HISTORY OF STRATEGIC AIR AND BALLISTIC MISSILE DEFENSE

VOLUME II
1956–1972

Executive Summary

A. Introduction

This is the second of two draft volumes on the history of strategic air and ballistic missile defense from 1945 to 1972. It covers the 1955–1972 portion of the larger period, and is organized into five interrelated and progressively more detailed chapters. Chapter I provides a comparison of U.S. and Soviet strategies, Chapters II and III deal with U.S. strategy and Soviet strategy, while Chapters IV and V cover U.S. systems and Soviet systems.

This Executive Summary is drawn directly from, and highlights critical judgments of, these five chapters. As such, it outlines the substance of the much larger body of primary evidence contained in the separate books in this draft volume which was gathered to address the reasons underlying policy formulation and decision making for strategic defense and the relationship between the superpowers within that highly complex security policy arena. Results of research concerning factors influencing attitudes of policy/decision makers at critical times appear in Chapters II and III.

This Executive Summary has three major groupings: one, to reflect the contextual setting of decision-making, circa 1955; the second, to highlight strategic air defense policy comparisons and contrasts, 1955–1972; and a third, to present judgments and conclusions about the results of the play of factors and perceptions which molded air defense decisions during these years. These three sections derive from and are firmly tied to an evidential base; however, time and documentation constraints have limited the effort to develop that base. Consequently, important elements of the story may appear to be slighted. The essential and significant, however, are here.

Central questions faced the U.S. and Soviet defense planners. Fundamentally they asked: "How to defend the country?" and "How may we be attacked?"

B. The Setting

1. Influential Factors

During this period, U.S. and Soviet perceptions of strategic air and missile defense requirements were strongly influenced by (1) science and technology, (2) uncertainties in the future environment as to the continuity of the other's policies and nuclear strategies, and (3) the growing wish to move toward some limitations on arms.

2. Context in 1955

a. U.S. Strategy and Policy

U.S. national policy called for a strong and effective security posture with emphasis on strategic retaliatory forces and an integrated continental defense system. U.S. continental defense policy called for

intensification and acceleration of programs in order to be prepared against a Soviet threat anticipated to be grievous by 1957. Disarmament arrangements, if practicable, would be sought.

b. Soviet Strategy and Policy

Soviet strategy in the Spring of 1955 built on a fundamentally changed doctrine of preemption designed to frustrate an enemy attack. This provided the basis for having strategic forces not only for offensive employment but also to disrupt a Western surprise attack. In addition, the Soviets had an active defense system to help secure a growing strategic deterrent force and to defend the homeland. A missile development program was being pushed.

3. General Overview

a. Factors Influencing Deterrence

Concern over a perceived vulnerability to a surprise nuclear attack led both nations to develop powerful deterrent forces and supporting postures. Technology was the predominant factor influencing the character of the strategic choice made during this extended period for national defense. Deterrent strength was basic to national security.

The United States and the Soviet Union shared the basic choice that was made. Both looked to an integrated national air defense system as one element of deterrence. The weighted emphasis of the U.S. choice went to the strategic offensive element of the deterrent; the Soviet deterrent inclined to a more balanced posture between offensive and defensive components.

As the deterrent force of the two nations evolved, threat perceptions influenced their character. Based upon a perspective of the mid-1950's, the United States decided that the deterrent strategy required the high priority development of long-range missiles. The equivalent level of priority did not attend programs for strategic air and missile defense although the threat projected distinctive needs for active defense.

A reversed set of priorities guided the Soviet effort; response to the threat of U.S. strategic offensive power emphasized the need for an active defense throughout this period while building up strategic forces.

b. Factors Influencing Air and Missile Defense Decisions

In the context of the existing basic national security policy, U.S. strategic air and missile defense contributed to the U.S. deterrent posture while the threat changed and new technological developments appeared to challenge various aspects of the established strategy. Prime factors bearing on the U.S. strategic decisions concerning air and missile defense during this period included the threat, technology, and budgetary constraints.

Soviet strategic concepts and planning for a continuing, upgraded air defense structure and ABM deployment were influenced by the same factors and this accounts for obvious similarities in the pattern of basic trends. The nature and rationale of Soviet decisions, however, involves speculation although the available evidence clearly shows that the political leadership set priorities for strategic defense and regularly allocated a substantial resource commitment to that effort.

C. Strategic Actions

1. Parallel Decisions During the Period

Actions of consequence to the U.S. and Soviet strategic air and missile systems are detailed in Chapters II and III. Among those actions, certain decisions stand out. Noteworthy for their relative significance, these decisions have added dimension because the U.S. and Soviet Union each chose parallel routes in their approaches to security.

a. Mid-1950's Build-Up

The United States and the Soviet Union each decided early in the period to build up the strategic air defense structure existing at the time based upon perspectives of the current and anticipated manned bomber threat. In effect, these decisions extended and reinforced earlier decisions to establish the national air defense systems. Given added impetus in the mid-1950's by decisions for build-up, each of the national systems generated a momentum for a continuation of the established pattern of action with respect to air defense. Each acquired a self-sustaining dimension.

In the Soviet Union this influenced subsequent decisions involved in the revamping of the National Air Defense Forces which took place as part of Khrushchev's general reorganization of the armed forces (Section C, Chapter III, "Major Decisions"). Reductions in fighter aircraft and the virtual elimination of antiaircraft artillery were noteworthy elements of this restructuring. These actions coincided with the availability of a new surface-to-air missile system, the SA-2, and the advanced development of the SA-3.

1) Factors Related to Soviet Decision

The availability of these missile systems and new fighters and improved early warning and communications links, it is presumed, enabled Khrushchev to accomplish resource savings within the strategic air defense force in keeping with his larger, basic reorganization of the armed forces. Thus, it can be inferred that the availability of the products of technology—the new SAMs, fighter aircraft, radars and communication links—resulting from decisions and action taken earlier facilitated this Soviet decision. The economic situation remained generally poor despite a rise in military budgets about the time. Soviet threat perceptions had to take into account about 1,500 U.S. strategic aircraft, including the recently introduced B-52. U.S. naval aircraft, the RAF and an embryonic ballistic missile threat were added problems. Confidence among the Soviet leadership, however, was high as a direct result of the stunning achievement of the Sputniks; Khrushchev's authority was accepted; he was respected as the principal leader and he had already made the larger strategic decisions on offensive missiles. To upgrade the national air defense structure was therefore, a natural progression.

2) Factors Related to U.S. Decision

a) Threat Perceptions

Threat perceptions and decision processes appear to be the prime factors in this decision. An updated special intelligence estimate current at the start of this period held that by 1957 the U.S.S.R. could develop the capability of launching approximately 1,000 aircraft in an initial air operation against the United States. While it considered it more likely that the U.S.S.R. would elect to commit substantially fewer, this estimate

believed that 550 mission aircraft would constitute the maximum initial effort (Chapter I and Annex V, Chapter II).

Essentially limited progress had been made in the air defense programs already directed by President Eisenhower. There was concern because of revised intelligence estimates concerning the Soviet nuclear stockpile and fear aroused by the prospects of the fallout hazard. (Annex V, Chapter II deals with estimates, assessments and key decisions at the time.) There also was growing Canadian concern. The Killian report, "Meeting the Threat of Surprise Attack," pointed up Soviet capabilities in early 1955, and indicated critical U.S. targets were relatively few saying that "200 nuclear bombs . . . would decisively defeat us and . . . a first attack could be fatal if we were surprised and unprepared." The Killian report specified a number of deficiencies of the U.S. air defense system. WSEG Report No. 15, "Continental Defense," which circulated during the summer of 1955, contained a variety of recommendations on the subject. Many separate groups were urging high level U.S. Government action for improved air defense.

b) Decision Process

In the highly structured U.S. national security organization, the policy process was institutionalized, but dependent on various ad hoc groups for technical assessments and evaluations. Decisions resulted from the evidence such groups developed concerning the need for action on strategic programs. In 1953, President Eisenhower's Reorganization Plan No. 6 had revised the functions of the U.S. Armed Forces and the chain of command, abolished the Munitions Board and Research and Development Board, established seven Assistant Secretaries of Defense, and, in the National Security Council, major policy questions and security issues had become the purview of the Planning Board, made up of representatives drawn from the Departments of State, Defense, and Treasury; the Office of Civil and Defense Mobilization; and the Bureau of the Budget.

This Board, which included advisors from the JCS and CIA, had members personally appointed by the President upon nomination of the designated departments and agencies and the approval of the President's Special Assistant for National Security Affairs, Robert Cutler, a prominent Boston banker. The Planning Board, while only a small part of the NSC system under President Eisenhower, constituted the heart of the U.S. security structure since it had the central task of formulating policy for the consideration of the Council and the approval of the President. Board consideration of an issue began with the preparation of a preliminary study and discussion. Following this a draft would be prepared, modified, and cleared through inter-agency coordination. Special studies of air defense problems abounded.

b. Long-Range Missile Development—Deployment—Mid-1950's

The Soviet Union and the United States each decided early in the period to pursue accelerated development and deployment of long-range offensive missile systems. These decisions were significant because of their direct consequences with respect to the choice of basic strategy and because of the added dimension they gave to the evolution of threat perspectives.

1) Factors Related to Soviet Decision

The promise of technology appears to have been a primary factor in this decision. The Soviets needed a deterrent to neutralize U.S. strategic air and missile bases in Europe, to hold Europe hostage against a U.S. threat of action, and to support strategic concepts for the operations the combined arms against Europe.

A strong Soviet security position was needed; a deterrent force contributed directly to the defense of the homeland. Technology offered the prospect of an impressive solution to the threat. Khrushchev would boast that the strategic attack aircraft was obsolete. He had decided not to produce a large bomber force. Rockets and missiles were manifestations of a growing Soviet emphasis on these new means for wielding nuclear power.

Nuclear power had already proven useful for Soviet strategic purposes. The United States had shown interest in detente during 1955 and, despite its commitment to "massive retaliation," events in Suez and Hungary the following year indicated that the pattern of power in world politics was changing. Events in the fall of 1956 showed that efforts to impose political change by force at the expense of another major power could induce great risk in the nuclear era. Soviet nuclear threats, however, were blatant at the time; their diplomatic success now seems incredible.

2) Factors Affecting the U.S. Decision

Concern over the Soviet bomber program and the ICBM threat combined to make threat perception a principal factor relating to this U.S. decision. Technology also was of great significance, and related to this decision was an intense, bitter wrangle over roles and missions and bureaucratic politics. The Soviet ICBM test and later successful launch of Sputnik, however, acted as a catalyst which fused several separate factors and impelled the decision. U.S. decision making also felt the pull of other influences. Disarmament proposals provided one of these.

2. Contrasts in Choice

a. U.S. Choice

U.S. strategic thinking gave primary emphasis to the employment of offensive forces to defend U.S. interests as part of a desired strong security posture. That concept was reaffirmed by the strategic decisions made early in this period. Effectively, air defense was secondary. In keeping with the strategic concept that it was desirable to destroy an attacker as far from the target as possible, the United States, over this period, emphasized massive strategic offensive forces—both aircraft and missiles—to meet the perceived threat. U.S. strategy, however, included an integrated continental air defense system. That system grew in keeping with the scale of the anticipated Soviet bomber capabilities and contracted as the Soviet missile threat intensified. From the beginning of this period, U.S. policy and strategy sought to explore the possibility of reaching practicable arrangements for arms limitations with the Soviet Union. To maintain a credible retaliatory deterrent in the face of the growing Soviet missile threat the U.S. strategy looked to adequate warning and a declared concept of sufficient strategic strike capacity to be able to absorb a massive Soviet attack and to have surviving residual capabilities adequate enough to permit penetration of Soviet defenses to deliver unacceptable damage to the Soviet Union.

From an initial objective of improved active defense as part of its deterrent strategy, the U.S. subsequently shifted to concepts of assured destruction and later, to sufficiency. By the mid-1960's, with the shift to assured destruction, U.S. continental air defense had effectively run its course. Decisions made in the twilight years of the Eisenhower Administration, however, were significant to the outcome. Earlier decisions, moreover, appear to demonstrate that the basic U.S. strategic choice involved a technological race.

b. Soviet Choice

The Soviet strategy sought to provide a secure deterrent through active air defense in order to lessen the extreme vulnerability of deterrent forces. Concurrently, however, the Soviets also pursued the development and deployment of improved strategic capabilities, including missile systems, for offensive and defensive employment, and a coordinated civil defense program. Contrary to the general belief that the Soviets routinely adhered to a predilection for defense, Chapter III shows a substantial and sustained Soviet commitment to the strategic offensive component, greater than the priority given to defense of the homeland. (Table 19 contains comparative budget data.) Complementing and extending the strategy, Soviet bombers were widely displayed and advertised. Nuclear blackmail was also used to support fundamental Soviet objectives; threats were carefully timed against action on disarmament goals.

It is difficult to extrapolate Soviet strategic plans from the operational force deployments and related evidence of resource commitments for defense. No official presentation of decisions is available. After the fact judgment concerning Soviet strategic decisions, based upon the appearance and deployment of weapon systems, permits inferences to be made about the Soviet approach to strategic planning. Relevant intelligence and the growing volume of Soviet literature dealing with questions of doctrine and strategy, also enable specialists in Soviet affairs to demonstrate that Soviet strategic doctrine reflected a "classic" war strategy focusing on the relative outcome and the need to come out best rather than to achieve specified levels of destruction. Active air and missile defense could help to survive a nuclear attack. The Soviet position from the mid-1950's however, also openly stressed the utility of nuclear strike forces as a deterrent to Western attack. From that time, increased emphasis was given to the importance of Soviet nuclear forces as a major factor restraining aggression against the U.S.S.R. Continuing concern for their security, however, is demonstrated by the extended commitment to active air defense. The evidence is mixed with respect to the actual goal in the development of Soviet strategic forces; whether "superiority" was the goal, air defense was prominent.

3. Tactics—U.S.-Soviet Air and Missile Defense Strategy

a. From the Beginning to Sputnik (1955–1957)

Impelled by technology and the prospect that effective defense against the perceived bomber threat was practicable, both the United States and the Soviet Union augmented their existing strategic air defense structures in the mid-1950's. Specific objectives for the U.S. included an increased "kill" potential for air-to-air and surface-to-air missiles. Operational concepts recognized the desirability of destroying an attacker as far from the target as possible; however, attrition of the attacking force remained the basic U.S. concept. Each side had already begun surface-to-air missile deployments; these would accelerate during the following period.

b. The Early Missile Era (1958–1961)

The Soviet Union and the U.S. proceeded with the deployment of first generation long-range, surface-to-surface missile systems during this period although the Soviets held back on substantial deployment of the ICBM system which had launched Sputnik. However, each side now had missile strike capabilities as part of a growing deterrent strength. Vulnerabilities of first generation systems caused changes in the characteristic of the missile force.

By the end of this period the Soviets transferred responsibility for civil defense to the Ministry of Defense and emphasized this function. Accelerating Soviet ABM development provided for extensive test-

ing and, in the air defense field, a nationwide deployment of SAM missile defenses gave added evidence of the growth of PVO capabilities. Soviet decision makers also approved a new generation of all-weather fighters. The Soviet programs for air and missile defense provide a sharp contrast to the U.S. effort.

As President Eisenhower's second term approached its end, a number of U.S. air defense programs felt the effects of decisions for their cancellation. Thus, in the period of this relatively short span of years, the NORAD system was first augmented during 1958 with the deployment of new, longer range Nike-Hercules missile units and the DEW line and SAGE system commenced operating; however, between the summer of 1959 and 1960, the F108 program was cancelled; the SAGE Super Combat Center was cancelled; DEW line radar improvements were cancelled; programmed Bomarc sites were cut to 10; U.S. Navy ships were withdrawn from operating a sea barrier; a number of programmed, radars, prime and gap-filler were reduced; and the requirement for a new aircraft early warning and control (AEW&C) aircraft was cancelled.

Coincident with this pattern of cancellations and reductions NORAD strategy appeared to shift when, in January 1959, the North American Air Defense Objectives Plan (59–69) included the statement:

> Attrition of the enemy's forces no longer constitutes defense. . . . The air defense must be capable of virtually destroying the enemy's total offensive force on its first missions. . . . Complete and absolute protection of the entire North American continent will not be possible within the resources of Canada and the United States. Therefore defense forces must be deployed to defend the vital elements which animate our national structure.

c. 1961–1968, McNamara Years

As this period began, the Soviet threat to the United States increasingly reflected ICBM developments; U.S. air defense planning, therefore, required consideration of possible attack by a mixed Soviet nuclear force, probably to consist of initial missile strikes followed by manned bomber attacks. That planning was measured against the developing doctrines of flexible and controlled response.

Controlled response closely involved damage limitation; air and missile defense were as natural complements to the basic doctrine. With the shift from damage limitation to assured destruction by the mid-1960's, however, the U.S. air defense structure underwent significant reductions. From 1965 to 1968 fighter-interceptor strength went down 50 percent. The Navy first reduced and then ceased all operations on the DEW line extensions. In May 1965, the mid-Canada line ceased operations. By late 1965, Nike-Hercules defenses at SAC bases were being eliminated. By 1967, a reexamination of the role that Nike-Hercules would play in a mixed missile/bomber threat environment led to further eliminations. The Sentinel program foundered in the face of a concert of varied opposition.

Soviet air defense emphasized a continued program of modernization to meet the threat posed by increased speed, higher altitude, and electronic countermeasures capabilities of manned aircraft and cruise missiles. The transition to improved organization and operation of PVO Strany included action to begin deployment of the SA-5 missile system, probably designed to counter a high-velocity, medium- to high-altitude aerodynamic threat. A Soviet ABM defense was operationally deployed at Moscow.

d. 1968–1972

The sharp contrast already evidenced between the U.S. and Soviet air defense systems received increased emphasis during this period. CINCNORAD's reduced mission in covering critical areas would

be "partially" satisfied with forces available. A threat assessment by the Office of the Secretary of Defense, built on a new and greatly reduced threat, believed NORAD's reduced forces had the "capability to defend against a small attack (about 10 bombers) after one day of warning…." (Section E, Chapter IV details this.)

Soviet air and missile defense developments in this period underscored the growing coherence of that system, and its impressive strengths, which now included integration of the system with the Warsaw Pact countries. As the period closed, the Soviet anticipation appeared to be pointed to active defense consisting mainly of antimissile defenses.

D. Conclusions

1. Summary Judgments

Technological changes were the predominant factor affecting air and missile defense strategy during the period primarily as they related to the developing offensive threat. Their scope and pace introduced considerable uncertainty and greatly strained the stability of the U.S.-Soviet relationship. By their pace and the nature of the changes projected, technological innovations raised fundamental challenges to previous concepts of how to defend the United States.

U.S. strategy, in turn, built on the variety of new weapon system developments; Soviet strategic air and missile defense trends, dating from the mid-1950's, demonstrated Soviet anticipation, awareness and response to developments in U.S. strategic offensive forces. The scale and character of the threat varied over the period from bombers to missiles which complicated the choice of strategies.

Basic functions remained unchanged; the defense had to detect, identify, intercept, and destroy the attacker. Science and technology helped greatly but, as the period progressed, the time available for reaction grew less. This became of increasing consequence from the beginning of the nuclear era. To be instantly ready, the defense had to have a high order of competence, dedication, and vigilance. No longer could planners depend on a long mobilization period.

2. Conclusion

The basic patterns of action were set by initial, and early, strategic choices. Thereafter, the strategic problem centered on technological development. Threat perceptions increasingly involved possible application by the Soviets of new technologies in order to define or delimit future threats. Perceptions of future threats were influenced by the view of available technologies, whether or not the Soviets had demonstrated the capacity to apply them. Available or known technologies were extrapolated to assess future threats. It is difficult from this research to conclude whether "worst case" assessments, built on mirror-imaging, influenced U.S. strategic choices.

Interaction was inherent in the premises; however, a direct action-reaction cycle was not a factor in the development of U.S. and Soviet strategic air and missile defense systems, although tactical and operational considerations necessarily influenced developments and deployments.

Chapter I

U.S. and Soviet Strategies Strategic Air and Missile Defense 1955–1972

A Comparison

A. Introduction

During this period, U.S. and Soviet perceptions of strategic air and missile defense requirements were strongly influenced by (1) science and technology, (2) uncertainties in the future environment as to the continuity of the other's policies and nuclear strategies, and (3) the growing wish to move toward some limitations on arms.

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Basic functions remained unchanged; the defense had to detect, identify, intercept, and destroy the attacker. Science and technology helped greatly but, as the period progressed, the time available for reaction grew less. This became of increasing consequence from the beginning of the nuclear era. To be instantly ready, the defense had to have a high order of competence, dedication, and vigilance. No longer could planners depend on a long mobilization period. Warning grew in importance, soon it would be measured in minutes.

B. What Was Different from the First Decade?

1. 1955 Environment

a. Strategic Interaction in the General Situation

By 1955 Soviet nuclear capabilities and the potentials of science and technology directly challenged the chosen U.S. security policy instrument, massive retaliation. Hard realities and uncertainty confronted the basic U.S. policy of deterrence and affected its continuity.

As it originated earlier and later buttressed U.S. national security, deterrence was set in the context of U.S. global responsibilities projected into the indefinite future. While the two super-powers could engage in

a strategic dialogue, other factors limited freedom of choice. Throughout this period, surprise became a factor of vital concern in developing strategy. Advances and advantages in the technological race led directly to critical evaluations and assessments of U.S. security policy and recommendations for action. (Annex V, Chapter 2 treats U.S. 1954–1956 assessments and impacts on the U.S. continental air defense system.)

A perceptible shift in the strategic balance appeared evident at the start of this period, one which no longer favored America. Already a direct interaction was taking place between Soviet and U.S. bomber and air defense forces. The future prospect, however, pointed to a marriage of megaton weapons and intercontinental delivery means by the Soviets. Significant policy planners saw U.S. national survival seriously and suddenly jeopardized with the prospect that several hundred Soviet aircraft or ICBMs could devastate the industrial and population centers of the nation. An initial resulting shock in U.S. Government circles intensified because of the growing U.S. appreciation of nuclear weapons effects resulting from U.S. Pacific tests, the plethora of studies and analyses of U.S. vulnerabilities, and changing estimates of Soviet strategic capabilities, adding up to greater danger and difficulty for the United States. The ocean barriers no longer provided protection and the developing continental air defense system was then essentially ineffectual against this threat. There was a need to secure the deterrent.

By the mid-1950's Soviet policy clearly aimed at deterring U.S. nuclear attack. Following the contest for power in Stalin's succession, critical Soviet assessments of Stalin's policies emerged quickly. Post war Soviet foreign policy under Stalin's leadership had caused an active military alliance to develop in the West. Soviet actions had failed to tip the strategic balance in Europe in favor of Moscow. By hardening the division of Europe, Stalin had committed the U.S.S.R. to a political-military confrontation with the West and the economic and military resources of the United States had become increasingly involved in the cause of European security. While a prime Soviet objective in the early 1950's had been to forestall inclusion of West Germany in NATO or NATO defense arrangements, the 1955 Western coalition included a rearming West Germany. There was a growing awareness of an expanding U.S. military might; notwithstanding Soviet nuclear developments, the U.S.S.R. remained vulnerable and strategically weak. The developing deterrent had to be secured.

b. Reducing "International Tensions"—"Peaceful Coexistence"

The new Soviet leadership, therefore, sought to improve relationships with other nations and to reduce "international tensions" while improving its own security position. The Soviet leadership stressed the "Leninist policy" of dealing with capitalist countries on a businesslike, more peaceful basis. Khrushchev emphasized "peaceful coexistence." Khrushchev claimed that the Soviet bloc and the Western nations could "coexist" without major war; at the same time he moved to redress the strategic imbalance and made it clear that renunciation of the use of violence by Communists was not excluded by "peaceful coexistence." In essence, the Soviet leaders hoped "peaceful coexistence" would deter U.S. action in areas of interest to the Soviet Union and provide a framework in which to pursue the struggle against the capitalists. The goal was obvious: to maximize Soviet effectiveness in the struggle while minimizing danger to the U.S.S.R. Active air defense would be a prime element of Soviet strategy; however, research on missile defense also received attention. A distinctive feature of Soviet policy would be to advertise strategic weapon achievements while pressing arms limitations and encouraging hopes and expectations for stability and peace.

c. Broad U.S. Security Goals

Peace was the long-term, constant U.S. security goal. More than the mere absence of war was sought; the Soviets had raised U.S. apprehensions and laid down a competitive relationship through the "peaceful coexistence" line that governed the U.S.-Soviet interaction for "peaceful" relations. Pursuit of peace was difficult and integrating the pursuit of peace with more immediate and pressing security goals more difficult primarily because of the distinctive threat of imminent attack. U.S. policy built heavily on mutual security pacts; however, allies were of little immediate help against a direct Soviet threat against the U.S. As the U.S.-Soviet strategic interaction progressed, deterrence had greater political dimension. Political-psychological factors in the strategic interaction were significant. Quantitative and qualitative changes in the threat directly impacted U.S. security policy.

Broad goals of U.S. policy were:

(1) *Neutralization of the military threat*. This remained a primary goal for U.S. national security throughout the period. It received the highest priority in U.S. security thought and action. The priority obtained from the beginning. Soviet military power confronted the U.S. planners with the strategic reality of ready forces with nuclear strike capabilities directly threatening the United States. Estimates saw a growing threat to deter Soviet nuclear attack against the United States in a context of changes affecting U.S. global security interests entailed deliberations on priorities. Deterrence had a continuing urgency. That urgency sustained the high priority given to deterrence but generated requirements for decisions and choices on how to carry it out. The importance of deterrence also emphasized other U.S. policy themes and goals.

(2) *Stability in international relations*. Desire for stability made this a major theme of U.S. security policy. Alliances were seen as a means to further the containment doctrine and an effort to get a stable world balance resulted. Alliances would become increasingly involved in U.S. strategic questions of significance to the strategic interaction would be various attempts to establish practical limits on decisions and actions relating to strategic forces in order to maintain stability. Soviet boast, bluff and bluster would increase with greater strategic capabilities. Efforts at stability would attempt to avoid direct confrontations, to ensure "fail-safe" procedures and to develop and gain Soviet acceptance of other restraints to improve the chances that U.S.-Soviet controversies could be safely managed and concluded. With stability, U.S. policy could also advance another, related theme—reduction of tensions—in pursuit of its basic security goals.

