VCSA	Vice Chief of Staff of the Army
WECOM	United States Army Weapons Command

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