(3) *Lowering overall tension level*. This theme animated different aspects of U.S. foreign policy. Long term in its implications, it pointed toward support of deterrence by removing the causes of conflict situations which might bring about a direct confrontation, or their escalation.

2. The 1955 Problem—Where To Go Next

a. U.S. Strategy and Policy

U.S. strategy, already based on deterrence, now had to take steps to defend against surprise attack. The Soviets obviously took seriously the possibility of U.S. strategic attack and had developed a strong, active air defense force. The situation pointed up a basic fact concerning defense applicable to U.S. and Soviet strategists: the essential nature of defense is to react. A threat must appear before the need for defensive measures is established.

The growth of Soviet strategic offensive capabilities in 1955 seemed to be an acute threat to the U.S. retaliatory force and to the North American continent. Pressure therefore quickly grew to install and extend required early warning based upon revised, updated intelligence and appraisals such as the early 1955 Killian report which stressed the consequences of surprise.

U.S. policy called for a strong security posture emphasizing strategic retaliatory forces and an integrated continental defense system. The threat was seen to be grievous by mid-1957. Disarmament arrangements, if practicable, also would be sought.

b. Soviet Strategy and Policy

Soviet strategy in the spring of 1955 built on a fundamentally changed doctrine of preemption designed to frustrate an enemy attack. This provided the basis for having strategic forces not only for offensive employment but also to disrupt a Western surprise attack. In addition, the Soviets had an active defense system to help secure the growing strategic deterrent force and to defense the homeland. A missile development program was being pushed. The threat was changing and technology a factor of promise.

3. Options—More Defense or More Offense

a. For the United States

In the light of the mid-1950's threat, the basic and feasible U.S. options appeared to be (1) augmented, sustained defense or (2) increased deterrent capacity.

A capability for active defense could contribute to the U.S. deterrent posture by reducing the chances that a Soviet planned attack could succeed; additionally, an active air defense system and civil defense program could help to limit damage. The defense option could also generate capabilities useful to defend against countries other than Soviet Union and among these capabilities, proven weapon systems and equipments and follow-on systems in advanced development were, or could be expected soon to be, available for employment against a bomber threat. Against a Soviet long-range missile threat, priority development of an antimissile system offered the possibility of an active defense against that eventuality, assuming U.S. bombing would be unable to prevent Soviet missiles from being launched. An antimissile research and development program begun in 1955 might be expected to progress as rapidly as an ICBM development.

The active defense option had been exercised earlier following the initial U.S. perception of a Soviet direct threat to the United States. That earlier choice was neither impelled nor required; nonetheless, urged by civilian scientists, it represented a deliberate strategic decision. Currently, the Soviet threat was real and the U.S. retaliatory capability was vulnerable to that threat.

b. Soviet Strategy

Analogous options were available for Soviet consideration with the threat perceived at the time including (1) U.S. strategic forces, (2) forward deployed bomber and carrier forces, or (3) likely U.S. missile development.

c. Commonalities

Each side needed to secure the deterrent force, initially against air attack; later, against missile attack. Possible measures to accomplish that included (1) active defense, (2) alert measures, and (3) first-strike capability, i.e., "superiority."

C. Contrasting Responses

1. Importance of Air Defense Strategy

a. U.S. Strategic Choice—Deterrence

U.S. strategic thinking gave primary emphasis to the employment of offensive forces to defend U.S. interests as part of a desired strong security posture. That concept was reaffirmed early in this period; air defense was secondary. In keeping with the strategic concept that it was desirable to destroy an attacker as far from the target as possible, over this period the United States emphasized massive strategic offensive forces—both aircraft and missiles—to meet the perceived threat. While emphasizing strategic offensive forces, U.S. strategy included an integrated continental air defense system. That system grew in keeping with the scale of the anticipated Soviet bomber capabilities and contracted as the Soviet missile threat intensified. From the beginning of this period, U.S. policy and strategy sought to explore the possibility of reaching practicable arrangements for arms limitations with the Soviet Union. To maintain a credible retaliatory deterrent in the face of the growing Soviet missile threat the U.S. strategy looked to adequate warning and a declared concept of sufficient strategic strike capacity to be able to absorb a massive Soviet attack and to have surviving residual capabilities which would be adequate enough to permit penetration of Soviet defenses to deliver unacceptable damage to the Soviet Union.

From an initial objective of improved active defense as part of its deterrent strategy, the U.S. subsequently shifted to concepts of assured destruction and later, to sufficiency. By the mid-1960's, with the shift to assured destruction, U.S. continental air defense had effectively run its course. Decisions made in the twilight years of the Eisenhower Administration, however, were significant to the outcome. Earlier decisions, moreover, appear to demonstrate that the basic U.S. strategic choice involved a technological race.

b. Soviet Choice

The Soviet strategy sought to provide a secure deterrent through active air defense in order to lessen the extreme vulnerability of deterrent forces. Concurrently, however, the Soviets also pursued the development and deployment of improved strategic capabilities, including missile systems for offensive and defensive employment, and a coordinated civil defense program. Contrary to the general belief that the Soviets routinely adhered to a predilection for defense, Chapter III shows a substantial and sustained Soviet commitment to the strategic offensive component, greater than the priority given to defense of the homeland. (Table 19 contains comparative budget data.) Complementing and extending these steps, Soviet bombers were widely displayed and advertised. Nuclear blackmail was also used to support the fundamental Soviet strategy; threats were carefully timed against action on disarmament goals.

It is difficult to extrapolate Soviet strategic plans from the operational force deployments and related evidence of resource commitments for defense. No official presentation of decisions is available. After-the-fact judgment concerning Soviet strategic decisions, based upon the appearance and deployment of weapon systems, permit inferences to be made about the Soviet approach to strategic planning. Relevant intelligence and the growing volume of Soviet literature dealing with questions of doctrine and strategy, also enable specialists in Soviet affairs to demonstrate that Soviet strategic doctrine reflects a "classic" war strategy focusing on the relative outcome and the need to come out best rather than to achieve specified levels of

destruction. The Soviet position from the mid-1950's has openly stressed the utility of nuclear strike forces as a deterrent to Western attack. From that time, increased emphasis has been given to the importance of Soviet nuclear forces as a major factor restraining aggression against the U.S.S.R. Continuing concern for their security, however, is demonstrated by the extended commitment to active air defense, further evidence of Soviet unwillingness to subscribe to a concept of mutual assured destruction. The evidence is mixed with respect to the actual goal for the development of Soviet strategic forces.

Soviet ABM development may have been motivated by the prospect of a U.S. breakthrough which, combined with MIRV, could incline the U.S. to consider a first-strike. In this light, Soviet calls for vigilance and readiness to "frustrate" a possible enemy surprise nuclear attack and for intensified efforts to develop better active and passive defense capabilities, evidenced the Soviet desire for defense in order to survive a nuclear war. While the resource data contained in Chapter III show only a relative commitment, the data make it clear that concepts for active defense had a significant role in Soviet strategy.

2. Impact of Technology on Strategic Options

Action on the 1955 Killian report seems effectively to have established the direction of U.S. strategy. Based upon relative priorities, offensive forces would carry the U.S. defense burden against the Soviet Union. In addition to recommending a priority U.S. missile development program, the Killian report included suggestions for several specific air defense measures including the use of nuclear warheads with air-to-air and surface-to-air missiles.

While calling for accelerated air defense measures, the Killian report emphasized particularly the significance of the growth of Soviet progress in long-range missiles. That development would greatly change perspectives on the worth of maintaining active air defenses against bombers and pose a series of difficult questions concerning U.S. strategic options as later technological innovations challenged established strategy. This progression further influenced air and missile defense because technological advances several times during this extended period underscored the vulnerability of the deterrent force.

The properties of range, speed, payload, accuracy, and readiness of offensive missiles were of great consequence to the fundamental strategies being pursued by each side. As ICBMs were perfected, vast improvements resulted from various technologies. As one example, the technology of fuels progressed very rapidly and, by making it possible to maintain missiles in readiness for extended periods, also permitted their emplacement in underground silos, hardened against explosion. The vulnerability of the nuclear deterrent was ensured thereby, it seemed. The parallel development of missiles for firing from submarines greatly increased the U.S. capability to survive a first strike. The first generation missiles, however, were soft because they had to be fueled regularly to be made ready, and were deployed above ground. They represented a vulnerable deterrent.

The principal impact of the initial ICBM had appeared to be the capability to make surprise attack much easier. Soft targets were tempting. Quickly the need for some warning against the Soviet ICBM threat gave rise to the U.S. radar warning systems BMEWS, Ballistic Missile Early Warning System. Since BMEWS could "see" a missile about 15–20 minutes before that missile would arrive in the United States, SAC bombers could be on ground alert or airborne and the U.S. retaliatory force,

which was then vulnerable to attack, would be protected against destruction through adequate warning. (BMEWS was oriented to the north and would not provide warning against the submarine-launched missile attack.)

Radar warning of an attempted Soviet missile attack would permit SAC aircraft to become airborne although warning would pose the difficult question of whether ICBMs of the U.S. retaliatory force should be launched on the basis of radar warning alone. The aircraft could be recalled if necessary; the missiles could not. To make it possible for the U.S. retaliatory force to survive a first strike attack, ICBMs—Minuteman and Titan and some Atlas—therefore came to be put in hard silos. With the advent of Polaris, the chances of a successful Soviet counterforce first strike diminished very greatly.

As hardening progressed and Soviet counterforce appeared impracticable, the United States faced the fact that it had no method of defense feasible once offensive missiles were launched. At the time no effective form of active defense against nuclear missile attack was available.

Improvements in accuracy then threatened to make the fixed ICBM vulnerable to preemptive first strikes, and, about the same time, the development of MIRVs raised the possibility of attack ratios which greatly favored the attacker. Passive protection soon became less competitive with improvements in accuracy and weapon yields. Since exclusive reliance on a single element of the U.S. deterrent (Polaris/Poseidon) appeared imprudent, increased attention then turned to the possibility of active, hard point defense. A U.S. ballistic missile defense program appeared to be a requirement; it would be useful as a means of helping to maintain stability, i.e., deterrence. In marked contrast, the Soviet actions of the 1960's to deploy an ABM pointed directly to damage limitation, i.e., defense.

3. Summary—U.S.-Soviet Air and Missile Defense Strategy

a. From the Beginning to Sputnik (1955–1957)

Impelled by technology and the prospect that effective defense against the perceived bomber threat was practicable, both the United States and the Soviet Union augmented their existing strategic air defense structures in the mid-1950's. Specific objectives for the U.S. included an increased "kill" potential of air-to-air and surface-to-air missiles through use of nuclear warheads. Operational concepts recognized the desirability of destroying an attacker as far from the target as possible; however, attrition of the attacking force remained the basic U.S. concept. Each side had already begun surface-to-air missile deployments; these would accelerate during the following period.

b. The Early Missile Era (1958–1961)

The Soviet Union and the United States proceeded with the deployment of first generation long-range, surface-to-surface missile systems during this period although the Soviets held back on substantial deployment of the ICBM system which had launched Sputnik. However, each side now had missile strike capabilities as part of a growing deterrent strength.

By the end of this period the Soviets transferred responsibility for civil defense to the Ministry of Defense and put a highly respected senior officer, Marshal Chuikov, a Deputy Minister, in charge. Accelerating Soviet ABM development provided for extensive testing and, in the air defense field, their nationwide deployment of SAM missile defenses gave added evidence of the growth of PVO capabilities. Soviet decision makers

also approved a new generation of all-weather fighters. The Soviet programs for air and missile defense also provided a sharp contrast to the U.S. effort.

As President Eisenhower's second term approached its end, a number of U.S. air defense programs felt the effects of decisions for their cancellation. Thus, in the period of this relatively short span of years, the NORAD system was first augmented during 1958 with the deployment of new, longer-range Nike-Hercules missile units and the DEW line and SAGE system commenced operating; however, between the summer of 1959 and 1960, the F108 program was cancelled; the SAGE Super Combat Center was cancelled; DEW line radar improvements were cancelled; programmed Bomarc sites were cut to 10; U.S. Navy ships were withdrawn from operating as a sea barrier; a number of programmed radars, prime and gap-filler, were reduced; and the requirement for a new aircraft early warning and control (AEWAC) aircraft was cancelled.

The SAGE Super Combat Center would have had a hardened facility and improved computers. When it was cancelled, the decision was made to proceed with the existing SAGE program which was to be 80 percent effective by the end of 1961 and complete by 1963.

Coincident with this pattern of cancellations and reductions, NORAD strategy appeared to shift when, in January 1959, the North American Air Defense Objectives Plan (59–69) included the statement:

> Attrition of the enemy's forces no longer constitutes defense. . . . The air defense must be capable of virtually destroying the enemy's total offensive force on its first missions. . . . Complete and absolute protection of the entire North American continent will not be possible within the resources of Canada and the United States. Therefore defense forces must be deployed to defend the vital elements which animate our national structure.

c. 1961–1968, McNamara Years

As this period began, the Soviet threat to the United States increasingly reflected ICBM developments; U.S. air defense planning therefore required consideration of possible attack by a mixed Soviet nuclear force, probably to consist of initial missile strikes followed by manned bomber attacks. That planning was measured against the developing doctrines of flexible and controlled response.

Since controlled response closely involved damage limitation, air and missile defense could be seen as natural complements to the basic doctrine. With the shift away from damage limitation to assured destruction by the mid-1960's, however, the U.S. air defense structure underwent significant reductions. Major reductions from 1965 to 1968 brought fighter-interceptor strength down 50 percent. The Navy first reduced and then ceased all operations by ships and aircraft on the DEW line extensions in May 1965, the mid-Canada line ceased operations. By late 1965, Nike-Hercules defenses at SAC bases were eliminated. By 1967, a reexamination of the role that Nike-Hercules would play in a mixed missile/bomber threat environment led to further eliminations. The Sentinel program foundered in the face of a concert of varied opposition and policy choices.

Soviet air defense emphasized a continued program of modernization to meet the threat posed by increased speed, higher altitude, and electronic countermeasures capabilities of manned aircraft and cruise missiles. The transition to improved organization and operation of PVO Strany included action to begin deployment of the SA-5 missile system, probably designed to counter a high-velocity, medium- to high-altitude aerodynamic threat. A Soviet ABM defense was, by now, operational at Moscow.

d. 1968–1972

The sharp contrast already evidenced between the U.S. and Soviet air defense systems received increased emphasis during this period. CINCNORAD's reduced mission in covering critical areas would be "partially" satisfied with forces available. A threat assessment by the Office of the Secretary of Defense, built on a new and greatly reduced threat, believed NORAD's reduced forces had the "capability to defend against a small attack (about 10 bombers) after one day of warning. . . ." (Section E, Chapter IV details this.)

U.S. intelligence dealing with Soviet air and missile defense concerning this period underscores the growing coherence of that system, details its impressive strengths, including integration of the system with the Warsaw Pact countries and holds up a view of the Soviet anticipation of active defense consisting mainly of antimissile defenses.

4. Judgments

The basic trends in this summary highlight weapon system developments and deployments which reflect strategic choice. Showing a steady decline in U.S. strategic air defense—during a period marked by the advent of the ICBM and the resulting renewed U.S. emphasis on deterrence for defense—these trends contrast with the sustained, improved, and continuing Soviet national air defense effort. Interaction is implicit in the record. It is basic that U.S. and Soviet commitments to active air defense represent reactions to a perceived threat. The technological factor weighs heavily in any interaction assessment, however, because technological advances provided an essential stimulus for the threat perceptions developed during this period.

While the appearance of Sputnik represents a watershed event to key the reality of the Soviet ICBM threat, earlier U.S. judgments on the basic strategic course needed to meet forthcoming challenges to U.S. security had already anticipated that development. The essential disposition to these decisions probably existed at the start of this period.

In the context of the existing basic national security policy, U.S. strategic air and missile defense developments contributed to the U.S. deterrent posture while the changing nature of the threat and further technological developments challenged various aspects of the established strategy. Prime factors bearing on the U.S. strategic decisions concerning air and missile defense during this period included the threat, technology, and budgetary constraints. These factors do not exclude others but represent those which had substantial influence. (Disarmament policy is a strand which runs through the period but research accomplished for this study merely permits an acknowledgment and an example.)

Soviet strategic concepts and planning for a continuing, upgraded air defense structure and ABM deployment have been influenced by the same factors. This accounts for obvious similarities in the pattern of basic trends. The nature and rationale of Soviet decisions, however, involves speculation although the available evidence clearly shows that the political leadership set priorities for strategic defense and regularly allocated to that effort a substantial resource commitment.

The pattern of action reflected by the basic trends outlines the substance of choices made; consideration of the influences for these choices appears in the following section.

D. Reasons and Influences

1. Parallel Decisions During the Period

a. Mid-1950's Build-Up

The U.S. and the Soviet Union each decided early in the period to build up the strategic air defense structure existing at the time based upon perspectives of the current and anticipated, manned bomber threat. In effect, these decisions extended and reinforced earlier decisions to establish the national air defense systems. Given added impetus in the mid-1950's by the decisions for build-up, each of the national systems generated a momentum for a continuation of the established pattern of action with respect to air defense and each acquired a self-sustaining dimension.

In the Soviet Union this contributed to subsequent decisions involved in the revamping of the National Air Defense Forces which took place as part of Khrushchev's general reorganization of the armed forces (Section C, Chapter III, "Major Decisions"). Reductions in fighter aircraft and the virtual elimination of antiaircraft artillery were noteworthy elements of this restructuring. These actions coincided with the availability of a new surface-to-air missile system, the SA-2, and the advanced development of the SA-3.

1) Factors Related to Soviet Decision

The availability of these missile systems and new fighters and improved early warning and communications links, it is presumed, enabled Khrushchev to accomplish resource savings within the strategic air defense force in keeping with his larger, basic reorganization of the armed forces. Thus, it can be inferred that the availability of the products of technology—the new SAMs, fighter aircraft, radars, and communication links—resulting from decisions and action taken earlier facilitated this Soviet decision. The economic situation remained generally poor despite a rise in military budgets about the time. Confidence among the Soviet leadership, however, was high as a direct result of the stunning achievement of the Sputniks; Khrushchev's authority was now accepted and respected as the principal leader and he had already made the larger strategic decisions on offensive missiles. To upgrade the national air defense structure was, therefore, a natural progression.

2) Factors Related to U.S. Decision

a) Threat Perception

Threat perceptions and decision processes appear to be the prime factors in this decision. An updated special intelligence estimate current at the start of this period held that by 1957 the U.S.S.R. could develop the capability of launching approximately 1,000 aircraft in an initial air operation against the United States. While it considered it more likely that the U.S.S.R. would elect to commit substantially fewer, this estimate believed that 550 mission aircraft would constitute the maximum initial effort.[1]

Essentially limited progress had been made in the air defense programs already directed by President Eisenhower.[2] There was concern because of revised intelligence estimates concerning the Soviet nuclear

[1] Record Group No. 319, Records of Joint Actions, Department of the Army, Army Staff, DCSOPS, JCS Papers, National Archives Building (hereafter RG 319), *Annex to Appendix A*, (par 2 d, p. 1152) JCS 1899/162, 2 Nov 54 quotes SNIE 11-7-54 paragraphs 8–9.
[2] RG 319, *Memorandum to Secretary of Defense Subject: Continental Defense (NSC 5408)*, 11 June 1954 (JCS 1899/117).

stockpile and fear aroused by the prospects of the fallout hazard.[3] (Annex V, Chapter 2 deals with estimates, assessments and key decisions at the time.) There also was growing Canadian concern.[4] The Killian report, "Meeting the Threat of Surprise Attack," pointed up Soviet capabilities in early 1955, and indicated critical U.S. targets were relatively few saying that "200 nuclear bombs . . . would decisively defeat us and . . . a first attack could be fatal if we were surprised and unprepared."[5] The report specified a number of deficiencies of the U.S. air defense system.[6] WSEG Report No. 15, "Continental Defense," which circulated during the summer of 1955, contained a variety of recommendations on the subject.[7] (Many separate groups were prominent in urging high level U.S. Government action for improved air defense.)

b) Decision Process

In the highly structured U.S. national security organization, the policy process was institutionalized, but dependent on various ad hoc groups for technical assessments and evaluations. Decisions resulted from the evidence such groups developed concerning the need for action on strategic programs. In 1953, President Eisenhower's Reorganization Plan No. 6 had revised the functions of the U.S. Armed Forces and the chain of command, abolished the Munitions Board and Research and Development Board, established seven Assistant Secretaries of Defense, and, in the National Security Council, major policy questions and security issues had become the purview of the Planning Board, made up of representatives drawn from the Department of State, Defense, Treasury, the Office of Civil and Defense Mobilization, and the Bureau of the Budget.

This Board, which included advisors from the JCS and CIA, had members personally appointed by the President upon nomination of the designated departments and agencies and the approval of the President's Special Assistant for National Security Affairs, Robert Cutler, a prominent Boston banker. The Planning Board, while only a small part of the NSC system under President Eisenhower, constituted the heart of the U.S. security structure since it had the central task of formulating policy for the consideration of the Council and the approval of the President. Board consideration of an issue began with the preparation of a preliminary study and discussion. Following this a draft would be prepared, modified, and cleared through inter-agency coordination.

The evolution of an NSC policy paper under this process might take weeks and ". . . all points of view were represented, heard, explored and contested."[8] The policy formulation process under President Eisenhower has been described by Mr. Cutler as one side of the "policy hill." Policy moved up the side of the hill through the Planning Board to the Council at the crest where it was "thrashed out" and submitted to

[3] RG 319, Appendix to Enclosure, JCS 1899/130, 9 July 1954, contains observations and recommendations by Robert C. Spraque to NSC on 1 July 1954.
[4] RG 319, JCS 1899/156, August 1954.
[5] RG 319, *Memorandum to Secretary of Defense*, JCS 1899/200, 18 April 1955; "Report of Technological Capabilities Panel, ODM, to the President"—14 February 1955, and NSC Action 1355, 17 March 1955 as cited in *Chronology of Significant Events and Decisions Relating to U.S. Missile and Earth Satellite Development Programs May 1942–October 1957*. Historical Section, JCS, 22 November 1957; and "History of Strategic Arms Competition," *Chronology—U.S. Volume I 1945-60*, Office of OSD Historian, October 1974, (OSDH-74-0001), p. 445, quotes from Killian report.
[6] Ibid.
[7] Ibid.
[8] "Organizing for National Security, The National Security Council," Study submitted to Committee on Government Operations, U.S. Senate by the Subcommittee on National Machinery, pp. 9 and 51, Government Printing Office, Washington, D.C., 1960.

the President for decision. Once the President approved the policy, it went down the other side of the hill to the departments and agencies the President charges with carrying it out.[9]

In one sense, the JCS were critical of the NSC policy process. The formation of the many ad hoc groups formed to perform technical evaluations of military capabilities, jeopardized the security of war plans since under the various NSC ad hoc committee arrangements, representatives of various civilian agencies scrutinized operational details of war plans.

Fundamentally, another concern of the JCS bearing on the NSC strategic policy process involved the possibility that established defense priorities would be set aside by the NSC in favor of changed programs. With respect to air defense, the JCS attempted to discourage "corner cutting" in order to accelerate air defense programs at the expense of established programs for offensive systems. Deterrence appealed as a concept both to the NSC and the JCS, apparently to a greater degree than defense measures, particularly in the light of budgetary limitations; however, the JCS preferred to determine questions of balance between U.S. offensive and defensive forces through their own deliberations. The questions of balance between offensive and defensive forces remained vexing and even within the defensive category, there were highly substantive questions on what would be a proper "balance."

b. Long-Range Missile Development—Deployment—Mid-1950's

The Soviet Union and the U.S. each decided early in the period to pursue accelerated development and deployment of long-range offensive missile systems. These decisions were significant because of their direct consequences with respect to the choice of strategy and because of the added dimension they gave to the evolution of threat perspectives. (There are numerous consequences; this discussion attempts to focus on air/missile defense considerations.)

1) Factors Related to Soviet Decision

The promise of technology appears to have been a primary factor in this decision. The Soviets needed a deterrent to neutralize U.S. strategic air and missile bases in Europe, to hold Europe hostage against a U.S. threat of action, and to support strategic concepts for the operations of the combined arms against Europe. A strong Soviet security position was needed; a deterrent force contributed directly to the defense of the homeland. Technology offered the prospect of an impressive solution to the threat. Khrushchev would boast that the strategic attack aircraft was obsolete and he had decided not to produce a large bomber force. Rockets and missiles were "the thing"; the SA-2 and the FROG were other manifestations of a growing Soviet emphasis on these new means for wielding nuclear power.

Nuclear power had already proven useful for Soviet strategic purposes. The United States had shown interest in detente during 1955 and despite its commitment to "massive retaliation," events in Suez and Hungary the following year indicated that the pattern of power in world politics was changing. Events in the fall of 1956 showed that efforts to impose political change by force at the expense of another major power could induce great risk and would weigh heavily on future credibility. Soviet nuclear threats were blatant at the time; their diplomatic success now seems incredible.[10] A threat to initiate a nuclear war, especially from

[9] Ibid., p. 54.
[10] Arnold Horelick and Myron Rush, *Strategic Power and Soviet Foreign Policy*, University of Chicago Press. Chicago, 1965, pp. 31, 212, 216, 218; Adam Ulam, *The Rivals: America and Russia Since World War II*, Viking Press, New York, 1971, pp. 258–259.

the Soviet position of strategic inferiority, appears incredible because of the existing balance. Nonetheless, during the Suez crisis ". . . from their prime minister down to a lowly consul, the Soviets were cheerfully accounting that they were going to visit destruction of the United States ally where America still enjoyed a huge superiority over the U.S.S.R. both in nuclear weapons and in means of delivery. On any rational count the Soviet threats were ridiculous."[11]

Horelick and Rush see this particular period as a threshold because

> . . . the failure of the United States to intervene in Hungary was probably a key to the Soviet leaders as decisive confirmation that the West meant to employ its strategic preponderance defensively and would not make it the basis for a far reaching political or military offensive against the Soviet Union. At the same time, the Suez crisis demonstrated that the emergent Soviet nuclear capability, though still far inferior to that of the United States, could be fashioned into a potent instrument of Soviet foreign policy. The Soviet attempt to intimidate Britain and France by alluding to the possibility of a rocket attack against them proved to be the forerunner of a series of more direct efforts to exploit Soviet strategic power politically in the later years.[12]

2) Factors Affecting the U.S. Decision

Concern over the Soviet bomber program and the ICBM threat combined to make threat perception a principal factor relating to this U.S. decision. Technology also was of great significance, and related to this decision was an intense, bitter wrangle over roles and missions and bureaucratic politics. The Soviet ICBM test and later successful launch of Sputnik, however, acted as a catalyst which fused several separate factors and impelled the decision.

U.S. decision making also felt the pull of other influences. Disarmament proposals provided one of these.

Harold Stassen, named by President Eisenhower as his Special Assistant for Arms Control, had proposed in May 1955 that the United States try to reach an initial arms control agreement with the Soviet Union and other major nations because he judged that a leveling off in armaments by 1957 would stop the United States and Soviet Union short of achieving the nuclear capabilities which estimates indicated to be sufficient for mutual annihilation.[13] Stassen's proposal drew on the Killian report. Stassen's proposal also reflected developments in the UN Disarmament Commission meetings in London during February 1955 when the Soviet representative called for a freeze on armaments and armed forces and proposed the destruction of all nuclear systems.

A prime consideration in the growing Soviet-Western exchange on disarmament involved the effort to guarantee both sides against surprise attack by the other. Negotiations focused largely on the issue of surprise attack by strategic forces because, while the strategy of each side sought to deter nuclear attack, surprise attack against strategic forces was not likely to be deterred if those forces were significantly vulnerable. Special action was needed to secure the deterrent force.

Most Soviet proposals for disarmament/disengagement implicitly included a reduction of NATO's importance or strength. Differences of opinion developed within the NATO concerning action to be taken on such Soviet proposals. In general, the British favored limitations on forces and weapons; the Germans were strongly opposed. The U.S. tended to side with the British, while France was inclined to

[11] Ulam, op. cit., p. 258
[12] Horelick and Rush, op. cit., p. 311 (The authors cite Hans Spier, "Soviet Atomic Blackmail and the North Atlantic Alliance" (RM-1837, 10 Dec 1956) as providing a useful contemporary analysis of Soviet threats during the Suez crisis.)
[13] JCS Chronology as in OSD Chronology, Vol. I, op. cit., p. 209.

support the German view. The Soviet campaign helped to promote division in NATO. Anthony Eden, for instance, proposed a notably softer line with the Soviets at Geneva in July 1955. Stating that "we should be ready to examine the possibility of a demilitarized area between East and West," he went on in some detail: "There is suggestion of a mutual security pact. There is the prospect of agreement about the total of forces and armaments of the two groups both in Germany and in the countries neighboring Germany. This would be subject to reciprocal supervision. There is the concept of a demilitarized area."[14]

U.S. disarmament officials had been meeting in London in the summer of 1957 with the Soviets when the announcement of the Soviet ICBM test was made. The attitude of the Soviet representative, shown by a violent rejection of Western disarmament proposals in a presentation at the meeting of the Disarmament Subcommittee on 27 August, included a boast about the Soviet ICBM achievement. (In April, Ambassador Zorin, the Soviet representative in London, told Harold Stassen that U.S. overseas bases and the possibility that the U.S. would give nuclear weapons to states around the U.S.S.R. constituted a threat. At the time the U.S. was active in negotiating possible bases for Jupiter and Thor.)[15]

President Eisenhower reacted to the Soviet announcement the next day by issuing a special statement expressing his deep disappointment. He noted that the Soviet attack on the Western disarmament position had included their ICBM boast and called on the Soviet Union to reconsider its disarmament view.[16] The disarmament session adjourned almost immediately after the Soviet ICBM test; following the session in London, Walter Lippman referred to Soviet actions there as a "diplomatic coup" and added: "They have identified themselves first with the idea of abolishing nuclear weapons, and then with the idea that they are superior in nuclear weapons. There are a lot of people in the world who like to be on the side of a winner."[17]

By the end of September, the state of U.S. missiles had become a larger issue. The U.S. Atlas, which had exploded on its first test in June, blew up in a second attempt at a 650-mile launch in late September. Senator Symington, in mid-September, charged the Eisenhower Administration with "misleading" the American people with half-truths about the danger of Russia's development of an ICBM. But American attention then centered on Little Rock, Arkansas, where the civil rights issue had come into sharp focus. On 2 October 1957, however, Secretary Wilson formally submitted his resignation and, at a press conference at the Pentagon that day the facts of budget ceilings showed up in two announcements he made: the Air Force would temporarily limit its progress payments to major aircraft manufacturers in an effort to keep expenditures down and the JCS felt economy cuts had brought our combat capabilities down to a dangerous minimum.

In the aftermath of the Soviet ICBM launch and Sputnik, U.S. threat perceptions of Soviet capabilities dominated the pattern of response. An increased appreciation for the impact and future potentials of technology was obvious and became another factor to reinforce the long-term U.S. commitment to strategic nuclear forces for deterrence.

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[14] Eugene Hinterhoff, *Disengagement*, Stevens and Sons, London 1959 (Appendix 3, pp. 389–390).
[15] JCS Chronology, as in OSD Chronology, op. cit., p. 272.
[16] Ibid., p. 285.
[17] *Washington Post*, 29 August 1957, p. A. 19.

2. Corollaries and Consequences

a. Post-Mortem to Sputnik

The U.S. post-mortem following the Soviet ICBM test and Sputnik launch quickly identified the scapegoat for the shock and the fear that was in the back of everyone's mind. Walter Lippman wrote: "The fact that we have lost the race to launch the satellite means that we are losing the race to produce ballistic missiles. . . ."[18] The day after Sputnik II was launched, Senator Lyndon Johnson said that the U.S. missile program had "been the subject of constant bickering among the three services. It has meant inter-agency battles fought with all the fierce intensity. . . of war itself. . . . The independence that was accorded the three branches was not included to be an invitation to waste motion."[19] As the search expanded for the cause of the Sputnik technological setback to the United States, inter-service rivalry was made to explain the technological failure.

b. Reorganization Act of 1958

Concurrently, the President forwarded recommendations to Congress that resulted in the Defense Reorganization Act of 1958 which greatly increased and centralized authority over the Services in the Secretary of Defense and his office. The chain of command was changed; executive agency responsibilities essentially done away with; staff support for the JCS doubled and reorganized; and authority over the research and development of new weapons and weapon systems centralized under a new Director of Defense Research and Engineering. The increasingly centralized control by the Secretary of Defense obviously diminished the role of the Services.

c. Close Congressional Security

Not quite so obvious, but of great consequence, the Congress began to take a hard, close look at costly plans and programs which involved competing or duplicating demands for Congressional support. Congress recognized the Soviet threat for what it was and had taken steps to provide what had been recommended and needed for U.S. national security. Reflecting the national mood, Congress suffered a loss of confidence as a result of the Soviet technological achievements of 1957. It appeared that, despite sustained Congressional support to meet U.S. defense needs, something was wrong. While the basic issue might concern overall costs, at the heart of the Congressional concern was the soul searching question of the longer term implications of U.S. security: What did the nation really need for its defense? The new missile systems to be part of the required U.S. strategic offensive force involved the Congress. The growing capacity of defensive missile systems and their operational deployment by the Soviets made aircraft attrition a factor that would bear on their deliberations about the size and composition of other U.S. strategic offensive forces. Soviet defensive missile capabilities stimulated consideration of the variety of penetration aids, improved electronic countermeasures, defense suppression measures and projected future requirements for manned strategic bombers. Following the demonstration of a Soviet ICBM, therefore, the Congress took a harder look at requests for fiscal support for air defense systems development and deployment and the several related actions which were said to be required because of the growing Soviet missile threat, offensive and defensive.

[18] Ibid., 10 October 1957, p. A. 15.
[19] *Aviation Week*, 4 November 1957, p. 33.

d. Other Congressional Concern

The basic issue involved costs. Congress was equally concerned, however, with the implications of the developing threat for U.S. long-term security. Conditioned by the informed testimony of the Executive Branch, the Congressional leadership had a good appreciation for the Soviet bomber threat which recent intelligence estimates gave impressive capabilities. While the Soviet bomber threat was somewhat eclipsed after Sputnik by concern for their missile threat, Congress remained conscious of Soviet bomber capabilities. Deliberations about measures to support Defense Department programs for air defense found, among a number of influential Congressional leaders, an established predisposition for backing them. Opposition to sustained support for active defense, however, showed along several lines.

e. Opposition to Air Defense

One, even among air defense supporters, concerned what appeared to Congress to be the Defense Department's credit card approach to the problem. The costs of separate and apparently duplicating air defense measures and programs in the late 1950's bothered Congress, among other reasons, because of interest in overall air defense costs. This came into sharper focus when opponents of continued expenditures for air defense argued these funds were better committed to support new strategic offense requirements. They argued that there was no defense against missiles and, in the light of new Soviet threat capabilities, believed air defense was an anachronism. They felt that air defense could not prevent Soviet bombers much less missiles, from achieving great destruction. Accordingly, they favored U.S. defense through a strategic offensive strategy. Another element of Congressional opposition developed and grew as part of the larger and continuing Congressional concern for security issues. This opposition focused on the specific question of "stability," looking to the possibility of the United States achieving some agreement with the Soviets to advance a diplomatic detente. This opposition took on added dimensions as the continuing advance of weapons technology intruded on the concept of stability either as a way toward disarmament or to prevent a war. As it developed, this Congressional opposition shared in the ABM debate and closely monitored activity bearing on mutual deterrence.

f. Hope for "Stability"

Stability as an issue, however, regularly found challenges in the variety of technological change and operational deployments taking place before SALT. As these progressed, improvements in warhead yield and accuracy and the advent of the new type warheads again raised questions of the vulnerability of the deterrent force. With the safety of those retaliatory elements as well as the bomber element threatened by further advances in weaponry, increased pressure arose for consideration of active missile defenses, a concept that now appeared practicable.

In the U.S. deliberation about ballistic missile defense, budget considerations and longstanding opposition to the ABM worked against a U.S. operational commitment. The Soviets however, continued to stress active and passive defense measures, and moved to deploy an ABM defense system which implied a concern for the imagined threat of a U.S. first strike. While the United States had developed "immense" strategic offensive forces, the substantial elimination of the Soviet retaliatory force was beyond their capabilities. Therefore, the Soviet ABM deployment did not directly affect U.S. action to develop strategic forces, but it did help to give rise to the later announcement of U.S. action to provide a "thin" ABM deployment, coupled

with the assertion there was a "mad momentum" to the "arms race" in nuclear weapons. Subsequently, the "mutual vulnerability" of U.S. and Soviet strategic forces became caught up in the Soviet attainment of admitted nuclear equality with the United States at the Moscow Summit in 1972 which dramatically altered the status of the Soviet Union in the world.

3. Implications for U.S. Air/Missile Defense

As the 1950 decade closed, U.S. planners still had the urgent task of providing answers to the basic question, "How to defend the country?" Planners also sought information concerning a related basic question: "How will the United States be attacked?" They knew that a missile gap existed; a general election campaign made that a slogan; however, it was difficult to get information on the missile threat or details of how it might be applied. Available air defense units and forces could counter the air breathing threat but no capability existed for defense against missiles.

U.S. threat perceptions recognized the relative importance of the bomber threat to be decreasing. The size of that threat, however, plus the advent of Soviet air-to-surface missiles and the prospect of a new Soviet bomber justified continuation of an active air defense system. How long the air defense system might be required or how much resource support it should receive was indefinite and contentious. Critical congressional inquiry could be expected and within the Defense Department the relative priority given to air defense was falling. If the NORAD system faced reductions, would the concepts of "area defense" and "defense in-depth" remain valid?

Potentially more contentious was the question of emphasis to be given to antiballistic missile programs. Should an active system be planned? When would it be required to have an active antimissile defense for the United States? How would it be funded? What about submarine launched attack? Who would support an accelerated, intensified program? Antimissile defense might be feasible, but wouldn't the growth of the Soviet ICBM force permit a massive attack against the U.S. to overwhelm the antimissile defenses? Was it really feasible seriously to contemplate that the United States could be defended by AICBM systems? (Section III, Chapter IV and Chapter II reflect the problems inherent in such questions.)

As the Soviets demonstrated in the 1960's growing capabilities in ICBMs, and later, hardened ICBMs and submarine launched missiles, deterrence could be seen to be dependent on the restraint of the adversary.

Crisis situations in Berlin and Cuba brought new focus to the status of deterrence. The mutual opposition of the "superpowers" had generated security measures for deterrence whereby the threat of nuclear weapons had become "indispensable" but their use was "unthinkable."

E. Conclusion

U.S. and Soviet concern over a perceived vulnerability to a surprise nuclear attack led both nations to develop powerful deterrent forces and supporting postures. Technology was the predominant factor affecting the character of the strategic choices which were decided upon during this extended period to realize the established strategic goal: deterrence.

The United States and the Soviet Union shared the basic choice that was made. Both looked to an integrated national air defense system as one element of deterrence. The weighted emphasis of the U.S. choice went to the strategic offensive element of the deterrent; the Soviet deterrent inclined to a more balanced posture between offensive and defensive components.

As the deterrent force of the two nations evolved, threat perceptions influenced their character. Based upon a perspective of the mid-1950's, the United States decided that the deterrent strategy required the high-priority development of long-range missiles. The equivalent level of priority did not attend programs for strategic air and missile defense although the threat projected distinctive needs for active defense.

A reversed set of priorities guided the Soviet effort; response to the threat of U.S. strategic offensive power emphasized the need for an active defense throughout this period while building up strategic forces.

The basic patterns of action were set by initial, and early, strategic choices. Thereafter, the problem centered on technological development. Threat perceptions increasingly involved intelligence judgments of possible application by the Soviets of new technologies. These judgments represented efforts to define or delimit future threats. Perceptions of future threats were influenced by various views of available technologies, whether or not the Soviets had demonstrated the capacity to apply them. Available or known technologies were extrapolated to assess future threats. It is difficult from this research to conclude whether "worst case" assessments, built on mirror-imaging, influenced U.S. strategic choices.

Interaction was inherent in the premises; however, a direct action-reaction cycle was not a factor in the development of U.S. and Soviet strategic air and missile defense systems, although tactical and operational considerations necessarily influenced development and deployment.

Chapter II

Blue Air Defense Strategy, 1955–1972

A. Administrative Note

In large part, this chapter consists of public statements by U.S. Presidents and Secretaries of Defense, classified and unclassified offensive and defensive weapons inventories, and budgetary allocations by program categories and military services. It is postulated that these materials by themselves serve to tell a major part of the story of critical decisions about U.S. air defense strategy in the 1955–1972 period. This supposition is consonant with the notion expressed in the following quotation: "Administrations are fully committed only when they are publicly and explicitly committed."[1]

Since primary source material was readily available on these public and explicit commitments, a basic decision in the research strategy was made to pursue the story of strategy through them (and classified statements when available) rather than relying mainly on secondary, judgmental sources. Also regarding the use of secondary sources, it was anticipated that Professors May (see paragraphs 6 and 7 of his critique of BDM Vol. 1) and Steinbrunner would be more able to provide the requisite judgments about the course of strategy for the overall project if they were provided with a firm evidential base rather than with secondary assessments. Further, the use of primary sources allowed the major historical actors to speak for themselves about threat perceptions, policy plans, and other variables which impinged on the continental defense effort. The lack of access up to the present to many intelligence documents which may provide a flavor for the interaction of bureaucratic groups on air defense strategy truncates the story which is told here, but since this working paper is under continual revision new elements of the story will be added as they are accessed.

B. Introduction and Abstract

Driving American air defense decisions in the 1955–1972 period was the desire to detect, identify, and destroy threats to the continental United States as far away as possible. The fulfillment of this desire became more and more complex as time passed during these years, for as the Soviet threat changed in character from solely manned bombers to ICBMs with manned bombers in a supporting role, the U.S. defense problem itself changed.

The beginning of this historical period found U.S. strategy based on the primacy of our manned bomber offensive force as the major deterrent to Soviet manned bomber attack, with a secondary but nevertheless major role for a defensive system to destroy Soviet bombers if such an attack were launched. By evolution, this strategy came increasingly to rely on our ICBM force for prime deterrence of the Soviet ICBM threat,

[1] Samuel P. Huntington, *The Common Defense: Strategic Programs in National Politics*. Columbia University Press, New York, 1961. p. 339.

with defensive efforts concentrated on early warning of ICBM attack and drastically reduced emphasis on defense against a manned bomber attack.

Several factors directly influenced the manner in which this changed emphasis came about. These factors include (1) the perceived and actual threat to CONUS, the anticipated application of that threat, and the changing nature of that threat; (2) the importance of air defense strategy to overall national security policy goals (including strategic offensive and general purpose force commitments); (3) the impact of technology on the capabilities for air defense; and (4) the policy goal of detente with the Soviet Union.

The relative degree of importance of these factors on major air defense decisions is addressed in the summary portion of this chapter. Conspicuous by absence from the above list are two other factors which might have been expected to be crucial to air defense strategy—namely, budgetary constraints and interservice competition. It is the judgment of this research effort that while these two factors may have been influential in decisions about air defense systems (see Chapter IV) they had much less impact on the *overall* strategy than did the four factors above. For example, even under the fiscal austerity of Eisenhower's balanced budget concept, air defense flourished and in fact systems inventories grew to all-time highs. While it can be argued (as it is in some of the Congressional testimony in this chapter) that air breathing threat defense systems declined in the late 1950's and early 1960's because of monetary constraints, this reality was stimulated by an even larger context and a more important appreciation for a newly perceived Soviet ICBM threat and our inability to destroy that incoming threat. Regarding interservice pursuit of roles, missions, and new systems in fresh areas of the air defense effort, it is judged that such service actions did not significantly impinge upon strategic thought and assessments. Some of the Congressional testimony in this chapter reflects the strategic thinking of various presidents and secretaries of defense, and points clearly to two judgments: (1) service "competition" was probably based on serious and very real debate about alternative "best" ways of doing the *same* job, so that it was "competition" only in one sense—the desired end was the same; and (2) strategy about the ebb and flow of air defense, made at the highest decision-making levels, was likely not based on *relatively* insignificant choices between competing weapons systems.

Instead, the more fundamental strategic question which governed the situation was this: "Can the job of an adequate defense be done?" The answer to this question when asked regarding defense against the manned bomber was a definite "yes." The answer to this question by various Secretaries of Defense about ballistic missile defense was a highly qualified "maybe," an answer which meant that ballistic missile defense was never a truly serious element of air defense strategy. It is in the answers to these two questions and in the salience of the four factors already listed that the story of air defense in the 1955–1972 period lies. These questions and factors will be related to five major decisions affecting air defense strategy during this period. These decisions are:

(1) Decision to build up the air defense system January 1955 (result of earlier decisions)[2]
    Reason: The Soviet manned bomber threat (primarily)
    Results:
        – CONAD SAM battery peak—244 In FY 1959
        – USAF interceptor squadron peak—96 in FY 1957

(2) Decision to deploy 1st generation ICBM/IRBM CY 1958

[2] It should be noted that these five decisions are not of equal importance to the course of air defense strategy. The degree of importance attached to each is discussed in the chapter summary.

Reason: The predicted Soviet ICBM threat (primarily)
Concurrently,
- – Air breathing threat would therefore be less important in the future
- – A strong R&D impetus was provided on advanced programs
- – Major defense reorganization took place to move programs ahead

(3) Decision to refine existing air breathing defense systems (not to develop new systems) circa 1959–1963
Examples:
- – No super combat centers
- – SAGE refined to BUIC 1/11/111
- – Ajax to Hercules and no further—SAM-D a development project
- – 101/102/106 interceptors refined with avionics—no follow-on IOC
- – Continual deployment cutbacks 1961–1972

(4) Decision not to deploy a BMD system 1958–1967
Ramifications:
- – Offensive forces carried the defensive burden against Soviet ICBMs
- – Continental air defense against the existing ICBM threat was null and void

(5) Decision for detente (begun under Eisenhower-culminated in SALT)
Ramifications:
- – Leveling off of offensive forces began CY 1966
- – Continued reduction in existing air breathing defense—AWACS/F-106X/OTH told how much was "enough"—just a little.

This presentation on U.S. continental air defense strategy 1955–1972 is subdivided into four fairly distinctive periods of time. The notion of "fairly" distinctive periods is emphasized because the division of years in the manner below in no way indicates a belief that a single date can be selected on which a new strategic thrust began to hold sway over decision-makers; the data on which this chapter is based are simply not precise enough to make such an assertion, even if possible.

Nonetheless, some distinctive trends in the period are evident. The first subdivision is January 1955 to the launching of Sputnik I on October 4, 1957. While an air defense system existed before 1955, as did the major impetus for it, that year is crucial because never again in the military posture briefings and associated testimony during the 1955–1972 period were the President and the Secretary of Defense more adamant about the need for a better air breathing threat defense system than they were in early 1955. The realization of this desire was reflected in the inventories of major air defense systems peaking at all time highs for the overall 1955–1972 period in the FY 1957–1959 years. The more general build up of all air defense forces was also reflected at about this time, specifically in the FY 1956–1958 period. The ending date of this period is less definite, for upon examination it will be noted that CONAD air defense SAM batteries, for example, did not crest until FY 1959, after the Sputniks. However, the remarkable difference in military posture statements before and after Sputnik I reflects the importance of that event as one which marks a convenient dividing line, with a more-or-less concurrent major switch in strategic emphasis.

The second period begins with Sputnik and ends with the entrance of Robert McNamara as Secretary of Defense in 1961. The dramatic emphasis on U.S. missile programs after Sputnik was coupled with a slow redefinition of the Soviet threat in these years—by the time of posture briefings in early 1960, the "missile gap" issue had sprung up as the critical strategy problem of the day, although this was no doubt partially caused by the presidential election of that year. Also during these years, a gradual reevaluation of the need for an air breathing threat defense system took place as perceptions of the Soviet threat changed to emphasize the predominant role of the ICBM as the major offensive weapon. The lack of an adequate active defense against the ICBM, coupled

with this newly perceived threat, lead to serious questions throughout these years about the need for the expensive antibomber defense system which had been created. Air defense system weapons inventories began to show declines in these years at the same time that great emphasis was placed on rapidly deploying the first generation U.S. IRBMs and ICBMs. While the selection of Sputnik is somewhat arbitrary, since the U.S. missile program was active well before that time, the selection of 1961 as the ending data for this period is less arbitrary than it is a reflection of a new way of looking at defense problems instilled by a new Secretary of Defense.

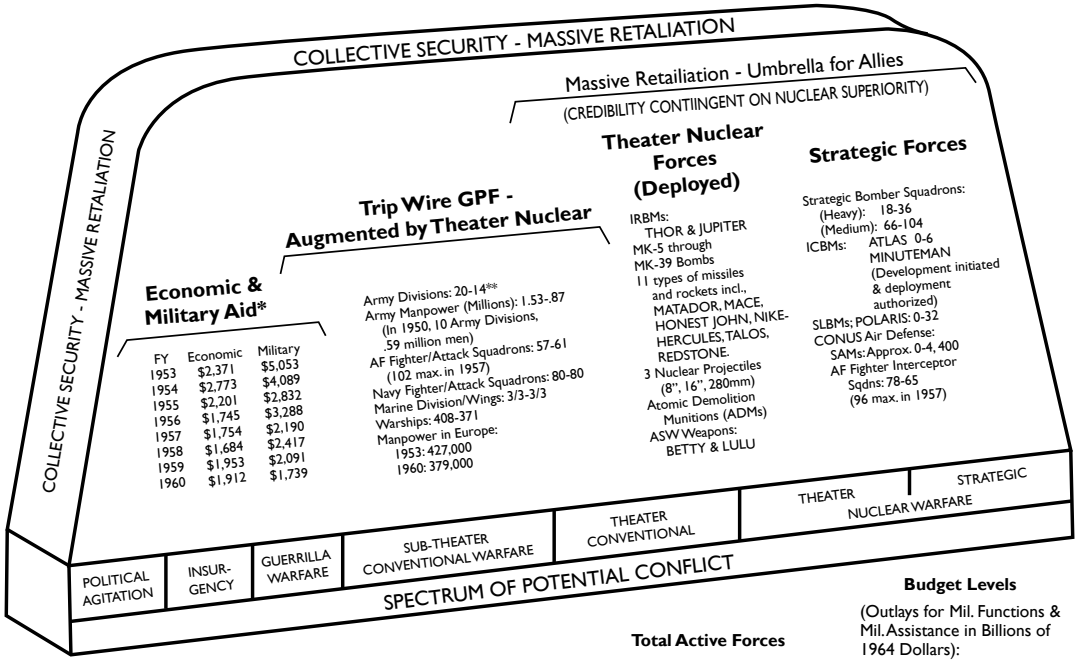
The third period begins with McNamara as Secretary of Defense and ends with Clark Clifford taking that position. The new amount of light shed by McNamara about the defense posture and some dramatic and early decisions about the changing nature of defense during his tenure mark this as the beginning of the third time period. While the decreasing need for a bomber defense was made fairly clear by Secretary of Defense Gates in 1960, Robert McNamara was even more adamant about the changing need in April 1961 with his first major address. The general downward trend in air defense weapons systems inventories which began during the second period continued through the McNamara years at the same time that the U.S. ICBM inventory began to show the fruits of the post-Sputnik initiatives in missile development. The concepts engraved on granite for the McNamara years which affected air defense were: the increasing Soviet ICBM threat, the lack of an active ICBM defense, the need for a second-strike capability, hardening, dispersal, and adequate warning. Interceptors came to be viewed as inherently soft; the need for them and for Ajax and then Hercules SAMs declined as the Soviet bomber force leveled off and the Soviet ICBM force built up. The soft ground control environment was hardened progressively by refinement, not by major revision. Warning time was increased, second generation ICBMs entered the inventory, and SLBMs became a (if not the) most significant component of offensive weaponry. By the calendar year 1966, McNamara had consistently put off deployment of the Nike Zeus/X ABM system (see Chapter IV, Section III), and offensive force levels began to stabilize at prescribed ceilings. Continental air defense became a very small wave in the very big ocean of strategic interaction by this time, with the exception of the decision to deploy an ABM system in September 1967 (which appears to have been primarily a bargaining chip to be used for detente rather than a strictly militarily defensive move). As Vietnam took over the predominance of Congressional attention on defense, this period comes to a close with a McNamara-inspired plan for air defense which was to serve as the mainstay of the fourth period.

The fourth period covers McNamara's departure from the DOD scene to the end of 1972. The beginning of this period is an approximation, for the heritage of military posture on air defense which Robert McNamara left Clark Clifford carried on specifically through at least FY 1970 and then generally throughout the end of the period. Air defense had waxed strongly under Eisenhower and had waned ever since, with continual decline during these last years reflected in weapons inventories. The proposal which McNamara advanced for FY 1969 included several elements of a neatly tied package designed for the first time since at least 1961 to substantially replace the existing air defense system. McNamara's proposal called for a new air defense interceptor, a system to fully replace SAGE/BUIC, and new OTH B radars, The proposal was later modified to include a SAM-D to replace the existing Hawk-Hercules force. This "new" package carries the air defense story through the end of the period, for it describes the story well—a realization late in these years that what existed needed replacement if air defense was to be a serious undertaking with the almost immediate reply that it could not be a serious undertaking with the existing policy on ABM deployment, punctuated by the ABM treaty of May 1972.

Figure 1 is a graphic portrayal and Figure 2 is an abstract of the Eisenhower strategy 1953–1960. These figures help to set the stage for the discussion of U.S. air defense strategy in the 1955–1960 period. While the period of

time portrayed on these figures does not overlap perfectly with the time construct employed in this chapter, these summary displays are still useful in suggesting the major offensive and defensive force highlights of these years.

Figure 1—Eisenhower Strategy, 1953–1960



* Deliveries, excluding Military Assistance, Service funded (Converted to constant dollars using same index as that for total DoD Budget).
** Includes three training divisions that did not have a combat assignment.

Figure 2—Abstract of the Eisenhower Strategy, 1953–1960

Eisenhower Administration

Strategy Concepts: Strategic superiority; limited general purpose forces deployed well forward with a potential tripwire function for possible nuclear response; strong regional and bilateral alliances with a dominant U.S. air, sea, and ground role; allied ability to handle low intensity conflicts; and substantial economic and military aid. Eisenhower strategy and forces were deterrence-oriented with emphasis on nuclear umbrella.

Forces: Emphasis on development of new systems. Many nuclear systems deployed today were initially developed including IRBMs and Atlas, Titan, Polaris, and Minuteman ICBM/SLBM systems. Work on ABN was also initiated. A notable decline in General Purpose Forces was evident from Korean War levels. Military manpower dropped by more than one million men. The number of Army divisions and Navy warships declined. Tactical air squadrons increased.

Budgets: In constant FY 1964 dollars, the budget came down sharply from the Korean peak in the first two years and remained relatively stable thereafter. The post-Korean mean average was about $46 billion.

Foreign and Military Assistance: The trend was down from post–World War II peaks but a rough balance was struck between military and economic assistance and the dollar levels remained relatively high.

Manpower: Emphasis was placed on Reserve call-ups for augmentation requirements.

C. Prelude to 1955

While many of the major decisions and significant events affecting continental air defense strategy in the middle 1950's have already been detailed in Volume I of this study, it is useful to reflect on the course of some of the events just before 1955 to set the stage for the military posture which would characterize U.S. efforts at that time.

Samuel P. Huntington has suggested that *the* critical decision in the innovation of continental defense was made by the Eisenhower Administration in the fall of 1953, when it approved a series of recommendations made by the Lincoln Laboratory Summer Study Group in 1952.[3] The Summer Study Group had, as Indicated in Volume I, called for a major U.S. defense system based on a projected Soviet bomber threat to the continental United States. The Soviet explosion of a hydrogen bomb in August 1953 served to trigger this renewed consideration of the Summer Study Group report. Additionally, a series of recommendations and considerations during this period by independent consultants and the JCS fed into approval of NSC 162 on 6 October, which called for the expenditure of $20 billion over 5 years for continental defenses.

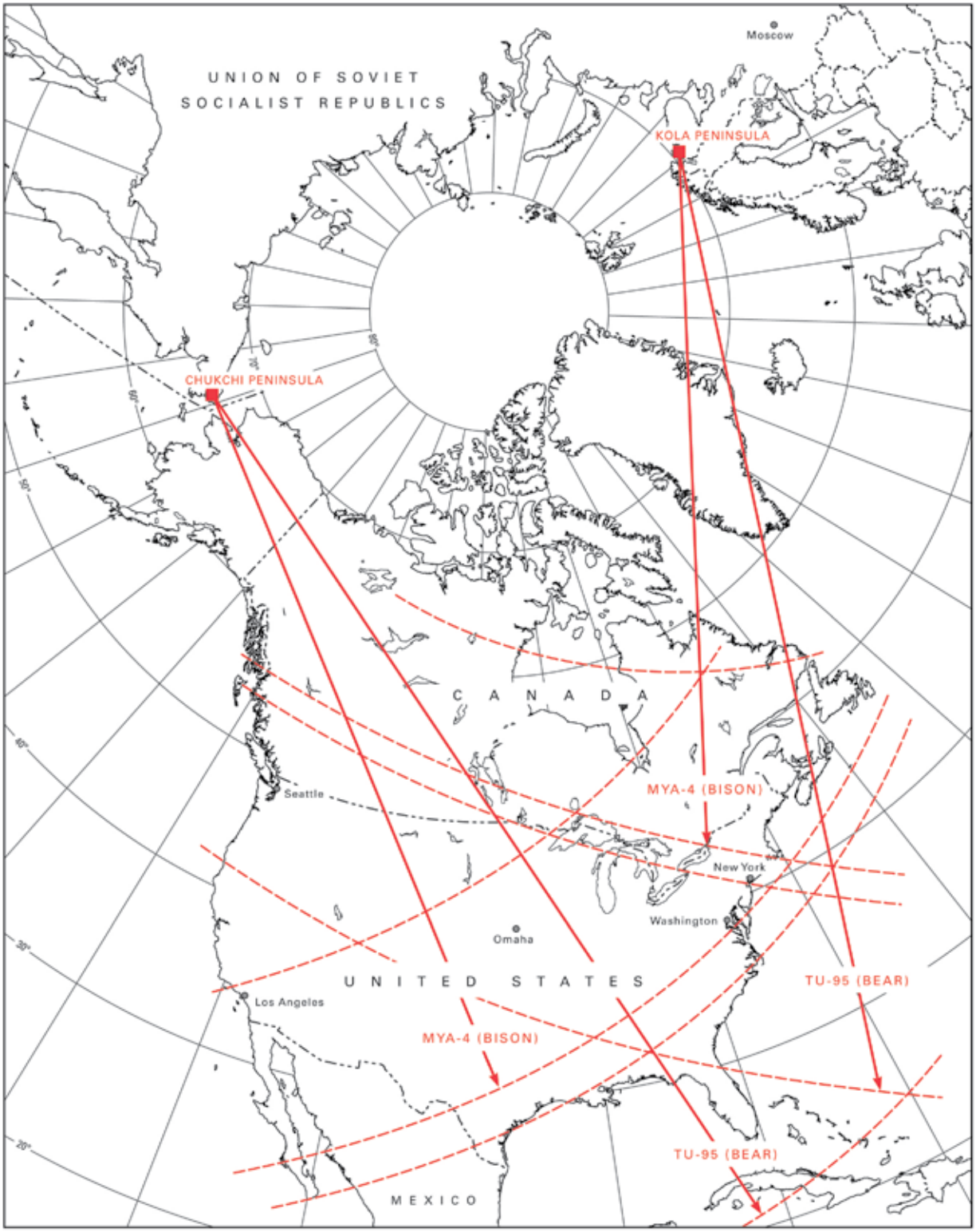
But the tremendous size of the commitment suggested by NSC 162 was not to come about—the actual difference between the FY 1954 and FY 1955 budgets for continental defense was only about $1 billion, although still a sizable amount. Continued budgetary and strategic reservations tended to detract from the defense effort. Nevertheless, increased emphasis on continental defense made NSC 162 a major turning point in policy. The "New Look" paper submitted by the JCS in December 1953 stressed the importance of the continental defense effort, and in conjunction with it, calendar year 1954 saw the continued deployment of many major air defense hardware and command and control systems.

At the same time that these events were occurring, the Soviet threat was undergoing a dramatic change in intensity as new offensive weapons phased into their inventory. During these years and through most of 1954, the Soviet Union was equipped with the TU-4 aircraft as the primary element of its strategic offensive forces. Capable at best of one-way missions against the United States, the TU-4 was thus a more major threat for the much closer Western European nations than it was for the United States. Nonetheless, the United States would be threatened by the TU-4 in a WWIII scenario where one way missions would likely be all that were necessary when coupled with deliverable atomic weapons. That TU-4 threat was reinforced in late 1954, when the Soviet Union first publicly displayed the "Bear" long-range turboprop bomber, judged as the first of a series of Soviet aircraft capable of striking U.S. targets and then returning to recovery bases. The Bear was closely followed by the display of jet-engined Bison in May 1955, an intercontinental bomber that appeared to be in a class with the U.S. B-52. The U.S. air defense systems response to this threat is discussed in Chapter IV, Section II. These significant new weapons provided grist for the mill of strategic debate—the so-called deterrent and bomber gaps developed as hotly debated questions by the time of the highly publicized Symington Air Power Hearings in the Senate in April 1956. The capabilities of these new Soviet aircraft in an attack on the continental U.S. are shown in Figure 3.

This carries the story somewhat beyond the first events during 1955, however. President Eisenhower, faced with self-established budgetary policy strictures and the burgeoning need for a continental defense system in light of the Soviet Bear threat, had major policy decisions to make in early 1955.

[3] Ibid., p. 328.

Figure 3—Soviet Bomber Capabilities



Russian long-range bombers could reach any targets in the U.S. and return to bases in the U.S.S.R. if they were launched from the Kola or Chukehi peninsulas. The polar routes illustrated are the shortest. Solid lines show maximum ranges for bombers flying round-trip missions without refueling; broken lines show the radii for round-trip flights in which the planes are refueled once.

D. Blue Strategy 1955–1972

1. 1955–October 4, 1957: Emphasis on the Air-Breathing Threat Defense System (The decision to build up the air defense system)

The post–Korean War years were to allow the United States time to reappraise its strategic doctrines with the ending of a major conventional-conflict. The Eisenhower Administration took office in 1953; and by 1955 had consolidated a distinctive approach to foreign affairs and defense matters. By 1955, most of the so-called "free world" regional alliances had been formed; the New Look defense policy had become part of the lexicon of national security; and "massive retaliation" was the enunciated method for dealing with Soviet incursions worldwide. The New Look policy had ramifications for the status of continental air defense, and so deserves some scrutiny.

It should be noted, however, that in these early years of the period being covered it is more difficult to show a ready link of over-arching policies to continental air defense than in later years; in particular, Robert McNamara's posture statement breakdown of offensive and defensive forces during the 1962–1965 fiscal year period sheds a much greater deal of light upon such considerations. This type of problem during the earlier years encourages the emergence of a disjointed picture.

The New Look was generally characterized by an emphasis on the role of strategic airpower as the predominant military tool of U.S. policy; conventional forces were de-emphasized at the expense of Army manpower. These general guidelines were to be conducted within the parameters of reduced defense spending and an attempt to balance the federal budget. A variety of statistics tend to bear out this pattern, although in an imprecise way. Regarding the budget, the post–Korean War years show a downward trend in defense expenditures in the post-war force reduction period, as indicated in Table 1. These actual appropriation figures include inflation but an adjusted expenditure level shows the same general pattern, as illustrated in Table 2.

Table 1—Defense Appropriations, Fiscal Years 1952–1958

FY 1952	$56,939,568
FY 1953	46,610,938
FY 1954	34,371,541
FY 1955	28,800,125
FY 1956	31,882,815
FY 1957	34,656,727
FY 1958	33,759,850

Note: These amounts do not include any supplemental estimates or appropriations not considered or made in the regular annual Defense Appropriations Acts. This is a particularly important caveat for FY 1958 in post-Sputnik quarters.

Source: *Congressional Quarterly*, October 28, 1972, p. 2840.

A summary of the Defense budgets by program during these years would be instructive in showing the allocations between strategic forces and general purpose forces, but such figures for the FY 1952–1955 years are not comparable by category compared to later years.[4] More interesting (and available) are alloca-

[4] Don R. Brazier, Acting Assistant Secretary of Defense (Comptroller), Statement before the Defense Subcommittee of the House Committee on Appropriations in connection with the FY 1974 budget estimates of the Department of Defense, May 31, 1973, Table 18.

tions by military service, which show the increasing slice of the budgetary pie which the Air Force received during these years, shown in Table 3. Available information for Army and Air Force force levels in selected areas also generally tend to bear out the supposed direction of the New Look, as shown in Table 4.

Table 2—Budget Levels
(military functions and military assistance in billions of 1964 dollars)

FY 1953	$60.7
FY 1954	56.3
FY 1955	46.6
FY 1956	44.7
FY 1957	45.5
FY 1958	45.8

Source: "Statement of Secretary of Defense Melvin R. Laird Before House Armed Services Committee on the FY 1972–1976 Defense Program and the 1972 Defense Budget." March 9, 1971, GPO, p. 155.

Table 3—Defense Budget Summary by Branch of Service
(in millions of current [1975] dollars)

FY	Army	Air Force	Navy/Marines
1953	$16,242	$15,085	$11,875
1956	8,702	16,749	9,744
1957	9,063	18,363	10,398
1958	9,051	18,435	10,906
FY	9,468	19,084	11,728

Source: U.S. Congress, House, United States Defense Policies in 1965. House Document No. 344. 89th Congress, 2nd Session. Washington, U.S. GPO, 1966, p. 192.

Table 4—Selected Army and Air Force Forces

FY	1950	1951	1952	1953	1954	1955	1956	1957	1958
Regular Army Divisions	—	—	—	20	19	20	19	18	15
Reserve/National Guard Divisions	—	—	—	51	51	45	37	37	37
FY	**1950**	**1951**	**1952**	**1953**	**1954**	**1955**	**1956**	**1957**	**1958**
Strategic Air Force Wings/ Squadrons									
Heavy Bomber	3/	3/	4/	6/	6/	7/	11/	11/	11/33
Medium Bomber	12/	18/	22/	22/	24/	23/	28/	28/	28/84

Source: Defense Management Summary CY 1973 Directorate for Information Operations, Office of the Secretary of Defense, Washington, D.C. Army forces from Table 125, Unclassified; Air Force Forces from Table 135, Secret RD, Except for FY 1950–FY 1974 Forces.

Thus, the general pattern of the New Look policy as characterized earlier seems to have made its way intact to the actual deployment of, and expenditures on, forces during these years. For a discussion of the factors affecting the New Look, see Chapter IV. The opposite side of the strategic offensive coin was clearly defense against the Soviet offensive threat. The impetus for defense against this threat was stated both clearly and strongly in a letter from President Eisenhower to Secretary of Defense Wilson at the very beginning of 1955:

> The White House, Washington, January 5, 1955
>
> The Honorable Charles E. Wilson
>
> The Secretary of Defense, Washington, D.C.
>
> (excerpted by author)
>
> ". . . due to the destructiveness of modern weapons and the increasing efficiency of long-range bombing aircraft, the United States has reason, for the first time in Its history, to be deeply concerned over the serious effects which a sudden attack could conceivably inflict upon our country.
>
> Our first objective must therefore be to maintain the capability to deter an enemy from attack and to blunt that attack if it comes—by a combination of effective retaliatory power and a continental defense system of steadily increasing effectiveness. These two tasks logically demand priority in all planning."[5]

With this statement, President Eisenhower established a link which was both to remain and to become more and more clear as time passed between strategic offensive and defensive efforts. The "why" for Eisenhower's desire for a continental defense system of increasing effectiveness was clearly tied to the perceived threat posed by strategic bombers. Secretary Wilson's response to Eisenhower's tasking on continental defense was made clear in his Briefing on National Defense to the House Committee on Armed Services, presented in January 1955. The presentation is interesting because of the degree of detail offered about the continental defense system, and the explicitly stated urgency of the program. Wilson began his presentation with a reiteration of Eisenhower's message to him: "Therefore, our primary objective must be to maintain the capability, first to deter an enemy from such an attack; and second, to blunt any such attack if it comes. Both purposes require a combination of effective retaliatory power and a continental defense system of steadily increasing effectiveness. These two tasks logically demand high priority in our security planning."[6]

"The continental defense program is being pushed with all practical speed," said Wilson; he then detailed the existing elements of the system: (1) warning net—land, sea, and air—both electronic and a Ground Observer Corps of 13,000 posts; (2) weapons systems—manned interceptor aircraft, AAA, SAMs; and (3) command and control system, the link between the first two elements.[7]

He went on to say that "while continental defense is the primary responsibility of the Air Force, the continental defense system is a joint undertaking of all the services. . . ."[8]

He specified the assignment of responsibilities in air defense in this fashion:

(1) USAF and ANG: land warning net, Texas towers, interceptors, and early warning aircraft.
(2) Army and National Guard: AAA and Nike
(3) Navy: picket ships, early warning aircraft, harbor defense, and submarine surveillance.

[5] Hearings before House Armed Services Committee, 1955, p. 198.
[6] Ibid., p. 203.
[7] Ibid., pp. 204–205.
[8] Ibid., p. 205.

For a more detailed discussion of these elements, see Chapter IV, Section II. The aircraft control and warning net was being implemented at that time, and was to consist of several key elements: (1) a CONUS permanent radar net with augmentation; (2) the Pinetree radar line, now "virtually complete"; (3) ". . . an early warning line across middle Canada"; (4) "the distant early warning line. . . ."[9]

On the future air defense effort, Wilson was both specific and bold:

> A comprehensive and vigorous research and development effort is directed toward the future air defense system which will encompass radars of increased range- and height-finding capability; high performance, long-range, medium-range, and short-range, piloted and pilotless Interceptors; more versatile surface-to-air guided missiles; improved devices for submarine detection; and nuclear weapons applications to continental defense.
>
> While our air defense system is already formidable, we must devote our efforts to a steadily improving air defense system phased to cope with growing Soviet capabilities and make maximum feasible use of new weapons and techniques as they are developed.[10]

Secretary Wilson's clear intentions on improving the existing air defense system were to be reflected in a dramatic rise in the numerical amount of deployed hardware to support that system. Selected major equipment items portray this increasing air defense effort, as shown in Table 5.

Table 5—Selected Air Defense Systems, FY 1954–1958

	1954	1955	1956	1957	1958
Army Forces					
Nike Ajax batteries/launchers	5/	26/	151/	240/	241/
Nike Hercules batteries/launchers, CONAD	—	—	—	—	1/
Hawk batteries/launchers, CONAD	—	—	—	—	—
Total SAM Batteries/Launchers, CONAD	5/	26/	151/	240/	241/
RA Air defense battalions	117	122	133	119	86
Reserve/NG Air defense Bns	128	127	137	142	136
Air Force Forces					
Wings/Squadrons					
Air Defense Forces Interceptors	28/84	29/80	32/96	32/96	28/83
ANG Forces					
Wings/Squadrons					
Interceptors (all weather)	6/21	6/21	8/23	9/29	10/43
Interceptors (day)	—	—	15/50	16/48	10/26

Sources: For Army Forces: Table 125, Defense Management Summary, op. cit.; For Air Force Forces: Table 135, Defense Management Summary, op. cit.

In addition to the dramatic rise in these deployed forces through at least the end of FY 1957, the transfer of responsibility for some of the air defense effort to reserve/national guard forces was beginning to take place. It should also be noted that there was a "leveling off" in the force levels for all portrayed systems by the end of fiscal year 1958. This is of particular interest in conjunction with Secretary Wilson's Military Posture Briefing for FY 1958, where a second thread of the pre-Sputnik air defense policy becomes clear. Air Defense Command interceptor squadrons for FY 1958 were reduced by two previously planned but never activated squadrons; the FY 1957 status quo was thus retained in this area.[11] Similarly, heavy strategic

[9] Ibid.
[10] Ibid., p. 206.
[11] Hearings before House Armed Services Committee, 1957, p. 227.

bomber wings were retained at the 1957 level of eleven (three B-36's, eight B-52's).[12] This posture briefing, in addition to being considerably shorter than the FY 1956 statement made by Wilson, was also very different in approach.

While it is judgmental to suggest that a policy decision was made sometime in 1956 (prior to submission of the FY 1958 budget) that the existing air defense system was "enough," it can at least be pointed out that Wilson's approach to the defensive effort was considerably less vigorous than it had been earlier. Where the FY 1956 message was a comprehensive, organized statement of purpose, force levels, and future direction, that for FY 1958 is characterized by a great deal of questioning from the committee members over the size of the requested budget and manpower ceilings. Wilson's predilection to accept the status quo is clear in his interchange with the Committee Chairman Carl Vinson:

> [Vinson] "So you are satisfied that the defense that we have today is adequate for the security that the Nation requires in an era of peacetime?"
>
> [Wilson] "That is correct."[13]

Standing as an example of the lack of specificity which Wilson used under direct questioning is this interchange on the last page of his Posture testimony:

> [Mr. Gubser] "As one considers this $38.5 billion request for new obligational authority, you get the impression, probably erroneously, that the great emphasis is on offensive striking power. Now, would you say that this is an erroneous impression, and that a balance has been achieved between offensive striking power and defensive weapons?"
>
> [Wilson] "The very best balance that we can work out is what we have striven to have. There may be some difference of opinion in any particular case between the men who are charged with responsibility for the striking power, like the SAC bases, for instance, as against the men that are charged with the defense, continental defense. Each of them would like maybe to see the thing slide a little bit in their own direction. Admiral, what would you say about it, as an overall balance between offense and defense?"
>
> [Admiral Radford] "I think that it represents the best balance that we can estimate at this time."
>
> [Mr. Gubser] "Thank you."[14]

This interchange is curious for several reasons. During the FY 1956 hearings (in early 1955), Wilson introduced his briefing with the strongly worded statement from the President on the need for an improved continental defense system. Yet by early 1957, similar initiative seems to have deserted his effort; by the end of his testimony a committee member wonders aloud about what Wilson *really* said about the balance between offensive and defensive forces during the briefing he just gave. The overall military effort for FY 1958 seems to be "marking time" during 1957 although this is certainly not to say that the effort was small: previous figures suggest the major commitment which existed for both offensive forces and continental defense. Nonetheless the continental air defense effort initiated during 1955 does not receive the same degree of attention that it did earlier; the system was in being by early 1957, and Secretary Wilson professes that the defense is "adequate" at that time.

The winds of change which blew across American strategic thinking at this time may have also contributed to the lack of emphasis on air defense. The Gaither Committee report (commenting for the first time on the possibility of a "missile gap") and the Rockefeller Brothers Fund report (which made similar recom-

[12] Ibid.
[13] Ibid., p. 112.
[14] Ibid., p. 132.

mendations) were completed late in 1957 but were indicative of the reexamination which was going on over the direction of strategy.[15] Then too, the possibility of a Sputnik launching was known to segments of the intelligence community well before it occurred; the implications of this Soviet missile technology (albeit crude) may well have begun greater emphasis on strategic forces to counter the threat given the realization that no system of defense then existed which could counter the ICBM.

And then with the launching of Sputnik on 4 October 1957, policy direction changed drastically—the pendulum swung dramatically back in the affirmative direction on continental defense it had begun on during 1955, but with a different twist since the character of the threat was changing.

2. 4 October 1957–January 1961: Reevaluation of the Strategic Threat (The decision to deploy first generation IRBMs/ICBMs)

Secretary of Defense McElroy took over from Charles Wilson on 10 October 1957, less than a week after the first Sputnik was launched. By early January 1958, the reverberations from that dramatic event had crystallized into a policy shift within defense strategy, a shift on which McElroy was clearly willing to comment for the Congress. When queried about the importance of the U.S. missile and satellite program at that time, McElroy's view was forthright:

> [Mr. Brooks] "How important do you know it to be now?"
>
> [McElroy]"Well, as far as I am concerned, there is nothing more important in the defense operations."[16]

The importance attached to developments in the missile and satellite field clearly overshadowed air defense in McElroy's testimony. The first objective of the Defense Department program for FY 1959 was offensive weapons of retaliation; it was there that most of the emphasis was placed. He did go on to say, however, that:

> A coldly calculating enemy would consider not only our power to retaliate but also our ability to defend ourselves against him in his attempt to destroy us. We must, therefore, build defenses of such strength that it will be obvious to such an enemy that he cannot, through a sudden and vigorous attack, destroy the military capability of this Nation and knock it out of further combat. This is a second major objective of the Defense Department program; and our continental air defense, our Naval Forces, and the alert and dispersal program of our Strategic Air Command are our principal safeguards here.[17]

Clearly then, continental defense was secondary to the offense and was but one of several constituent elements of the defense program. McElroy himself was apparently on the offense in the FY 1959 message, for he dramatically portrayed the spending and developmental initiative he saw as required:

> . . . while we are maintaining our ability to meet the war of today, we must at the same time be pushing rapidly forward in the development and procurement of new advanced weapons which may not be operational for 2, 3, or even as many as 10 years, and of means of defense against such weapons in the hands of others. . . . We must not only support a full military capability in being, but must also invest billions of dollars in the development of weapons which will not add to our strength until they are fully deployed some years later. . . . It is clear that the need for maintaining present and future military capability in a period of rapid technological change exerts an upward pressure on the Nation's defense budget.[18]

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[15] Morton H. Halperin, *Contemporary Military Strategy*, Little Brown and Co., Boston 1967, pp. 50–51.
[16] Hearings before House Armed Services Committee, 1958, p. 3992.
[17] Ibid., p. 3976.
[18] Ibid.

The need was clear, and the requested expenditures supported the verbiage: $39.8 billion was requested, with a direct obligation of $41.1 billion even though total manpower was declining by design. Under the budgetary umbrella, missiles were the topic of the day. McElroy's comments are instructive about the state-of-the-art in the field, and about planned programs:

> Surface-to-air missiles have proved their reliability and effectiveness, and are replacing antiaircraft artillery. . . . They constitute an important part of our present defense against invading aircraft. . . .
>
> Missiles in each of these categories [Author's Note: surface-to-air, air-to-air, and air-to-surface] are here and in operation. Some of them are rapidly being made obsolete by the second generation weapons coming along in the same class but that is the nature of such weapons. It is important that we continue to improve them.
>
> The intermediate range ballistic missile and the intercontinental missile fall into the category of those which are in the later stage of development, but not yet operational. This is a critical area. We do not have positive evidence that Russia is ahead of us in these long range missiles, but the only basis on which we can properly operate is to assume that they are. We are going ahead, as you know, with production of both the Jupiter and the Thor in the IRBM field. Both weapons are promising; neither has been completely tested. We would have preferred to wait until one or the other had successfully completed its tests and fully proved itself, and then go ahead with that one. We would have saved some money by doing so. But time is critical in this program. Since we have high hopes that both will prove to be satisfactory, we decided to avail ourselves of the existing production facilities behind both of them, and thus push forward the date on which we could have the IRBM deployable in larger quantities.
>
> We are somewhat farther from an operational ICBM. This program is advancing with the highest priority.[19]

Organizational changes were brought about to meet the shifting priorities:

> To make certain that these programs move forward, and to administer the development and production of the short-range and long-range missiles, I have established the office of Director of Guided Missiles, and have appointed William Holaday to that position. . . . He is the man to whom I look for the direction of our missile program, and l am prepared to back him with the full authority of the Secretary's office. . . .
>
> Such long-range programs as the antimissile missile and the military satellite programs are in the research and exploratory development stages. They are important and must be pursued, but they must not detract us from the speedy development of our other missile systems. To handle them, I am establishing within the Department of Defense an Advanced Research Projects Agency, which will be responsible to the Secretary of Defense for the unified direction and management of the antimissile missile program and for outer space projects.[20]

McElroy was also clear about areas within the defense budget which deserved special attention:

> Let me now turn to a brief review of the budget. As you know, the fiscal 1959 budget is being transmitted to the Congress today. In preparing this budget, we found a number of highly important areas in which progress could be significantly accelerated if sufficient funds were made available early in 1958. The major areas involved include ballistic missiles, a ballistic missile detection system, and dispersal and alert facilities for the Strategic Air Command.[21]

A single major addition to the existing continental defense system (and a harbinger of things to come) was his request for "construction of a new ballistic missile detection system to augment the existing continental defense warning network. This is essential to our security in view of Soviet missile programs."[22]

For a further discussion of this detection system, see Chapter IV, Section II.

The thrust of this immediately post-Sputnik presentation was on the importance of offensive weapons, IRBM and ICBM development, and missile defense and warning systems. Organizations were created to

[19] Ibid., p. 3980.
[20] Ibid., p. 3981.
[21] Ibid.
[22] Ibid., p. 3982.

handle new responsibilities in the missile field; R&D was to receive a shot in the arm from an infusion of funds for long-term development projects. Although the Soviet missile threat was dealt with only indirectly in this statement, the clear emphasis on speeding up U.S. missile programs was implicitly tied to the problem posed by Sputnik. The threat of Soviet missiles was something which would become increasingly clear within the next several years and would motivate U.S. programs in offensive missilery and defensive warning and attack systems.

The immense portent of this missile threat is seen in the following dramatic quotation from 1958:

> The prespective [sic] Soviet achievement of an ICBM capability has brought into the minds of statesmen and peoples for the first time, a general sense of U.S. vulnerability to Soviet attack, and consequently a sense that a major change in the world-military situation is impending. It is now generally believed that the U.S.S.R. will, during the next year or two rather than at some time in the distant future, be able to inflict instant and crippling damage on North American [sic], with a consequent deterrent power as effective as that which the U.S. has exercised.[23]

This fearful appraisal of the impending Soviet ICBM achievement was coupled with ". . . the belief, recently induced, that the U.S. will not achieve an effective ICBM capability until a year and a half or more after the U.S.S.R. has done so."[24]

Whether or not the appraisal was correct, the feeling of the times was plainly that the U.S. was behind the Soviet Union in ICBM capabilities and that we were threatened by an offensive power soon to be greater than our own. This threat and the motivation it provided will be dealt with as evidence is presented to support the contention.

A variety of measures support the general pattern of policy reflected in the FY 1959 testimony. Adjusted dollar figures show the increased level of spending for strategic forces and R&D during these years (illustrated in Table 6). The bias introduced into this set of figures by adjusting it to 1973 dollars is shown in Table 7 by the actual appropriations for defense during those years.

Table 6—Defense Budget Summary by Program
(in Millions of 1973 Dollars)

FY	Strategic Forces	General Purpose Forces	Research and Development
1958	10,514	14,223	2,029
1959	11,283	13,329	2,682
1960	9,828	12,775 (LO)	2,905
1961	11,521 (HI)	14,234	3,433

Note: "HI" and "LO" indicate those levels for the FY 1956–1973 period

Source: Dan R. Brazier, Acting Assistant Secretary of Defense (Comptroller) Statement before the Defense Subcommittee of the House Committee on Appropriations In connection with the FY 1974 Budget estimates of the Department of Defense, May 31, 1973, Table 18.

[23] "Available Information in Answer to BDM Corporation Questions by Years," OACSI, DA, Washington, D.C. 1975. No pages are given; material is from year 1958.
[24] Ibid., 1958.

Table 7—Defense Budgets and Appropriations
Fiscal Years 1958–1961 (no supplements included)

FY	Budget Estimate (Administration)	Appropriation
1958	36,128,000	33,759,850
1959	38,196,947	39,602,827
1960	39,248,200	39,228,239
1961	39,335,000	39,996,608

Figures shown in thousands of dollars.
Source: *Congressional Quarterly,* October 28, 1972, p. 2840.

While these last several of the Eisenhower years were to be the years of the political issue of arbitrary defense budget ceilings, the fact was not yet in the Congressional fire in early 1958. It was not until 1959 that Eisenhower was to make public denials of the charge that he was subordinating defense to budgetary considerations; it was not until 1959 that Maxwell Taylor resigned to publicize his disagreement with the Eisenhower Administration over the confines of budgetary ceilings.[25] Similarly, Congressional testimony does not reflect sharp queries over the low level of requested funds until somewhat later. The more general point is, however, that even within the confines of budget ceilings, expenditures for strategic forces and R&D show a fairly distinctive rise in the face of falling expenditures for general purpose forces.

Nineteen fifty-eight was also the year of the Department of Defense Reorganization Act and several major systems decisions such as resolution of the Nike Zeus/Wizard controversy in which the Air Force was reduced to a support role for the Army Zeus effort. For a further discussion of this controversy, see Chapter IV. Some of the more important elements of the reorganization have been shown in McElroy's testimony. While the system decisions were clearly important for the daily conduct of the defense effort, the overall impression is that they had little impact on the basic strategy of air defense. Such system decisions were probably a miniscule part of Secretarial and Presidential fare; and it was at this level that responsibility for overarching strategy remained. The high level of such strategic considerations is reflected by this exchange on another matter in 1958:

> [Mr. Price] "Referring now to your airborne divisions, how many airborne divisions do you have?"
>
> [McElroy] "Well, you are getting into the kind of thing where I need General Twining."
>
> [Mr. Price] "Well, it wouldn't be necessary—"
>
> [McElroy] "It may be two or three."[26]

The fact that the Secretary did not know how many airborne divisions the United States had at that time is suggestive of the generalized nature of his deliberations on the force structure. Clearly, the reduction of strategic postures to the ability to fight "1½" or "2½" wars is more indicative of the level of his considerations than is enumeration of debates about particular weapons systems or R&D activities. It is with this thought in mind that the presentation on strategy continues.

[25] Paul Y. Hammond, *The Cold War Years: American Foreign Policy Since 1945.* Harcourt, Brace and World, New York, 1969. p. 103.
[26] 1958 Hearings, op. cit., pp. 4050–4051.

How did U.S. force levels reflect the strategic emphasis during these years? Data on selected systems indicate the actual allocations which existed, as shown in Table 8. These figures reflect a phase-out of Nike Ajax batteries as Nike Hercules batteries were deployed during these years, but a reduction overall of about 20 percent in CONAD SAM batteries. For more detailed information on these reductions, see Chapter IV, Section II. Both Air Force and Air National Guard interceptor forces declined over these years, with ANG interceptor forces peaking in FY 1958 and Air Force interceptor forces peaking in (not shown) FY 1957. While medium bomber forces began to decline during these years, heavy bombers continued to increase and Atlas and Shark missiles entered the inventory in FY 1960.

Table 8—Selected Systems, FY 1958–1961

	1958	1959	1960	1961
Army Forces				
Nike Ajax batteries/launchers	241/	202/	122/	76/
Nike Hercules btry/lnch, CONAD	1/	42/	88/	114/
Regular Army Air Defense Bns	86	88	78	*
Reserve/NG Air defense Bns	136	106	95	*
Total SAM btry/lnch, CONAD	242	244	210	190
Air Force Forces				
Air Defense Interceptor Wings/Sqds	28/83	27/80	22/65	17/42
Air Defense Missile Bomarc Wg/Sqds	—	—	**	**
Strategic Missile Wings/Sqds				
Atlas	—	—	–/1	–/4
Shark	—	—	–/1	–
Total ICBM Launchers	—	—	**	**
Strategic Air Force Wings/Sqds				
Heavy Bombers	11/33	11/33	12/36	13/39
Medium Bombers	23/84	28/111	23/100	21/86
Air NG Interceptor Wings/Sqds				
All Weather Interceptors	10/43	12/43	11/40	8/33
Day Interceptors	16/48	10/26	—	—

* No comparable figures available

** Deleted to protect sensitive data

Source: Defense Management Summary, op. cit. Army Forces: From Table 125. Air Force and Air NG Forces (including strategic missile wings/squadrons): Table 135. Total ICBM launchers: Table 170. All figures unclassified except those from Table 170, which are SRD.

Less significant changes included the introduction of Bomarc in FY 1960 and the final conversion/replacement of Air National Guard day interceptors during FY 1959. Thus, the very strong emphasis on strategic offensive forces and missile development in the FY 1959 hearings was indeed reflected in the force development pattern for the years considered. It should naturally be noted that attempting to directly compare these systems as to the importance of their respective roles in the defense effort is like comparing apples to oranges—"importance" is highly ambiguous. Clearly, commitment to air defense (by way of force levels) declined somewhat during these years while ICBMs began to enter the inventory and heavy strategic bombers continued to increase. Secretary McElroy's Military Posture Briefing for FY 1960 was to reflect this general direction even more markedly, and additionally available material offers a window on the service-level view of the decision making process at the Secretary's level.

In McElroy's Posture Briefing for FY 1960 in early 1959, the trend of the importance of the offense coupled with recent events combined to make air defense a third priority item in the Defense package. As McElroy said:

> The basic policy of the Department of Defense continues to have the following principal elements:
>
> 1. We consider our first responsibility to be that of protecting the ability of this country to retaliate with large weapons in case of an outbreak of general war.
>
> 2. We consider as our second but equally pressing responsibility that of providing a capacity to apply military force promptly in various local conflict areas of the free world similar to Lebanon and Taiwan of the past year.
>
> 3. We seek these objectives without in any way overlooking the need for continental air defense and for maintenance of open sealanes.[27]

How important was air defense within this context? McElroy had this to say: ". . . We recognize air defense as an important adjunct to the retaliatory capability which supports deterrence. We must make the enemy know that an attack on us would be costly to his attacking force and that he cannot obliterate our ability to retaliate."[28]

And the Soviet threat against which our forces would have to be directed (including the adjunct of air defense) was also made clear:

> So they presumably might rely very heavily on the intercontinental ballistic missile. They, of course, do have some long-range aircraft, but they apparently did not decide to go into long-range aircraft to the extent that we have. It is our firm belief that our heavy bomber capability is substantially greater than theirs and that our medium bomber capability is appreciably greater than theirs. . . .
>
> Thus, their combination of feasible attacking weapons against the United States would appear to be: the ICBM, some submarine launched limited range air-breathing missiles, and heavy bombers.
>
> We, on the other hand, have a superior heavy bomber position and a superior medium bomber position, launched from this country, with adequate tankers to extend their range.[29]

The perceived threat during 1959 was thus heavily weighted toward Soviet ICBMs, yet according to the Secretary we did not have an air defense system capable of defeating such a threat.

Even in these early years, controversy over the advisability of deploying an ABM system was beginning to build up. NIE 7-58 had confirmed the need for a system like Nike Zeus, and CINCNORAD favored deployment of the system. In November 1958, the DOD Ballistic Missile Defense Committee, headed by Dr. Skifter, recommended that an immediate decision be made to put Zeus into production. This recommendation went to the Secretary of Defense, who referred it to the JCS. The JCS issued a split paper on the Skifter Committee recommendation with the Army favoring production and all other services opposed to it. This was not the end of NORAD support for Zeus—the January 1959 North American Air Defense Objectives Plan recommended an inventory of 29 Zeus batteries by the end of FY 1962, and 120 batteries by the end of FY 1963.[30] However, from the level of Secretary McElroy, the future success of a ballistic missile defense looked bleak—bleak enough to explain reservations about funding production with massive sums of money. While commenting on the program status of the Nike Zeus in 1959, McElroy said: "We

[27] Hearings before House Armed Services Committee, 1959, p. 792.
[28] Ibid., p. 794.
[29] Ibid., p. 819.
[30] "Summary of Major Events and Problems, FY 1959, Deputy Chief of Staff for Operations." DCSOPS, DA, Washington, D.C., Item 3.

will, in all probability, even with this kind of defense, have the same kind of problem we have on aircraft, that if there is a mass attack on a given target you are not going to be able to head them all off."[31]

Pregnant with meaning for the type of debate which would take place during the McNamara years on ballistic missile defense was his additional comment on Zeus: "So the kind of question we will have to decide is whether with the resources of our country we can provide this for the proportionate deflection of these, which is the optimum we can hope to achieve against this very tough [sic] intercontinental ballistic-type of weapon."[32]

A more detailed discussion of this problem can be found in Chapter IV, Section III.

The clear thrust of the testimony during early 1959 was about the controversial "gap in missiles." Whatever the merits of various arguments about Soviet ICBM capabilities in the near future, it became increasingly clear that the Soviet heavy bomber threat was a lesser part of the overall threat. Regardless of whether the Soviets had more or roughly the same number of missiles as the United States, the existence of the missile threat was most crucial to the size and type of defense system employed since there was no known defense against the ICBM. Given this technical defense problem and the composition of the threat, the system of defense against the air-breathing threat could be reduced—a position which was made clear the following year.

Even while the threat was being reassessed at the Secretary's level, various governmental elements continued to interact over the direction of air defense activities. Offered in Annex l is a case study of interaction during the 1958–1959 period, drawn from the "Summary of Major Events and Problems, FY 1959, Deputy Chief of Staff for Operations," Department of the Army. This case study, albeit from a single service source, reflects on the interrelationships among Congress, the Secretary of Defense, the JCS, and the military services at this particular point in time. Since similar vignettes are not available for many other decisions on air defense, this particular study takes on added importance although generalizations from it are not necessarily possible. The story told by it of the interplay of actors, however, suggests a divergence of opinion which is interesting.

The Decision to Refine Existing Air Defense Systems

The year 1960 found Thomas Gates as Secretary of Defense. In his February testimony on defense matters he seemed to refute the existence of a "missile gap" although John Kennedy would exploit the issue that failed in his Presidential campaign.[33]

Surely, Gates had reason to double any major gap—it was estimated that by 1 January 1960 that there would be a Soviet initial ICBM operational capability of only ". . . a few—say 10—series produced missiles. . . ."[34] And this small capability was coupled with the assessment that "what is known of Soviet strategic ideas suggests that the ICBM is thought of primarily in terms of deterrence . . . rather than primarily in terms of the deliberate initiation of general way."[35]

Gates began his testimony on an affirmative note regarding America's military strength:

[31] 1959 Hearings, op. cit., p. 857.
[32] Ibid.
[33] Paul Hammond, op. cit., p. 140.
[34] OACSI, op. cit., 1960.
[35] OACSI, op. cit., 1960.

> An aggressor's destruction must be so inevitable that initiating war is tantamount to suicide. That strength I believe we have now. . . .
>
> 1. Some of the facts which support this judgment are:
>
> (a) Our total strength . . . is so great that any surprise attack upon us would result in unacceptable destruction to the attacker. . . .
>
> (b) The establishment of early warning systems, the capability for an airborne alert at the time and on the scale needed, and the deployment of mobile, hardened and concealed missiles are progressing as planned. Our defense programs are under continuous review to insure that we maintain a long-range program of military strength.[36]

The nature of American response to the threat was thus changing. Early warning (of impending ballistic missile attack), hardened and hidden forces, and an airborne alert system had become crucial to the defense effort. The nature of the response was changing in relation to the changing threat, which is reflected in Table 9, showing numerical estimates of selected systems. "Alert" was becoming increasingly important not as a prelude to "defense" but as a signal for retaliatory "offense."

Table 9—Estimates of Selected Systems

	Mid-1965	Mid-1964	Mid-1963	Mid-1962	Mid-1961	Mid-1960
Bombers and Tankers						
Heavy	135	150	140	130	120	100
Medium	1,100	950	800	800	800	750
Ballistic Missiles						
Operational Inventory (700 mi.)	250	350	450	450	450	450
Launchers (700 mi.)	110	150	150	150	150	150
Operational Inventory (1,100 mi.)	80	160	240	300	300	300
Launchers (1,100 mi.)	50	100	100	100	100	100
Missile Subs						
Z Class	4	4	4	4	4	4
G Class	9	14	18	18	18	18
Nuclear	0	0	2	6	10	14

Each "Z" Class submarine would probably carry 2 missiles
Each "G" Class submarine would probably carry about 6 missiles
Each nuclear-powered submarine would probably carry 6–12 missiles

Source: "Available Information in Answer to BDM Corporation Questions by Years." OACSI, DA, Washington, D.C. 1975. From: Year 1960.

A variety of cutbacks in the air defense effort took place during fiscal year 1960 (see table on Selected Forces FY 1958–1961, previously shown) and Gates' testimony offered the reasoning behind them. While the testimony is linked to a specific reduction in the air defense system (discussed more extensively in Chapter IV), Gates' response is far-ranging:

[36] Hearings before Subcommittee of Committee on Armed Services, 1960, pp. 441–442.

> [Mr. Weisl] "In your opinion, do Soviet-manned bombers pose a current threat to the United States?"
>
> [Gates] "Yes, sir."
>
> [Mr. Weisl] "In view of this threat, will you be kind enough to explain the abrupt removal of 15 ships from the seaward extension of the DEW line over the objections of the commander in chief of the North American Air Defense Command? Was this done for military or budgetary reasons?"
>
> [Gates] "While the Soviet-manned bomber remains a threat, again, it is a matter of balance and degree. This extension of the DEW line was contemplated—I believe it was 1955—and I believe it was put into being in 1957. After a review of the continental defense picture again, and after consultation with the Joint Chiefs of Staff, it was considered that we could reduce somewhat the effort in connection with both Air Force tactical fighter squadrons and Navy ships in supporting this concept that was, as I say, devised five years ago. Those ships are not going out of existence in total."[37]

The Secretary's answer seems to suggest that the cutback was a reaction to the lessening bomber threat (". . . a matter of balance and degree.") rather than for budgetary reasons. However, Congressman Weisl questioned Secretary Gates closely on the exact reason for this cutback at length, and then submitted a Memorandum of Record from the Chief of Naval Operations which suggested that the cutback was motivated by budgetary considerations (see Annex 2). As 1960 was an election year, the issue of arbitrary budget ceilings affecting the military posture may well have motivated the type of questions which were raised. Nonetheless, the following interchange regarding cancellation of the F-108 long range air defense interceptor (described as such in testimony) adds weight to the argument that air defense was effected by budget priorities as well as the changing nature of the threat:

> [Mr. Weisl] "But that weapons system has been cancelled, has it not?"
>
> [General White] [Author's Note: General White was then Chief of Staff, USAF] "That weapons system was canceled [sic] because we simply could not carry it along with many of the other programs we had."
>
> [Mr. Weisl] "I believe you testified further that the F-108 was cancelled and certainly in your mind it was cancelled in the main on the theory that you would get the B-70; isn't that right?"
>
> [General White] "That is exactly right. 1 was informed, though I can't prove it, that the Air Force could have only one of the two systems under development for the future, and I was forced from where I sat in the problem to make a choice between the F-108 and the B-70. . . . The final analysis I think that caused me to go for the B-70 in this respect is that I cogitated what constituted—what would worry the Russians the most, and I came up without much doubt that the B-70 was the one that would worry the Russians more than the F-108 and that does not downgrade the F-108's capabilities in its field."[38]

In summarizing the deliberations of early 1960, the safest conclusion that can be drawn about the relative importance of the changing Soviet threat versus DOD budgetary considerations on reducing the air defense effort is that both had a major impact. The degree of importance assigned to each depends very much on a judgment about the available and imprecise evidence. At any rate, Senator Stennis neatly summed up much of the thinking at that time when he said: ". . . we are pouring these many hundreds of millions of dollars into ground-to-air defenses, some of which it seems to me is already obsolete."[39]

As illustrated in Table 10, changes in the deployed forces of NORAD and USAF ADC during this period also reflect the general reduction which was occurring. Comments on similar reductions can be found in Chapter IV.

[37] Ibid., p. 454.
[38] Ibid., p. 126.
[39] Ibid., p. 156.

Table 10—Summary of Force Changes, 31 December 1959–1 July 1960		
	31 December 1959	1 July 1960
NORAD Interceptor Sqds	67	55
NORAD Nike Batteries	258	270*
USAF ADC Interceptor Sqds	56	44

* This number had declined to 143 batteries by 1 July 1964.

Source: "NORAD/GONAD Historical Summary," January–June 1960. Directorate of Command History, Office of Information, Headquarters, NORAD/GONAD; p. 70. Figure for 1964 from same Basic Source, January–June 1964, p. 62.

3. January 1961–January 1968: The McNamara Years

The Kennedy Administration brought with it Robert McNamara as Secretary of Defense, and the years during which McNamara held that office were somewhat different from what had gone before. The air-breathing defense system continued to decline during this period, but McNamara's style of forthright information made the open and official reasons for this decline more clear than they had ever been. Technological innovations for improving the defense system came to the forefront of attention early in the McNamara years, and included such possibilities as Hawk 11, Mauler, alternatives to the Zeus system, super combat centers, advanced BUIC systems, and more sophisticated versions of the manned interceptor. These concepts, however, were waylaid or restricted. Although cost-effectiveness analysis was first mentioned in conjunction with the Polaris and Regulus systems decision in 1959,[40] it really came to the center of decision-making as a technique with McNamara and was then used to justify some of the decisions on the continental defense system. McNamara's comments on the changing nature of the Soviet threat are also instructive in determining reasons for the cutbacks in the defense system. All in all, the evidential base on continental defense becomes more rich with the McNamara years, at least until defense policy is overtaken by Vietnam in 1966–1967. Figures 4 and 5 help to portray overarching offensive and defensive strategy during these years.

McNamara's first Military Posture Briefing to the House Committee on Armed Services on February 23, 1961, was not reflective of his thinking since the new administration had just barely taken office and had not yet had time to make its mark on the course of national policy. At that time, McNamara repeated his tasking from President Kennedy to ". . . reappraise our entire defense strategy—our ability to fulfill our commitments—the effectiveness, vulnerability and dispersal of our strategic bases, forces and warning systems— . . . efficiency and economy . . . adequacy . . . in light of present and future dangers."[41]

McNamara's response was to appoint task forces to delve into several major areas of defense, one of which was to ". . . examine our requirements for strategic forces and continental air defense."[42] By the time of the House hearings to authorize appropriations for FY 1962 in April 1961, these task force reports had been completed and McNamara was at the helm of the Defense Department. His comments then are instructive about the perceived direction of the defense effort. The character of the changing threat was made clear immediately in his presentation: "The problem of deterring an all-out nuclear war has been greatly complicated by the introduction of intercontinental ballistic missiles into the arsenal of our major adversary in the world struggle. Only a year or so ago the principal general war threat to our security was a surprise attack

[40] 1959 Hearings, op. cit., p. 796.
[41] Hearings before House Committee on Armed Services, 1961, p. 633, February 23, 1961.
[42] Ibid.

by large number of nuclear armed manned bombers. A year or two from now our principal concern will be surprise attack by large numbers of nuclear-armed ICBMs."[43]

Figure 4—Kennedy-Johnson Strategy, 1961–1968

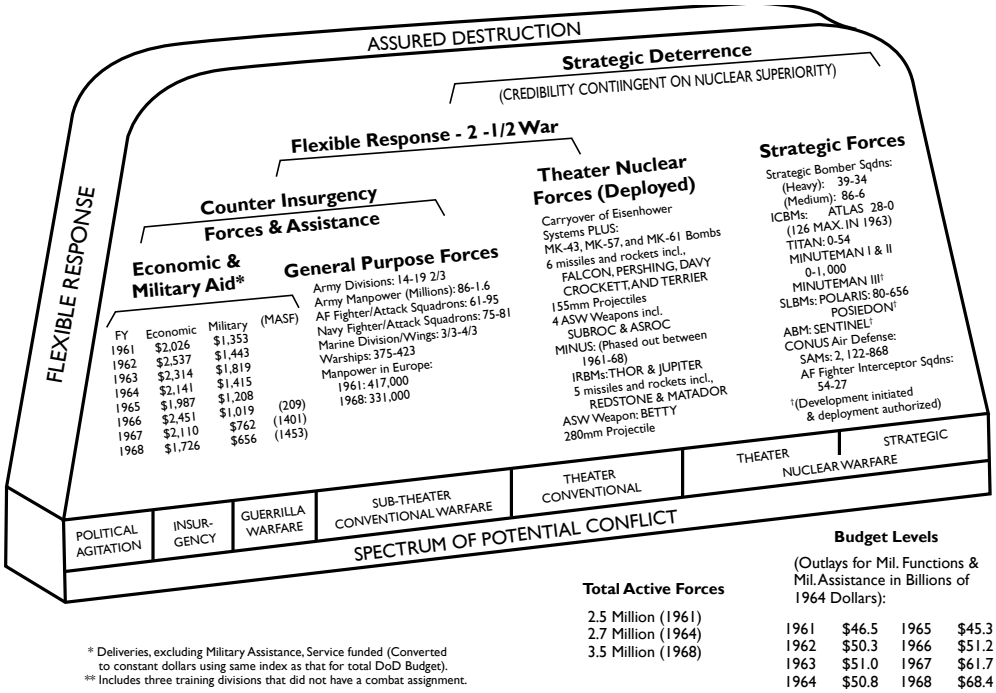


Figure 5—Abstract of the Kennedy-Johnson Strategies, 1961–1968

Kennedy-Johnson Administration

Strategy Concepts: Emphasis on "assured destruction" by strategic forces; "flexible response" for NATO strategy; a planning goal (never attained) to gain capability for fighting large Asian and European. conflicts simultaneously; pursuit of a capability for fighting and training others to fight limited wars and insurgencies; and large but declining foreign and military assistance programs. Significant change in strategy was the. shift in emphasis to greater orientation for U.S. toward bearing the principal Free World burden in non-nuclear conflict.

Forces: Strategic force buildup in early years until leveling off in the mid-1960's. Research and Development effort primarily emphasized refinements rather than conceptually new systems; notable exceptions: MIRV, battlefield sensors, F-II1, C-5A. In general Purpose Forces, divisions, warships and tactical air squadrons, except fighter-interceptors, increased substantially. Manpower increased by over one million men, due largely to Vietnam. Special Forces were expanded.

Budgets: Trend up, with pre-Vietnam (1962–1964) mean average $50.7 billion in constant FY 1964 dollars. Significant planning innovation: initiation of the Planning-Programming-Budgeting System (PPBS).

Foreign and Military Assistance: Trend toward roughly stable and large economic aid with military assistance down significantly. With general aid levels going down, there was shift from military to economic aid.

Manpower: Heavy reliance on use of the draft for conflict, rather than available Reserve forces. When Reserves were called up, it was largely for crisis-management requirements.

[43] Hearings before House Committee on Armed Services, 1961, p. 1238, April 11, 1961.

Secure, non-vulnerable forces which were controllable and could survive a first strike from the other side were the order of the day. In this regard McNamara desired a rapid shift from the Atlas and Titan programs to the Polaris and Minuteman, with no additional bomber procurement beyond the then-existing force of about 1,500 heavy and medium bombers. About 1/2 of these bombers, however, would be placed on ground alert status for launching within 15 minutes (compared to 1/3 then on ground alert status) to increase the effectiveness of the strategic offensive forces while missile forces were built up during fiscal years 1962–1963. Snark was to be phased out by December 1961 instead of the previously planned date of June 1963, with an "early" (unspecified) phase-out of the B-47 medium bomber. Development funds were requested for the Skybolt program, and the Hound Dog penetration aid missile was then being delivered, pending the acquisition of "adequate" ICBMs; the clear emphasis here was on refinement of the existing bomber force capability. Both the B-70 and the nuclear-powered aircraft project were dropped from full-scale weapons system development; the former primarily because of its cost, complexity, and outmoded capabilities, the latter because of its doubtful value and cost.[44] The clear emphasis within offensive forces was on an effective second-strike capability, to counter the expected Soviet ICBM force.

This threat was supported by the estimate at this time that ". . . ballistic missiles are clearly intended to become the dominant weapons . . ." of the Soviet long-range striking force.[45]

U.S. solid fuel, hardened, second generation missiles helped in this regard. Advanced strategic bomber programs were not necessary, nor were additional procurements of existing bomber systems because ICBMs would soon take over an increasing share of the offensive role. Continental defense received a small measure of attention compared to these major decisions on offensive systems with final FY 1962 strategic defensive expenditures of $2.0 billion and strategic offensive expenditures of $8.9 billion.

This degree of emphasis was justified by the judgment that "the large Soviet manned bomber forces will probably decline gradually in numerical strength, but five years hence the Soviets will probably still supplement their missile forces with medium and heavy bombers for both weapon delivery and reconnaissance."[46]

Since BMEWS could provide only about 15 minutes of warning time, development funds were requested for MIDAS which might be able to provide about 30 minutes of warning. The decision on Nike Zeus for FY 1962 was characteristic of many later comments about ballistic missile defense:

> The system, itself, is vulnerable to ballistic missile attack and its effectiveness could be degraded by the use of more sophisticated ICBM's screened by multiple decoys. Saturation of the target is another possibility, as ICBM's become easier and cheaper to produce in coming years. Finally, it is a very expensive system in relation to the degree of protection that it can furnish.
>
> Weighing all the pros and cons, it is our conclusion that we should continue the development, test, and evaluation phase of this program on an urgent basis, but we should not at this time take any steps for the production and deployment of the system.[47]

Two other air defense improvements included modifications to the ground control intercept system and Hawk radars, but the larger emphasis in continental defense was on the status of anti-ICBM programs such as Zeus and ARPA's exploratory Project Defender. Further information on the ARPA work can be found in Chapter IV. The new direction of the Kennedy administration on defense was reflected clearly in McNamara's

[44] Ibid., pp. 1238–1247.
[45] OASCI, op. cit., 1961.
[46] OASCI, op. cit., 1961.
[47] 1961 Hearings, op. cit., pp. 1248–1249.

remarks. While it was in fact the case that adjusted expenditures on strategic forces during FY 1962 were to decline somewhat from those of the previous fiscal year (which were the highest for the FY 1956–1973 period), those expenditures were still the second highest for the FY 1956–1973 years. Additionally, R&D expenditures rose from FY 1961 to FY 1962 by roughly $600 million. The changed policy on fiscal constraints from Eisenhower to Kennedy is also seen in defense appropriations for those years: while appropriations remained at about $39 billion for fiscal years 1959–1961, they increased sharply in fiscal year 1962 to about $46.5 billion. These figures and general trends for the McNamara years are reflected in Table 11. Within these rising defense budgets, the changing emphasis during the McNamara years from strategic to general purpose force expenditures because of Vietnam and almost continually rising R&D costs is shown in Table 12.

Table 11—Defense Budgets and Appropriations, FY 1961–1969
(in thousands)

FY	Budget Estimate	Appropriation
1961	$39,335,000	$39,996,608
1962	42,942,345	46,662,556
1963	47,907,000	48,136,247
1964	49,014,237	47,220,010
1965	47,471,000	46,752,051
1966	45,248,844	46,887,163
1967	57,664,353	58,067,472
1968	71,584,000	69,936,620
1969	77,074,000	71,869,828

Note: No supplemental estimates or appropriations not considered or made in the regular annual Defense Appropriation Acts are included in the above amounts.

Source: *Congressional Quarterly,* October 28, 1972, p. 2840.

Table 12—Defense Budgetary Summary by Program
(in millions of 1973 dollars)

FY	Strategic Forces	General Purpose Forces	Research and Development
1961	$11,521 (HI)	$14,234	$3,433
1962	10,876	16,691	4,069
1963	9,822	16,545	4,812
1964	8,509	16,497	4,857
1965	6,353	17,731	4,644
1966	6,128 (LO)	27,283	4,708
1967	6,293	29,986	4,620
1968	7,236	30,375 (HI)	4,277
1969	8,497	29,442	4,568

"LO" and "HI" Indicate those levels for the FY 1956–1973 period.

Source: Don R. Brazier, Acting Assistant Secretary of Defense (Comptroller), Statement before the Defense Subcommittee of the House Committee on Appropriations in connection with the FY 1974 Budget estimates of the Department of Defense, May 31, 1973, Table 18.

The last two fiscal years show a rise in expenditures for strategic forces and a decline in expenditures for general purpose forces, both trends which were to continue after McNamara's departure.

The military force inventories during these years show some of the same trends exhibited during the immediate post-Sputnik years, as well as some distinctive characteristics, as shown in Table 13.

These figures show the total conversion of CONAD Ajax batteries to Hercules batteries by the end of fiscal year 1964, with continued reduction in CONAD Hercules batteries through the end of the period. CONAD Hawk launchers rose by the end of fiscal year 1965, and then stabilized at 288 for the remainder of the period. The sharp reduction in CONAD-committed SAM batteries during these years is seen in the drop from the FY 1962 high of 208 to the FY 1969 low of 60. Secretary McNamara's comments regarding strategic bombers and ICBMs during his FY 1962 presentation are reinforced by these figures, and interceptor squadrons show a general decline throughout the period.

More reasons for the changing nature of the air defense system are provided in a Senate inquiry into the collapse of one of the so-called "Texas tower" early warning radar stations (discussed in Chapter IV). Held in May 1961 (at about the time Secretary McNamara expounded on the changing nature of the air defense threat), the inquiry was motivated by the destruction of Texas tower No. 4 in a gale on 15 January 1961. Tower No. 4 was one of three such installations off the northeastern U.S. coast whose annual maintenance cost had averaged around $10–11 million. This exchange suggests the Air Force position on the towers at that time (Mr. Charyk, below, was then Undersecretary of the Air Force):

> [Senator Stennis] "Well, we can argue about this a long time, Mr. Secretary; but how are you getting along without Texas tower No. 4 now? As I understand it, you have no plan to replace it."
>
> [Mr. Charyk] "We have no plans to replace it, Mr. Chairman, because the time period for reactivation of such an installation would be a matter of several years. With the changing nature of the threat, it is felt the investment would not be worth it at this time.
>
> There is also a new development which is pertinent here. We are proceeding to install a new radar aboard the early warning and control aircraft. . . . We are installing a new transistorized airborne long-range input system in these aircraft. . . . And so in a sense these aircraft will perform the type of a function that was previously performed by these Texas towers.
>
> . . . If the Installation of the APS 95 radar and the ALRI equipment on our early warning aircraft proves out as we expect at the present time, we would anticipate that we would abandon the operation of Texas towers 2 and 3 at that time."[48]

Thus, the official position for the decline in the Texas tower system cited: first, the changing nature of the threat; and secondly, the combination of technological innovations which would serve a similar purpose as that of the towers. It would seem that the relatively high cost of the tower system may have also been a factor, but since comparative costs for the early warning aircraft are not provided, the impact of the cost factor is not clear.

In reviewing Secretary McNamara's annual presentations through calendar year 1967, it becomes evident that the general pattern set by his comments during the April 1961 appropriations authorization hearings holds true through the 1966 presentation. That general pattern consists of increased emphasis on the offensive missile inventory (and its technological sophistication); increased emphasis on the enemy missile warning system; increased emphasis on the survivability of retaliatory forces after attack; and decreased emphasis on the necessity for a major active defense system against the air-breathing threat. It is also clear that reductions in some systems moved even more rapidly than was projected in the early McNamara years. Tables 14 and 15 show these unanticipated declines.

[48] Senate Inquiry into the Collapse of Texas tower No. 4, May 1961, p. 11.

Table 13—Selected Forces, FY 1961–1969									
	1961	1962	1963	1964	1965	1966	1967	1968	1969
Army									
Nike Ajax batteries/launchers, CONAD mission	76/	69/	34/						
Nike Hercules batteries/lnch, CONAD	114/	139/	127/2316	107/1926	95/1500	73/1194	73/1194	73/1194	
Hawk batteries/launchers, CONAD	—	—	8/576	8/576	8/288	8/288	8/288	8/288	
Total CONAD SAM batteries	190	208	169	115	103	81	81	81	
Total Regular divisions	14	16	16	16	16	17	17	18	
Air Force Wings/Squadrons:									
Heavy Bomber/Strat. Recon.[1]	13/39	14/42	14/42	14/42	14/42	13/40	12/38	11/35	10/30
Medium Bomber[2]	21/86	18/54	13/39	11/33	7/21	2/6	2/6	2/6	2/6
Titan	—	–/2	–/7	–/12	–/6	–/6	–/6	–/6	–/6
Minuteman	—	—	–/3	–/12	–/16	–/18	–/20	–/20	–/20
Atlas	–/4	–/7	–/13	–/11	—	—	—	—	
Air Defense Interceptors	17/42	16/42	16/42	12/40	11/39	9/33	7/30	6/26	5/19
Bomarc	2/7	2/8	2/8	2/8	2/6	2/6	2/6	2/6	–/6
ANG									
All-Weather Interceptor Wings/Squadrons	8/33	7/28	8/27	6/24	5/22	5/22	5/22	5/22	5/22

[1] Includes one heavy recon. squadron (RC-135) in FY 1967 and 1968.
[2] Medium bombers are B-58 through FY 1969; the FB-Ill is used during FY 1971, 1972, and 1973.

Sources: For Army Forces: Defense Management Summary, Table 125 “Selected Army Forces”; for Air Force Forces: Defense Management Summary, Ibid., Table 135

Explanatory Note, Tables 14 and 15

While some of the categories on the next two tables are not identical from one table to the other, and figures for the same categories are not identical (perhaps because of a changed accounting method in the intervening period), it is interesting to note the difference between projections in 1962 and the retrospective look of 1967. Many forces declined more rapidly than had been anticipated earlier, or declined although build-ups had been predicted.

Specifically, phasedowns not projected in CY 1962 but which were true by CY 1967 included those in: DEW aircraft, DEW stations, Gap filler radars, SAGE direction centers, and DEW extension ships (under Picket Ships in 1962).

Therefore, although the tone of McNamara's presentation in 1961 indicated a revised threat and cutbacks in air defense systems, projections for some future air defense hardware needs remained high in the early years of his term as Secretary of Defense.

Estimates of the Soviet threat in some of these years help to portray the reason for these declines:

> [1962] . . . limited bomber capability against North America will be tailored increasingly to conduct missions supplementary to ballistic missile attack.
>
> In the mid-1960's the principal Soviet forces for attack on North America will be increasing numbers of ICBM launchers, supplemented by increasing numbers of nuclear-powered missile submarines and decreasing numbers of bombers.
>
> [1963] In the later 1960's they would probably employ bomber forces in follow-on rather than initial attacks, and for increasingly specialized missions.
>
> [1964] By the end of the decade, Soviet intercontinental attack capabilities will rest primarily upon an ICBM force of some hundreds of launchers, supplemented by a sizable missile submarine fleet and a large but reduced bomber force.[49]

4. The Decision Not to Deploy a Ballistic Missile Defense System

A somewhat different and truncated pattern is observed in his treatment of the active defense system against ballistic missiles as it evolved from the Nike Zeus to the Nike X (and then the Sentinel system). By the time of McNamara's 1967 presentation on FY 1968, he was obviously overtaken by the enormity of events in Vietnam and so in that year did not perform his normally detailed review of strategic offensive and defensive forces. Because of these characteristics of the calendar year 1962 through 1967 presentations on defense posture, the record detailed here about them will differ considerably from what has gone before. McNamara provides a singularly concise summary of the 1961–1966 continental defense effort in 1966, and this presentation coupled with the selected weapons inventories and budgetary figures already offered will complete the picture for those years. Ballistic missile defense will be portrayed somewhat more closely since several changes in posture took place on it during this time.

First then, the nature of the 1961–1966 continental defense effort. On strategic defensive forces, McNamara had this to say on 8 March 1966: "As I have pointed out in previous years, the elaborate defenses which were erected against the Soviet's bomber threat during the decade of the 1950's, no longer retain their original importance. Today, with no defense against the major threat of Soviet ICBM's, our antibomber defenses alone would contribute very little to our damage limiting objective and their residual effectiveness after a major ICBM attack is highly problematical."[50]

[49] OASCI, op. cit., 1962, 1963, 1964.
[50] Hearings before House Committee on Armed Services, 1966, p. 7353.

Table 14—Continental Air and Missile Defense Forces
(End of Fiscal Year)

							Actual	Projected				
Surveillance Warning and Control[a]	**1961**	**1962**	**1963**	**1964**	**1965**	**1966**	**1967**	**1968**	**1969**	**1970**	**1971**	**1972**
NORAD COC	1	1	1	1	1	1	1	1	1	1	1	1
SAGE Combat Centers	8	8	8	7	7	6	6	6	6	6	6	6
SAGE Direction Centers	20	21	18	16	16	14	14	12	12	12	12	12
BUIC II Control Centers	—	—	—	—	—	14	12	2	—	—	—	—
BUIC III	—	—	—	—	—	—	—	7	19	19	19	19
Search Radars	182	179	169	168	162	158	154	154	149	149	149	149
GAP Filler Radars	112	103	96	100	92	91	91	91	91	91	91	91
DEW Radar Stations	67	67	67	39	39	39	39	39	39	39	39	39
DEW Extension Aircraft	50	44	45	43	20	—	—	—	—	—	—	—
DEW Extension Ships	5	5	—	—	—	—	—	—	—	—	—	—
AEW/ALRI Aircraft	60	60	67	67	67	67	67	67	67	67	67	67
BMEWS Sites	2	2	3	3	3	3	3	3	3	3	3	3
OTH Forward Scatter Trans/Receiv.	—	—	—	—	2/4	2/5	3/6	3/6	4/6	4/6	4/6	4/6
SPASUR Trans/Receiver	—	—	—	3/6	4/7	4/7	3/6	3/6	3/6	3/6	3/6	3/6
SPACETRACK Sites	—	—	—	—	3	3	3	4	4	4	4	4

[a]Includes CONUS, Alaska, Greenland, Iceland, and Canada

Source: Selected systems from p. 262 of "Statement of Secretary of Defense Robert S. McNamara before a Joint Session of the Senate Armed Services Committee and the Senate Sub-Committee on Department of Defense Appropriations on the Fiscal Year 1968–72 Defense Program and 1968 Defense Budget." January 23, 1967 (SRD) GPO.

Table 15—Continental Air and Missile Defense Forces
(End of Fiscal Year)

	Actual		Projected				
	1961	**1962**	**1963**	**1964**	**1965**	**1966**	**1967**
Surveillance, Warning, and Control							
SAGE Combat Centers	3	3	3	3	3	3	3
SAGE Direction Centers	20	22	22	22	22	22	22
COC	1	1	1	1	1	1	1
Manual Combat Centers	1	1	4	4	4	4	4
Manual Control Centers	5	3	—	—	—	—	—
Radar Stations	165	160	163	162	162	161	161
AEW and Control Aircraft	60	60	68	68	68	68	68
GAP Filler Radar	112	114	124	143	143	143	143
DEW Stations	63	67	67	67	67	67	67
Airborne DEW Extension							
Atlantic	18	18	18	18	18	18	18
Pacific	25	25	25	25	25	25	25
Picket Ships							
Radar Picket Escort	11	11	11	11	11	11	11
Radar Picket	16	16	16	16	16	16	16
Missile Masters	10	10	10	10	10	10	10
BMEWS	2	2	3	3	3	3	3

Source: Selected systems from p. 126 of "Statement of Secretary of Defense Robert S. McNamara before the Senate Committee on Armed Services The Fiscal Year 1963–1967 Defense Program and 1963 Defense Budget." January 19, 1962. GPO.

A number of changes reflected this emphasis. The soft SAGE system was initially modified with a manual BUIC, with IOC for the semiautomatic BUIC II in the fall of 1965 (see a related discussion of this in Chapter IV). By the end of FY 1968, planning called for all BUIC IIs to be converted to BUIC IIIs; thus, the hardening program initiated in 1961 was carried on with IOC for the related COC at Cheyenne Mountain during FY 1966. Based on the revised threat, radars were continuing to be phased down, along with the phasedown of interceptors and Nike Hercules batteries. The radar reorientation would ". . . leave a system of 151 search radars, 275 height finders, 91 gap fillers, 39 DEW radars and 67 AEW/ALRI offshore radar aircraft. All of the DEW line extension radars (ships and aircraft) have now been phased out."[51]

A major phasedown of the active fighter interceptor force was begun the year before, with no significant change projected through FY 1971; 22 Nike Hercules batteries would be phased out during FY 1967 as well.[52] While BMEWS was being improved and the over-the-horizon radar was being developed, the clear picture on the air defense scene was one of cutback and decreased emphasis. Initiatives that were taken consisted of refinements or experimental developments; air defense had ceased to be the burning issue it was in earlier years for lack of a pressing need. By that time, the Nike Zeus system had become the Nike X system, but as in previous years deployment of an antiballistic missile system was not foreseen as necessary for a variety of reasons. After discussing the problems, uses, and technical characteristics of the Nike X system, McNamara summarized the likelihood of deployment:

> Considering all of the uncertainties involved, including the nature and consequences of the Soviet reaction, the technical problems yet to be solved and the great cost of such a deployment, I do not believe that a decision should be made now to undertake an all-out damage limiting effort against the Soviet threat. Nevertheless, this issue should be kept under continuous reassessment, and the deployment [sic] effort on all elements of the system should be pursued with the greatest urgency. . . .
>
> With regard to Communist China, the timing of a U.S. light ABM deployment should be linked to the pace at which the threat actually evolves. Since we do not know [sic] believe the Chinese Communists could deploy any significant ICBM force before the mid-1970's, no production decision on that account is needed at this time.[53]

The latter comment regarding the possibility of deployment against a Chinese ICBM threat is particularly interesting in light of the September 1967 decision to deploy just such a system; for further information on this policy reversal see Chapter IV, Section III.

At the same time that air defense was on the decline and antiballistic missile defense was being held back, strategic offensive forces projections were beginning to decline and then level off. The impetus of 1961 had created by 1966.

In a sense, this "leveling off" was curious given the estimations about Soviet forces made at about this time. In 1965, it was indicated that "over the next 10 years it is estimated there will be considerable strengthening of Soviet strategic attack forces particularly in retaliatory capabilities, with chief emphasis on ICBMs. It is not believed, however, that the Soviets will expect to achieve, within the period of this estimate, forces which would make rational the deliberate initiation of general war, but that they will continue to adhere to the concept of a deterrent force."[54]

[51] Ibid., p. 7354.
[52] Ibid.
[53] Ibid., pp. 7356–7357.
[54] OACSI, op. cit., 1965.

Clearly, it was not anticipated that the Soviets would be following the U.S. pattern on offensive forces in the mid-term future. A hint of the "why" for U.S. action in this regard is seen in projections from 1966:

> The Soviets are building forces which will given them, in the next year or two, greatly increased confidence that they have a retaliatory capability sufficient to assure the destruction of a significant portion of U.S. industrial resources and population.
>
> . . . it is not believed, however, that the Soviets will expect to achieve by the mid-1970's strategic capabilities which would make rational the deliberate initiation of general war.[55]

It was estimated that the Soviets had about 335 operational ICBM launchers, compared to 954 total ICBM launchers for the U.S. at that time. The threat was therefore not numerically large, and the future projection called for 670–765 Soviet operational launchers in mid-1968.[56] Even given consideration of throw-weight for the missiles per launchers, it probably seemed likely that a rough parity might be developing in ICBMs between the two major powers. The "why" for the leveling off consequently seems tied to a real determination at that time that the arms race could be cooled down if the U.S. took the initiative in restricting growth in hardware.

The proposed U.S. bomber force, although to be modified in the medium bomber category, also reflected this direction, as depicted in Table 16.

Table 16—Proposed Bomber Force
(number of aircraft)

	FY 1967	FY 1971	FY 1957
B-52	600	255	255
B-58	80	0	0
FB-111	0	210	210

Source: 1966 Hearings, p. 7350.

While Poseidon was to be accelerated as an engineering development program, other directions on ICBMs were reflective of the completion of a basic trend begun in 1961 to build up missile forces:

> . . . There is now general agreement that a force of about 1,000 Minuteman missiles is appropriate in context with the total strategic offensive forces programmed and in light of the expected threat. . . .
>
> We still plan to continue the 54 Titan II missiles in the force throughout the program period. . . . [Author's Note: through FY 1975]
>
> . . . by the end of the first quarter of fiscal year 1968, the entire planned force of 41 submarines (656 missiles) will be operational.[57]

Both the decreasing emphasis on defense and the leveling off of the offensive commitment are reflected in Table 17.

[55] OACSI, op. cit., 1966.
[56] OACSI, op. cit., 1966.
[57] 1966 Hearings, op. cit., pp. 7350–7351.

Table 17—Financial Summary FY 1962–1967
(In Billions Per Fiscal Year)

	FY 1962 Original	FY 1962 Final	FY 1963 Actual	FY 1964 Actual	FY 1965 Actual	FY 1966 Estimated	FY 1967 Proposed
Strategic Offensive Forces	7.6	8.9	8.3	7.3	5.3	5.1	5.1
Strategic Defensive Forces	2.2	2.0	1.8	1.9	1.5	1.6	1.3

Source: 1966 Hearings, p. 7361.

By the time of McNamara's 1967 presentation on the FY 1968 program, the clear impact of Vietnam had exerted its influence over the type of policy statements made. In adjusted dollar figures, fiscal years 1967 and 1968 showed the highest expenditure levels for general purpose forces during the FY 1956–1973 period (see previous figures from the statement of Don Brazier, 1973). This expenditure level correlates strongly with the amount of program emphasis found in the FY 1968 statement. Programs where new direction and emphasis was lacking included both strategic offensive and defensive forces. A few examples describe the general pattern[58]:

Missile forces: "Last year I told this committee that . . . This is essentially the program we now propose to pursue."

Strategic bomber forces: "The manned bomber forces we propose to maintain through fiscal year 1972 are the same as those I presented here last year for the fiscal year 1967–1971 period."

Strategic reconnaissance: "The strategic reconnaissance force is the same as that presented a year ago."

Surveillance warning, and control: ". . . with two exceptions author's note: activation of BUIC II to slip, 5 more search radars than planned to be operated until FY 1969 because of technical transition problems) . . . the same as those I presented last year."

Manned interceptors: ". . . generally the same as those presented last year."

Surface-to-air missiles: "The Nike Hercules and Hawk missile forces are the same as planned a year ago. . . ."

Ballistic missile warning: ". . . the same as shown last year."

Antisatellite defense: "As described in previous years. . . ."

Civil Defense: "Same in content and objectives as that approved for the current year."

The very clear message of this testimony is the overarching problem of Vietnam. The briefing is introduced by the Secretary with comments about the then-current Vietnamese tactical situation, and discusses the need for general purpose forces in terms of worldwide deployments to meet the Vietnam requirements for U.S. troops. Congressional inquiry was not particularly pointed about the Vietnamese situation, but since the Posture Briefing was given in March 1967, public and Congressional antipathy toward the war was not yet prevalent at the time. Clearly, the previously decreasing emphasis on continental air defense had ground itself to a complete halt by this period.

5. Calendar Years 1968–1972 Plans for the Future of Air Defense

"Now that the antiballistic missile defense issue has been resolved," suggested Robert McNamara in January 1968 in his FY 1969 posture statement, "we are in a position to move forward intelligently on

[58] Hearings before Committee on Armed Services, 1967, pp. 875–880.

the solution of the antibomber defense problem."[59] The resolution he referred to was the Sentinel ABM deployment decision of September 1967 (see discussion in Chapter IV), which brought about a budget request for FY 1969 of $1.232 billion for ABM defense of which $651 million was for deployment.[60] While this decision to deploy a thin ABM system against the nascent Chinese ICBM threat thus seemed to break the calendar year 1967 logjam on the future of air defense, which has already been described, weapons inventories during these years did not reflect any upward trend compared to the area air defense concepts which were advanced to solve the defense "problem." Quite the contrary is actually true: air defense hardware for the most part continued the downward spiral on which it had begun for all practical purposes in 1961.

The reason for this spiral seemed patently obvious; an estimate from 1968 suggested the Soviet threat we faced at the time: "While they have only begun to narrow the gap in submarine launched ballistic missiles and remain inferior in heavy bombers, the Soviets will shortly overcome the U.S. lead in number of intercontinental ballistic missile (ICBM) launchers."[61]

Recalling the previously cited expectation of 1966 that the Soviets would have 670–765 operational ICBM launchers by mid-1968, it now (in 1968) seemed that the Soviets actually had 900 such launchers. This increasing threat, coupled with the comment that "attrition and retirment [sic] of older models will gradually reduce the Soviet heavy bomber force. The medium-bomber force will probably also decline as Badgers are phased out. . . ." meant that defense against the air-breathing threat would continue to decline as the composition of the threat changed.[62]

As depicted in Table 18, selected systems show the U.S. offensive and defensive force trends which had begun during the previous period. Additionally, Figure 6 helps to portray the overarching offensive and defensive strategy during these years. Coupled with these decreasing force levels was McNamara's proposal for a substantively new air defense system in his FY 1969 Posture statement (see Chapter IV). The key element of this new system was to be AWACS (Airborne Warning and Control System) which required development of a downward-looking airborne radar; this would have little vulnerability compared to the existing ground-based systems. McNamara then proceeded to sketch three alternatives which were considered for the future of air defense. While such alternative postures had been used on many other systems in the past, the approach was something new for air defense—a change was in the wind.

Previously, air defense had one posture since 1961—slight modification or reduction. McNamara had this to say about the alternatives:

> The first alternative would be to continue the current air defense forces at least through the mid-1970's. The second would be to modernize the forces with AWACS for warning and control and the F-12 for interception. The third alternative lies midway between the other two, and would provide for AWACS and the upgrading of the F-106 with an enhanced fire control system (including a "look-down" capability to engage low-altitude targets) and a new air-to-air missile. . . . Under alternatives 2 and 3 the entire SAGE/BUIC ground environment would be phased out, leaving only the FAA operated radars for peacetime air surveillance. However, some over-the-horizon (OTH) "back-scatter" radars would be added to provide an aircraft early warning capability . . . on balance, the AWACS/F-106X force seems to be the proper choice at this time.[63]

[59] McNamara FY 69 Posture statement (paperback), 1968, p. 66.
[60] Ibid., p. 75.
[61] OACSI, op. cit., 1968.
[62] OACSI, op. cit., 1968.
[63] FY 1969 Posture Statement, op. cit., pp. 68–69.

Table 18—Selected Forces, FY 1969–1973					
	FY 1969	FY 1970	FY 1971	FY 1972	FY 1973
Army Forces					
Hercules btry/lnch, CONAD	52/891	40/	21/	21/	N/A
Hawk btry/lnch, CONAD	8/288	8/288	8/288	8/288	N/A
Total CONAD SAM btry/lnch	60/1179	48/288	29/288	29/288	N/A
USAF Wings/Squadrons					
Heavy Bombers	10/30	9/31	–/29	–/26	–/26
Medium Bombers[1]	2/6	—	–/4	–/4	–/4
ICBM					
Titan	–/6	–/6	–/6	–/6	–/6
Minuteman	–/20	–/20	–/20	–/20	–/20
Air Defense Interceptors	5/19	4/14	–/11	–/9	–/7
Bomarc	–/6	–/5	–/5	–/5	–/3
AWACS	–/7	–/3	–/2	–/2	–/2
ANG					
All-Weather Interceptors	5/22	5/17	5/16	5/17	5/20

[1]B-58's were used in FY 1969 while FB-111's were used in 1971–1973.
Source: Defense Management Summary, op. cit. Army Forces: Table 125; USAF Forces: Table 135.

If the third alternative were completed, ". . . we could phase out all but one of the SAGE Combat Centers, all the SAGE Direction Centers, about half of the search radars, all of the Gap Filler and DEW Line radars, and all of the AEW/ALRI aircraft. . . .[64]

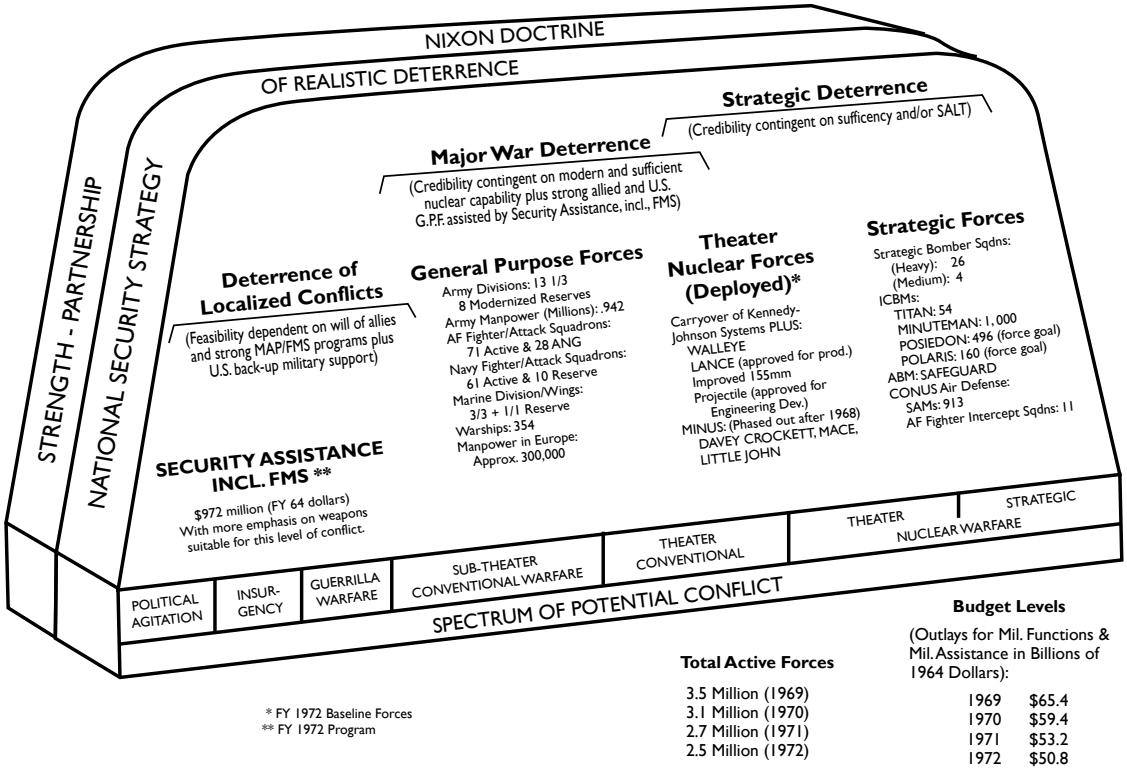
In addition, the F-106X would replace all existing air defense interceptors except for one ANG F-102 squadron in Hawaii; while most of the existing Hercules and all of the Hawks would be retained, all Bomarc forces would be phased out. Missile warning through BMEWS and OTH forward-scatter radars would remain basically the same pending completion of the OTH-B study proposed for that fiscal year.[65] Taken together, the elements of this proposal indicated a new direction for the air defense effort, and one which was to be restated almost verbatim by Clark Clifford in his presentation on the FY 1970 defense budget.

Congressional response to the McNamara proposal was not all that was hoped for: none of the $28 million for F-106X development requested was appropriated; AWACS received about $40 million, but OTH-B only received $1 million.[66] The only significant addition to the proposed new air defense system which Clark Clifford added in 1969 was a realization which had been stated less clearly earlier and which would

[64] Ibid., p. 72.
[65] Ibid., pp. 73–74.
[66] Clifford FY 70 Posture statement (paperback) 1969, p. 63.

summarize U.S. air defense capabilities in the post-ABM agreement period of 1972. Clifford had this to say about the effectiveness of antibomber defense: "No air defense system can provide a significant 'Damage Limiting' capability against the Soviet Union unless accompanied by a strong, effective ABM defense."[67]

Figure 6—Nixon Strategy for Peace



While the ABM system Clifford referred to was the Sentinel system designed against the Chinese threat, shortly thereafter Sentinel became Safeguard with the new Nixon Administration. Clifford's presentation was prepared by mid-January, 1969; by mid-March of that year President Nixon had redesignated the system and had redirected it, this time against *both* the Soviet and the Chinese threats rather than the Chinese threat alone. Safeguard is discussed more extensively in Chapter IV. Other elements of the continental defense system received less attention in these years, basically retaining the modernization posture which had been suggested by McNamara for the FY 1969 budget. Secretary Laird's presentation on the transitional FY 1971 defense budget is reflective of this fundamental stagnation of the air-breathing threat defense system: "The current bomber defense system, as the Congress is aware has a limited combat effectiveness and is expensive to operate. Accordingly, while research and development on a modernized system progresses, we plan to continue in FY 1971 the phase-down of the existing system in such a way as to make the best use of the remaining forces."[68]

The continual phasedown of the existing system is reflected in the previously presented figures, and the modernization program had not produced any significant results by then. Continued development funds

[67] Ibid., p. 58.
[68] Laird FY 71 Posture statement (paperback) 1970, p. 116.

were requested for AWACS and OTH-B, with additional studies on a revised manned interceptor switching from the F-106X to consideration of the F-14 or F-15 since again the Congress had not appropriated funds for the former program.[69] Both NEWS and the OTH forward-scatter systems continued in their missions with the addition during FY 1970 of the 474N system designed specifically to warn of SLBM launch.[70] The FY 1972 budget statement of Secretary Laird first mentioned the ongoing SAM-D development project of the Army in conjunction with planned strategic forces, as a possible replacement for Hercules and Hawk, but SAM-D as with other modernization efforts remained in the development stage. Maintenance of the status quo established in 1968 regarding air defense is reflected in the FY 1973 budget message by Secretary Laird in February 1972:

> Our air defense systems have not in the past been able to meet all of the objectives assigned to them. Command and control systems have been vulnerable, warning systems have been unable to detect all incoming aircraft using low-level penetration tactics, and our interceptors are too few in number and lack the "look-down shoot down" capability required against low-flying bombers.
>
> Because of this vulnerability and the reduced effectiveness of parts of our present air defense forces, we have decided to make some selected reductions in the current force levels, accepting some additional risks in the near term while pursuing development of more effective air defense components for the future.[71]

This vulnerability and limited effectiveness of our system was coupled with a general consensus on the existing and projected Soviet air-breathing threat which made even more clear the perception of a declining usefulness for our air defenses. That there was some disagreement about this perspective is also seen in a 1972 description of Soviet capabilities: "The Soviet force of intercontinental bombers and tankers consists of 110 Bears, 70 of which carry air [sic]-to-surface missiles, and 85 Bisons, including 50 tankers. The first units of a new strategic bomber—the Backfire—could become operational by late 1973. All but the Air Force continue to believe that it is best suited for use against Europe and Asia. The Air Force believes that it is suitable for a variety of missions including intercontinental attack."[72]

Although there had been no phase out or major attrition in these existing 195 heavy bombers over several years, they were characterized as "rapidly aging" and the earlier suggestion that a bomber attack would serve as a follow-up to an initial ICBM attack was not changed. The glitter, it seems, had gone out of the air defense business.

Previously mentioned consideration for a new solution to the interceptor was named the improved Manned Interceptor (IMI) program (although no funds were even requested for it for FY 1974) with design of a new satellite warning system ongoing.[73] The Safeguard ABM system was then (February 1972) in testing, with procurement initiated for some elements of the system; this activity would of course be restricted by the ABM Treaty of 26 May 1972 which limited deployment to two national sites per signatory.

The drastic change which had taken place in U.S. objectives regarding continental air defense during the 1955–1972 period is reflected clearly in Secretary Richardson's FY 1974 presentation:

> Planning of the CONUS air defense system has undergone a number of major changes during the last decade. The current objectives are to provide a defense of the U.S. against a small bomber attack, assuming a rela-

[69] Ibid., p. 119.
[70] Ibid.
[71] Laird FY 73 Posture statement (paperback) 1972, p. 74.
[72] OACSI, op. cit., 1972.
[73] FY 1973 Posture Statement, op. cit., p. 75.

> tively short period of strategic warning, and as a minimum a SAM defense of Washington, D.C. Forces which can satisfy these objectives will also be capable of performing peacetime surveillance and identification functions to protect the sovereignty of U.S. air space.[74]

Air defense had not moved full circle since 1955, but had changed direction 180 degrees instead. The defense system against the manned bomber threat had declined ever since the late 1950's when perceptions of the future Soviet threat foresaw the ICBM as the major element of that threat. An effective defense against the ICBM threat was never deployed, negating the value of a less important continental defense system which could significantly diminish U.S. losses in the face of a manned bomber attack. Offensive forces took on an increasing share of the burden of providing deterrence to attack in this situation, but their strategic employment moved from assured destruction and second-strike capability to sufficiency with the advent of substantive detente negotiations. Where earlier efforts had tried to increase warning time with radar nets strung further and further away from the United States, by the end of the period a short warning time was sufficient. Where earlier efforts had been bent on constructing a SAM defense system for all major U.S. population centers, by the end of the period a SAM defense of the capital was sufficient. Truly, the era of strategic emphasis on continental defense was over.

E. Summary

The introduction to this chapter suggested a set of factors which are considered to be crucial to the evolution of air defense strategy. Before investigating how these factors are related to the critical decision periods portrayed here, some general observations need to be made. First, this effort was incredibly constrained by time and the inability to access a great many primary sources which would have fleshed out the story which is told here. In particular, three areas come to mind which deserve further research as discussed below.

1. The Politics of Congress as it Affected Air Defense

It is interesting to note, for example, that both the bomber and missile "gaps" received especially great emphasis during Presidential election years—1956 and 1960, respectively. Was there any significance to this timing for the changing air defense strategy? Only a greater research effort can provide an answer. In another instance, an interesting case can be made for a method of decision making involving Congress which may have influenced air defense strategy. Prior to the DOD reorganization of 1958, the lack of OSD control over service budgets meant that a great many competing weapons system controversies were "bucked" to Congress for its participation in the resolution of them. That reorganization and the changes it brought about in centralizing DOD control over expenditures meant that such controversies came to be resolved in a substantively different way, within DOD. Another element of the story is that Congressional scrutiny of air defense in the post-Sputnik years (1958–1960) was much greater than it had been before, with many congressmen asking DOD "What kind of defense have you given us for our money?" While the Sputniks and the Soviet ICBM were one set of factors stimulating this inquiry another set *might* have been generated by the fact that Congress was tired of participating in the resolution of weapons system disagreements. It may have seemed to Congress that neither the Chiefs nor the services were united in the defense effort—publicized bones of contention had been such things as the SAM area versus point defense

[74] Richardson FY 74 Posture statement (paperback) 1973, p. 1961.

range limitations the Zeus-Wizard controversy, the Nike-Bomarc "disagreement," and the Thor-Jupiter "dispute." Such differences occurred both before and immediately after the DOD reorganization, but a case can be made for the argument that the reorganization was largely stimulated by the DOD desire to reduce the visibility of such system decisions and thereby reduce Congressional pressure. The DOD house became more orderly, and it may have been that the extent to which Congress could wield the budget as a whip over defense was reduced even though scrutiny had increased in the post-1958 period. *No* evidence was uncovered which would lend credence to this case; nonetheless it seems to deserve investigation because of its coincidence with the beginning of phasedowns in air defense systems in the 1958–1961 period. Did centralized OSD control over service budgets impact on system cutbacks? Did Congressional scrutiny stimulate a reassessment of air defense needs? Primary evidence is not available at the present time to comment substantively on these questions.

2. JCS/Service Participation in Air Defense Strategy

Here, clearly, are important elements of the strategic picture that are not explored in this chapter (although they are covered in Chapter 1). The picture of strategy portrayed by Congressional testimony often tends to make the decision-making process look consistently like a rational model in which a unitary state makes a single strategic decision about the external environment to respond to a stimulus. Enough evidence is available here to disagree with the simplicity of this model, but the real interaction of various bureaucratic groups on even the major decisions selected here is not known.

For example, it seems fairly certain that the Army stood as the only major institutional advocate of the Nike Zeus and then Nike X System. (See Chapter IV, Section 3 for a further discussion of this.) For many years, the Chiefs split on advocacy of this system and the flavor of that disagreement (through secondary sources) appears to stem from doubts about the capabilities of the system and its costs. Were these disagreements actually driven more largely by the desires of other services for a role in ballistic missile defense? Did the centralized OSD control in the post-1958 DOD reorganization period detract from the Army's argument because advocates for the system did not exist at OSD level? Were the Congressional debates of 1969 on the ABM sparked by the clear military disagreements which previously existed over it? These questions are not answered here, because primary source evidence is frankly lacking. The more general point is that such bureaucratic group interaction may have affected the course of strategy on ICBM defense because of the divergence of opinion over U.S. capabilities to defend against the threat. Surely the issue deserves further exploration.

3. The Impact of Detente on Air Defense

A subject treated briefly here (although also covered in Chapter I) is the impact of U.S. efforts toward rapprochements with the Soviet Union. Such efforts run throughout the years covered here, and are particularly crucial in the post-Sputnik years regarding U.S. resolve to pursue an effective missile defense, and strategic offensive superiority. Was a decision made early in the McNamara years that the Soviet Union would *not* attempt strategic superiority over the U.S. and so ceilings could be placed on our defensive and offensive forces? If so, it would explain the way the ABM seemed to be used as a bargaining chip for the SALT talks (although even this conclusion is an assessment drawn from a secondary source). If so, it would explain the leveling off of our offensive forces in the mid-1960's even given the type of Soviet threat

estimate divergences suggested in Annex 4 to this chapter. Khrushchev's enunciation of support for wars of national liberation in 1960 and the subsequent U.S. strategy of flexible response and our emphasis on the ability to fight brushfire wars also serve as major elements of the consideration of detente. With these changes, the strategies of the superpowers addressed a "new" potential area of conflict—no longer was nuclear war the professed predominant military arena. In such a changed perspective, nuclear weapons and defense against them became strategic tools of lesser importance than they had been—general purpose and special forces took on an increasing significance in perceived superpower competition. If this assessment is correct, it may have seemed only logical to decrease emphasis on air defense and strive for offensive and defensive limitations since control over territory could be gained in less traumatic and more effective ways than by the delivery of nuclear weapons to the opponent's homeland. Clearly, as with the first two points, this aspect of air defense deserves further consideration.

With these general comments in mind, the decisions and factors earlier enumerated can be put in perspective. We have noted that there were five major decisions affecting air defense during these years:

(1) The decision to build up the air defense system stated publicly in January 1955
(2) The decision to deploy first generation U.S. IRBM/ICBMs of 1958
(3) The decisions not to develop new air defense systems in the 1959–1963 period
(4) The decision not to deploy a ballistic missile defense system through September 1967
(5) The decision for detente, begun under Eisenhower and which culminated in SALT in 1972.

Of these five decisions, the most crucial for air defense strategy were decisions 1, 2, and 5. The implications of this prioritization will be discussed as the selected factors are related to the decisions.

4. Decision I: The Build-up of the Air Defense System, January 1955

The most salient factors in the decision to increase U.S. air defense efforts were the Soviet threat and our belief that the technological capability existed to counter that threat. Shortly before the beginning of this period the TU-4 manned bomber threat was supplemented with the Bear and the Bison, providing a great stimulus to the U.S. to do something about the U.S.S.R.'s growing offensive capability. Our reaction was two-fold: to increase our offensive forces and provide for a better defense. It had already been demonstrated before 1955 that the major elements of the air defense system could be developed; the new Soviet threat required refined technology, but the job could be done. Air defense was relatively important to overall U.S. strategy at the time, and so this factor is ranked concurrently with the threat in stimulating the build up of the system. Although the U.S. began rapprochement efforts with the Soviet Union during the same time at which air defense systems were built up, the effort produced no substantive conclusions and hence this factor had little impact on defense strategy. Neither budgetary constraints nor interservice competition were important to the decision, for the threat was clear and President Eisenhower was adamant about the need for a more effective system. This was clearly an important decision for air defense since it stimulated activity in the field in a way never seen again in the following years.

5. Decision II: The Decision to Deploy First Generation IRBM/ICBMs of 1958

This decision is important for air defense because of the major implications it had *for* it, rather than as a decision *on* it. The decision was largely a result of a single factor: the changing Soviet threat as evidenced by the Sputnik and ICBM launchings of late 1957. Because of the threat which was perceived from these

events, U.S. strategy changed to account for the new offensive weapons anticipated as shortly to be entering the Soviet inventory. Projections of Soviet reliance on ICBMs rather than on manned bombers as their major means of delivering nuclear weapons meant that our manned bomber air defense system would be less important than it had been. Since there were serious questions about the technical feasibility of an anti-ICBM defense, the defense effort came to rest more and more on offensive might to counter a threat which could not be handled defensively. Air defense became less important in the face of the revised threat and the inability to directly counter aspects of it. This decision ranks in importance with the first decision, for it marks the end of serious strategic concern with an air defense system. It was "all down hill" for air defense after the threat changed at this time; while the system continued through the rest of the years in revised form, it was clearly an adjunct to other, more important, systems and strategic considerations.

6. Decision III: The Decisions Not to Develop New Air Defense Systems in the 1959–1962 Period

These decisions were much less important than the second one because they are basically a continuation of it. Nonetheless, a lag of time between the two marks them as a separate series of events. The same factors which were influential in the second decision are operant here: decreased emphasis on the manned bomber threat, increased emphasis on the ICBM threat and our technological inability to counter it, and the subsequent limited importance of air defense. While the technology existed to improve the capabilities of a manned bomber defense and to harden it somewhat against an ICBM attack, the decreased priority afforded to air defense meant that innovations in that field had to take lesser priority to more important problems. Phasedowns and lack of funding for R&D programs were phrased in terms of budgetary constraints, but it is judged that had there been a perceived threat of major proportions which could be handled by our air defense systems, this argument would not have constrained air defense. The fact that "decision III" is really a series of lesser decisions is characteristic of its limited importance: there was no single decision not to develop all new systems or cut back all existing ones for the die had been cast earlier on the general problem. It was only a matter of carrying out the new strategy.

7. Decision IV: The Decision Not to Deploy a Ballistic Missile Defense System Through September 1967

This is clearly a continuing decision over a period of years, and one which was plainly stated in refined versions from 1958 through 1967. The single most important factor affecting it was probably the perception that although the Soviets had a burgeoning ICBM capability they would not use it to initiate general war and the likelihood of nuclear war was small. This is a conclusion drawn from estimates presented in this chapter. Closely following this perception in importance is the impact of technology, for at least in a strategic sense the ABM system capability was in doubt throughout these years. From 1958 through 1963 the feasibility of intercepting a "bullet with a bullet" was suspect although trial demonstrations had been held by the end of those years. From 1963 to 1967, technological questions revolved around the issues of an ABM system coping with penetration aids, chaff, decoys, radar blackouts, and a panoply of factors related to the effects of atmospheric ICBM destruction on our own systems and other soft targets. Did we have a sure-fire defense against these problems of the near-term threat? The answer was a resounding "no" from the level of the Secretary of Defense and the President. That there may have been other important factors is

also possible (such as an idiosyncrasy of McNamara against an ABM) but it is believed that a reduction in the fear of nuclear war and the suspect technology of the ABM were the prime elements in this decision.

8. Decision V: The Decision for Detente

This "decision" is more an element of U.S. foreign policy than it is a specific part of the air defense story, so it has been treated only incidentally in Chapters II and IV. Nevertheless it had great impact on the course of air defense strategy, for it set the mood of policy under which our strategic offense and defense stabilized. If, as in decision IV, the Soviets would not deliberately initiate general nuclear war, we could attempt to build bridges to them. If, as suggested in the estimates presented in the body of this chapter, the Soviets would not attempt to surpass the U.S. in an "arms race" but would instead seek parity, we could strive for limitations beneficial to both sides. This "decision" carried with it the fact that large defensive systems and continued growth in offensive forces were provocative—they ran contrary to the overall goal of detente. Since detente was more important than increasing weapons inventories, air defense strategy was affected by it and its goals came to be judged in light of more important concerns. As with the other major decisions affecting air defense strategy, this last crucial "decision" reduced the importance of the defense effort even more.

In summary, there were three major sets of decisions during these years which affected air defense—the decision to build up the air defense system in 1955, the decision to deploy first generation U.S. missiles in 1958, and the decisions throughout these years to pursue detente with the Soviet Union. The factors which most greatly affected these decisions were the existing and perceived Soviet threat, changes in that threat, our estimates of the use of that threat, and the state of offensive and defensive technology which existed at the time those decisions were made. Air defense strategy was thus clearly tied to a much larger set of ever-changing strategic decisions and assessments.

Annex I

CONUS Air Defense "Master Plan"

Source: "Summary of Major Events and Problems, FY 1959, Deputy Chief of Staff for Operations" DCSOPS, DA, Washington, D.C. Item 1, pp. 1–3.

ITEM 1

The JCS on 15 April 1958, in considering CINCONAD's CADOP 56–66, approved for service planning and programming guidance the deployment of 15 Bomarc squadrons, 80 Nike Ajax/Hercules battalions, and 26 Hawk Battalions by end FY 62 (JCS 2245/45). The Congress, in considering the FY 59 military construction program, viewed Nike Hercules and Bomarc as competing weapons systems and applied a 20 percent reduction in construction funds to force a decision by the Secretary of Defense between these two systems. The Secretary of Defense on 13 August 1958 requested (enclosure to JCS 2277/36) the recommendations of the JCS on how the reduction should be applied. Based on the subsequent JCS "split," the OSD solution resulted in the release of Nike Hercules funds for 13 2-battery SAC base defenses and 9 additional SAC base defenses contingent on the Army's ability to fund this program. This amounted to a total reduction of 3 SAC base defenses In the FY 59 program of 25. Funds for 1 Bomarc A and 2 Bomarc B squadron sites were released, and funds for the remaining 7 squadrons were withheld pending a review of the program. On 4 May 1959, the Senate Military Appropriations Subcommittee, in considering the FY 60 funding for CONUS air defense, criticized the failure of DOD to settle the Nike Hercules—Bomarc duplication and directed the Secretary of Defense to present a "Master Plan." On 19 May 1959, the Secretary of Defense requested (enclosure to JCS 1899/475) the JCS to prepare a "Master Plan" for CONUS air defense. The JCS could not agree and on 2 June 1959 the JCS forwarded (JCS 1899/481) to the Secretary of Defense the divergent Army, Navy, and Air Force Master Plans for CONUS air defense. The Air Force and Navy Master Plans were essentially short-range plans which terminated at 1963. The Army Plan was [based on a look at the 1965–1970 threat] calling for Zeus against the ballistic missile threat and the second generation Hawk against the aerodynamic threat, augmented by a LRAWS (long-range attrition weapon system) if feasible. Specifically, the Army Master Plan called for the following:

(1) Deployment of the 80 Nike Battalions and 26 Hawk Battalions which had been approved by the JCS in their consideration of CADOP 56–66. These weapons were to be phased out as second-generation Hawk became available.
(2) The 5 Bomarc A sites for which buy out funds had been authorized were to be completed in order to get a return for the nearly $2 billion invested in the program.
(3) Bomarc B would be terminated on the basis of its high cost, late availability, and limited capabilities.

On 19 June 1959, the Secretary of Defense forwarded (enclosure to JCS 1899/486) his decision on CONUS air defense subject to Congressional action, to the JCS, Secretary of the Army, Secretary of the Air

Force (Memo for Secretary of the Army and Secretary of the Air Force, subject: "Continental Air Defense Programs," OSA 19 June 1959). The decision provided for the following:

(1) No Hawk in fixed CONUS sites;
(2) 126 batteries of Nike Hercules for CONUS (30 to 15 SAC bases, 76 to convert existing Ajax sites, 20 at new city defenses) plus production of 50 Improvement Kits;
(3) 2 Bomarc A, 3 Bomarc A/B, and 11 Bomarc B squadrons;
(4) Improved SAGE only on the perimeter of the United States and a consequent reduction in direction centers, super combat centers and prime radars, with some increase in Gap Filler radars;
(5) Zeus funding increased $137 million for production feasibility studies.

Annex 2

DERs and the DEW Line

Department of the Navy, Office of the Chief of Naval Operations, Washington, D.C.

OP-03: jec
8 March 1960

Memorandum

Subject: Withdrawal of radar picket ships (DERs) from the seaward extensions of the DEW line.

1. During the review of the fiscal year 1961 budget in November, it became apparent that unless the Navy fiscal year 1961 budget was significantly increased over fiscal year 1960 budget it would be necessary to reduce naval personnel levels and naval force levels. During a budget review with Secretary of Defense in November, decision was made to reduce both forces and personnel. It was pointed out that reductions in force levels could not be made without reducing commitments. A reduction of 47 ships was made in the Navy and decision was made with the knowledge of the Secretary of Defense that the commitment to maintain picket ships on the Atlantic and Pacific extension of the DEW line would be eliminated.
2. The Chief of Naval Operations notified the Joint Chiefs of Staff of this decision and impending action, who in turn notified the commander in chief, North American Air Defense Command (General Kuter, USAF).
3. General Kuter notified the Joint Chiefs of Staff that he recommended against this action, in that removal of the picket ships would degrade the warning capability of the seaward extension of the DEW lines, and that the WV-2 aircraft which would remain flying these extension lines would not have as good detection capability as would the ships.
4. The Joint Chiefs of Staff presented this matter to the Secretary of Defense informing him of the intention of the Chief of Naval Operations to withdraw the radar picket ships (DERs) from the DEW line extension and notified the Secretary of Defense that NORAD (General Kuter) had expressed his opposition to the planned withdrawal of these ships.
5. Subsequently, the Secretary of Defense replied to the Joint Chiefs of Staff that he had taken cognizance of the withdrawal of the radar picket ships from the seaward extensions of the DEW lines during the fiscal year 1961 budget decisions.
6. There were a total of nine stations, four in the Atlantic and five in the Pacific, occupied by the DERs. These ships also acted as navigation check points and safety vessels for the aircraft flying the DEW LINE extensions out of Midway and Argentina. Two ships will probably be retained in the Pacific as safety vessels and navigation check points. They will, of course, contribute somewhat to the early warning on this line, but this will not be their major mission. In the shorter Atlantic line, the normal ocean station ship provided by the Coast Guard will provide the navigation check point and rescue services.
7. We have 36 DERs in the active fleet, 16 in the Atlantic and 20 in the Pacific; 8 Atlantic and 7 Pacific DERs will be decommissioned for a total of 15.
8. The decision to eliminate the ships from the seaward extension of the DEW LINE was made after careful deliberation. Force reductions had to be made. The ships having the least effect on the

fighting capability of the Navy were selected to be decommissioned. Eight of the oldest destroyers were put out. Only 15 of the 36 DERs were selected for decommissioning since these remaining ships have an ASW capability and can be used in other duties. One each of the DERs will be assigned to each of the inshore warning lines (contiguous lines) to rotate with the ships already assigned these duties in order that they may have better upkeep and ASW training.

Source: "Hearings before the Preparedness Investigation—Subcommittee of the Committee on Armed Services in conjunction with the Committee on Aeronautical and Space Sciences, United States Senate, 86th Congress, Second Session, on Missiles, Space, and other Major Defense Matters." GPO 1960. pp. 455–456.

Annex 3[1]

Phasedown of C² Systems, 1958–1963

The material in this annex is drawn exclusively from Thomas A. Sturm's "Command and Control for North American Air Defense 1959–1963," USAF Historical Division Liaison Office, January 1965 (Secret). The decision was made to include this material in an appendix rather than the main text since it is from a secondary source. As such, it tells a judgmental story about events and decisions which this author has not personally surveyed from primary sources, and is hence not viewed as part of the main story that can be told. Nonetheless, Mr. Sturm describes crucial decisions about the phasedown of air defense systems during the period of time when those phasedowns first began, and the detail of that story plus its author's careful work and reliance on primary sources makes it worth repeating here. A similar phasedown story can be found in Chapter IV.

The text of the appendix comes from pages 17–39 of the Sturm document. Restrictions on direct reproduction of the document have led to its appearance here in paraphrased and quoted fashion; Mr. Sturm granted permission for quotation from the document on 7 May 1975.

An ADC plan of 1958 was intended to increase SAGE quality and survivability by installing new solid state computers in hardened Super Combat Centers (SCCs). While this plan was approved by the Air Staff in February 1959 and in principle by OSD shortly thereafter, the *changing nature of the threat* to CONUS because of the ICBM led Congress to question the existing balance between antimissile and antibomber programs.[2] In response to this changed threat, Secretary of Defense McElroy asked the JCS and some of his own staff to propose revisions to existing plans. By 19 June 1959 service disagreements had been reconciled over changes, and Secretary McElroy presented the resultant Master Plan for Continental Defense which stated that *for economy reasons* three of the proposed SCCs would not be hardened.[3] By the end of the year the Air Force cancelled two of these three SCCs *because of Master Plan ceilings and other air defense commitments*.[4]

Several factors then combined to cancel the SCCs completely:

(1) The hastily prepared Master Plan needed revision;[5]

(2) Congressional inquiries about the changed threat had not yet been fully answered;

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[1] Unless otherwise noted, the documents cited in this annex are located in the Records Branch Files of the Directorate of Plans, Headquarters USAF and in the Correspondence Control Division, Office of the Secretary of the Air Force (OSAF).

[2] House Committee on Government Operations, 11th Report, 2 Sep 1959, Organization and Management of Missile Programs (cited in ADC Hist, Jan–Jun 1959, p. 2).

[3] Memo, SOD to JCS, 19 May 1959, subj: Continental Air Defense Program, in RL (59) 25; JCSM-211-59, 2 Jun 1959, subj: Continental Air Defense Program, in RL (59) 25; memo, B/G G. W. Martin, Actg D/Plans, to CSAF, 21 May 1959, subj: Air Defense Master Plan, in RL (59) 25; memo, SOD to JCS, 19 Jun 1959, subj: Continental Air Defense Program, in RL (59) 25; memo, SOD to Secy/Army & AF, 19 Jun 1959, subj: Continental Air Defense, RL (59) 25; Hitch Statement.

[4] Hist, D/C-E, Jul–Dec 1959, p. 98; memo, M/G J.K. Hester, DCS/O, to AF Ofc/Leg Ln, 12 Apr 1961, subj: Recapitulation of Readjusted Air Defense Program, in OSAF 777-61.

[5] Skifter Study, 25 Jan 1960.

(3) The 1958 DOD reorganization decreased former service control over C^2 budgets. JCS and OSD scrutiny of service recommendations subsequently to increase;

(4) The cost of improvements such as the SCCs would play an increasingly important role in budgetary considerations.

As a result of these factors,

> In November 1959, OSD advised the Air Staff that it was re-examining the Master Plan in the light of a recent revision of the missile threat. Intelligence credited the Soviet Union with having, by 1963–1965, a 60-megaton ICBM capable of striking within a mile or less of North American targets. As a result of this and other new estimates of requirements, the President's Scientific Advisory Committee had asked its Air Defense Panel to reassess the terms and objectives of the Master Plan. The panel, in turn, had asked OSD's Director of Defense Research and Engineering. (DDR&E) to assist. Pending completion of the project, OSD placed a hold order on SCC procurement.[6]
>
> One result of these investigations was DDR&E's recommendation to cancel the SCC program. Hardening the SCC's would not insure their survival against ballistic missiles of the potency which the Soviets could hurl against them by the time the centers became operational. The NORAD commander protested, labeling the move "a decided step backward in our limited capability for air defense." But OSD approved, and the Air Force and JCS concurred. On 26 March 1960, Acting Secretary of Defense James H. Douglas officially cancelled the program, allowing only the soft SAGE program of 3 CC's and 21 DC's (plus the training DC at Kansas City). As for Canada, the CADIN plan for replacing the manual center at St. Hobert with an underground CC/DC at North Bay and expanding and converting the Canadian radar system to SAGE would continue. However, since no solid state computers would now be ordered, the North Say center would be furnished with a modified AN/FSQ-7.[7]
>
> In summary, the expense of constructing underground centers and of purchasing the improved computers figured importantly in the decision to cancel the SCC plan. Equally important, the planners feared that even if the money were spent on the project—at the expense, perhaps, of other vital programs—the ability of the system to function after a missile attack remained in doubt. For one thing, they felt the SCC's could not be dug in deeply enough to prevent their destruction: for another, hardening the SCC's alone would not assure overall system survival. Since it would be too costly and time-consuming to harden every element of the system, it was better just to scrap the SCC project entirely before construction started.[8]

The cancellation of the SCCs meant that an alternative had to be devised to harden the existing system. The plan chosen was offered by NORAD and was subsequently described by President Kennedy and Secretary McNamara in the spring of 1961 (see p. 25 of Main Chapter text on McNamara's April testimony). The plan called for "…re-equipping certain radar stations and allowing them to assume manual control of weapons upon the destruction of their parent DC's."[9] In addition to this manual backup plan, a major assessment of SAGE was requested by McNamara. DDRSE was tasked with this evaluation, and in its report of May 1961 recommended that "…the Air Force divert much of the money allocated for improving antibomber sensors to backup command and control and other survival systems. SAGE should continue to be viewed only as a pre-battle system."[10] On 5 June 1961 McNamara notified the Air Force and the JCS that he agreed with DDR&E's concept of SAGE and emphasized that current and future air defense funds should be concentrated on the backup control system, missile early warning, and interceptor dispersal.

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[6] Memo, B/G J.A. Dunning, Dep Dir/War Plans, D/Plans, 9 Nov 1959, subj: Re-examination of Air Defense Program, in RL (59) 25; memo, Dr. H.R. Skifter, Asst DDR&E, to U/SAF, 28 Nov 1959, subj: Computers for the SAGE SCC's, in RL (60) 25.

[7] Memo, M/G H.T. Wheless, D/Plans to CSAF, 7 Jan 1960, subj: SAGE SCC's, with atch, subj: Talking Paper on SAGE SCC's, in RL (59) 25; memo for record by Col. A.R. Shiely, Jr., Dir/Ops, 29 Dec 1959, subj: OSDRCAF Air Defense Meeting, in RL (59) 25; memo, CSAF to JCS, 17 Mar 1960, subj: SAGE SCC's, in RL (59) 25; JCSM-113-60, 18 Mar 1960, subj: SAGE Super Combat Centers, in RL (60) 25; Actg SOD to JCS, 26 Mar 1960, subj: SAGE SCC's, in OSAF 153-60; ltr, CINCNORAD to JCS, 29 Jan 1960, subj: Super Combat Center, in RL (59) 25; ltr, CSAF to CINCNORAD, 30 Mar 1960, subj: Revised Air Defense Program, in RL (60) 25; CSAF to Air Staff, 31 Mar 1960, subj: Revised Air Defense Program, in AFCHO files; Erwin paper.

[8] Memo, Hester to SAF Ofc/Leg Ln, 12 Apr 1961.

[9] STURM (APPENDIX SOURCE), p. 24.

[10] DDR&E Rpt on Project No. 23, 1 May 1961, in RL (61) 3; Decision on JCS 1899/649, 26 May 1961, subj: Staff Study for SOD Project No. 23, in RL (61) 3; memo, SAF to SOD, 21 Apr 1961, subj: Questions Relative to the Future of the SAGE System, in RL (61) 3.

In a request for a major air defense review, McNamara asked the JCS to list alternate methods for a system which could *absorb a missile attack and then counter a small (300–500) follow-on bomber attack*.[11] This review was delegated to NORAD, which issued a final report in August 1961 calling for the equipment of 70 radar stations with their own computers—a small, dispersed SAGE system.[12] OSD agreed to this concept of a backup (BUIC) system, but bucked the plan back to the Air Force in its service budget submission phase directing that funding for it would have to come from other existing projects. The Air Force reduced purchase orders on items such as improved radars to compensate for BUIC funding, and the plan was approved on 13 March 1962 by Deputy Secretary Gilpatric. The character of the new plan is clear below:

> JCS summarized the rationale of the new plan in a reply to the NORAD commander after he had asked for reconsideration of center hardening. Let the BUIC program continue as planned, the NORAD commander had proposed, but only as a "stepping stone" to a hardened form of SAGE. JCS replied that cost and length of time to complete a hardened system militated against such action: "Since time is of the essence, the only feasible and timely solution available appears to be a dispersed back-up system which together with the primary SAGE control facilities, provides a degree of redundancy that will insure some survivable command and control capability.[13]

McNamara desired consideration of the closing of C^2 stations whole value was limited by the changing nature of the threat. To this end he asked CINCNORAD General Gerhart in the summer of 1962 to consider phasing out some of the early warning stations to reduce operating costs without degrading system capabilities.[14] The CINCNORAD plan in response to this tasking, submitted in September 1962, suggested the closing of 10 SAGE Direction Centers and 20 radar stations by June 1964 to purchase 12 squadrons of an improved manned interceptor (IMO and a mobile BUIC system, the "transportable control environment (TRACE)." The Air Staff agreed with a trade-off for the IMI, but disagreed with the amount of equipment proposed to be phased out.[15] The Air Force proposal was for reduction of five DCs and six radar stations during FY 1964.

McNamara's response to these proposals was more drastic than the phasedown of either of them. On 13 November 1962 he sent the military departments his decision on air defense planning for the next 5 years asking for their comments. The bomber threat, he suggested, was in the form of a small follow-on attack to an initial missile attack. The air defense system needed major reorganization since it cost $2 billion a year to operate but could not destroy more than a few percent of the follow-on bombers. The IMI would not be funded for FY 1964 because by its design it could not survive a defense suppression attack; TRACE would not be funded because the control needs of a future interceptor were not known.[16] He also recommended the

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[11] Memo, SOD to Mil Depts & JCS, 5 Jun 1961, subj: SAGE Reorientation, encl to JCS 1899/654, in RL (61) 3; memo, Mil Asst, Dep SOD to JCS, 14 Jun 1961, subj: Continental Air Defense Study—Project 126, encl to JCS 2101/434, in RL (61) 3; JCS 1899/660, 5 July 1961, in RL (61) 3; JCS 2101/434/2, 10 Aug 1961, subj: Continental Air Defense Study (Project 126), in RL (61) 3; memo, SOD to Mil Depts, 22 Sep 1961, subj: FY 1963 Program Package Guidance, encl to JCS 1800/471, in RL (61) 3.

[12] NADOP 63–73, 27 Jul 1961 (Supplement to NADOP 63–67); memo, D/Plans to DCS's, Dirs et al., 26 Sep 1961, subj: Project 126, NORAD Ten-Year Alternative Air Defense Plans, in RL (61) 3; memo, JCS to SOD, 18 Aug 1961, subj: Continental Air Defense Study (Project 126), in RL (61) 3; msg XPD-4, ADC to CSAF, 22 Jul 1961, in RL (61) 3.

[13] Memo, CINCNORAD to JCS, 30 Aug 1961, subj: Survivability of SAGE, in RL (61) 3; JCSM-1239-61, 16 Nov 1961, subj: Survivability of SAGE, in RL (61) 3.

[14] Memo, SOD to CINCONAD, 16 Aug 1962, subj: Improved Manned Interceptor, in RL (62) 3; memo, SOD to CINCONAD, 22 Aug 1962, subj: Actions Stemming from the 14 August Conference, Headquarters NORAD, in RL (62) 3.

[15] Memo for Record by D/Plans, 27 Sep 1962, subj: RCAF/USAF Meeting re NORAD Report on Manned Bomber Effectiveness, in RL (62) 3.

[16] Memo, SOD to JCS, 13 Nov 1962, subj: Continental Air Defense, with atch, 12 Nov 1962, subj: Draft Memo of SOD to President, in RL (62) 3.

closing of 22 long-range radar stations and 10 SAGE DCs by the end of FY 1965. He gave three reasons for these closings: (1) the system effectiveness would not be impaired; (2) his desired posture would be more closely approximated; (3) funding requirements would be eased.[17]

NORAD, the JCS, and the Air Force disagreed with the McNamara position. The JCS warned against making such severe reductions before introducing the IMI; in this situation the system would not be effective. The Air Force submitted an official "reclama" stating that a substitute for the SAGE elements was necessary before they could be phased out, else a "militarily unsound" situation would result. NORAD protested the "premature" closings.

Regardless of these protestations, Presidential approval was gained for the McNamara plan in early 1962 and an initial close down of 6 QCs and 17 radar stations occurred by the end of FY 1964.[18]

The general course of the air defense system was thus clear; continuing study of the system was directed, to evaluate future needs. In December 1962 Secretary of the Air Force Zuckert was charged with undertaking a study of the ". . . orderly phase down of the NORAD ground environment . . ." by DDR&E.[19] In January 1963 Secretary McNamara expanded the scope of this Continental Air Defense Study (CADS) to include air defense weapons and control systems through 1975. On 13 May 1963 the Study was submitted, calling for a phase down of SAGE centers as programmed BUIC centers were expanded from 34 to 46. An airborne warning and control system (AWACS) of 42 aircraft would be established to replace Navy aircraft and picket ships, and FAA and air defense operations would be merged to reduce radar stations.[20]

The response to CADS was that:

> OSD did not comment officially on the CADS report or on the NORAD, USAF, and JCS commentaries concerning it. As he had done the year previously, McNamara in early October 1963 circulated a draft of the recommendations he planned to send the President on the fiscal year 1965 air defense budget. Again, he elected to defer decisions on major improvements to the system, observing that he could not make them until, there were firm plans on such programs as civil defense and antiballistic missile defense. At the same time, he stated that he was considering further cuts in the antibomber defense during the coming year, among them the closing down of more SAGE centers and radar stations.
>
> The Air Staff and JCS recommended that McNamara postpone further reductions in weapon and warning and control systems until he had approved the Improved BUIC, AWACS, and Integrated DOD/FAA radar operation proposals and they were functioning. He subsequently modified his decision on the closings, directing on 27 November 1963 that only four additional SAGE DCs be closed in fiscal year 1966 and two SAGE CCs in fiscal year 1968.[21]

While the phasedown was therefore to occur more slowly than anticipated earlier, the direction was still very much downward. The same phenomenon is, of course, reflected in the Congressional testimony of the main text. While it is not clear that all service (including Army and Navy) interaction on the phasedown is shown by this appendix, it does suggest the substantive disagreement which existed over the possibility of degrading system capabilities without replacements for them. Congress, OSD and DDR&E favored cut-

[17] Ibid.; Hitch Statement, memo, OSD Compt to SAF, 4 Dec 1962, subj: Improved Manned Interceptor, cited in Hist, D/Plans, Jul–Dec 1962, pp. 37–8.
[18] JCSM-933-62, 21 Nov 1962, subj: Continental Air Defense, in RL (62) 3; memo, L/G G.P. Disosway, DCS/O, to DCS/P&P, 17 Nov 1962, subj: Operations Position on the Proposed Memo for the President on Continental Air Defense, in RL (62) 3; Hist, D/Plans, Jul–Dec 1962, pp. 42–3; memo, B/G R.F. Worden, Dep Dir/Plans, DCS/P&P, to CSAF, Jan 1963, subj: Background Paper on Phase-Down of 6 SAGE Centers and 17 Long Range Radars, in RL (63) 3.
[19] Memo, DDR&E to SAF, 13 Dec 1962, subj: Reductions of the NORAD Ground Environment, in RL (62) 3.
[20] Rpt by CADS Gp, 10 May 1963, Continental Air Defense Study, in RL (63) 3; msg 77938, CSAF to CINCONAD, 11 Jul 1963, in RL (63) 3; ltr, L/G D.A. Burchinal, DCS/P&P, to CINCONAD, 19 Aug 1963, subj: Transmittal of Conclusions and Recommendations, Continental Air Defense Study (CADS), in RL (63) 3.
[21] Talking Paper, as in n 44; Hist, D/Plans, Jul–Dec 1963, pp. 119, 93–94; USAF Current Status Rpt, Jan 1964, p. 3–25.

backs in the existing system: the JCS, CINCNORAD, and the Air Staff disagreed to varying degrees about the cutbacks unless expenditures were made at the same time on more efficient replacement components.

Several factors can be listed which served as the "why" for the phasedown which occurred:

(1) The composition of the Soviet threat changed;
(2) System costs and budgetary constraints were linked;
(3) Other programs had higher priority;
(4) Congress scrutinized air defense expenditures because of the changed threat;
(5) After the 1958 DOD reorganization, the services had less control than did OSD over the budget;
(6) Hardening existing components won out as a concept over building new components;
(7) The lead time for new components was too long given the changed threat;
(8) The existing system was not effective according to Secretary McNamara, for it could destroy only a "few percent" of the incoming bombers.

Annex 4

Threat Assessments in a Secondary Source

Perhaps one of the most interesting aspects of threat definition and its impact on U.S. defense is the extent of agreement and/or disagreement among major actors in the intelligence community over the actual and expected threat posed by the U.S.S.R. Evidence recently made available suggests some of these divergent opinions on specific aspects of the threat and offers a real insight into the complexity of decision-making in the face of soft evidence. While the exact impact of these divergent opinions on American air defense strategy is not clear, the general impact seems to be that precise phasing of the defense effort is impossible because of the lack of hard empirical evidence about aspects of the threat.

Several examples are presented here to show the substantive differences of opinion which have existed as well as the rationales for them.

In 1961, Soviet ICBM strength was assessed at a range of 10–25 launchers; it was expected that this force level would increase with the introduction of a new missile in the latter half of 1962 to a level of 75–125 operational launchers in mid-1963.[1] A graphic portrayal shows several opinions which diverged from this estimate:

Table 4-1—Operational Soviet ICBM Launchers, 1961–1964

	Mid-1961	Mid-1962	Mid-1963	Mid-1964
Director of I&R, DOS	75–125	150–300	200–450	N/A
ACSI, DA, and ACNO(I)	"a few"	50–100	100–200	150–300
ACSI, USAF	120+	300	550±	850

Table Source: See Footnote 1

From information available to us, the Director of Intelligence and Research, Department of State, believed that the launcher estimate should include an estimate of the largest ICBM force which the U.S.S.R. could have in mid-1961, which could be 200 launchers. While no evidence was available for his reasoning on other projections, it may be inferred that this was at least one factor in them. ACSI, DA, and ACNO(I), believed that the actual rate of increase would be particularly determined by ". . . the point in time when the Soviets have developed a new and less cubersome [sic] ICBM that can be more easily deployed."[2] ACSI, USAF, believed that the major determining factor in the development of Soviet force goals was that the ultimate elimination of the United States required a ". . . clear preponderance in military capabilities."[3] This

[1] "Available Information in Answer to BDM Corporation Questions by Years." OACSI, DA, Washington, D.C. 1975. No page numbers exist in the document, information is from 1961.
[2] Ibid.
[3] Ibid.

motivation also probably affected his estimate of Soviet Long-Range Aviation: where the suggested figure was about 150 heavy bombers and tankers, the ACSI USAF figure was 175; where the number of bombers which could be placed over the U.S. in two-way missions was suggested to be 200, his figure was 300.[4]

Other examples exist of the differences in estimates between one set and those of ACSI USAF. In 1963 it was suggested that 90–115 Soviet heavy bombers could be put over the U.S. on two-way missions, with another 150 medium bombers over several target areas including portions of the Northwestern U.S. From our information, ACSI USAF reasoned that this perception seriously underestimated the manned aircraft threat to CONUS and believed that a total of all such aircraft ". . . could exceed 500."[5] Where another estimate in the same year was that the Soviet heavy bomber strength would decline to about 130–175 by 1969, his figure was ". . . at about 200 or somewhat larger."[6] He also believed the Soviets would introduce a follow-on heavy bomber where the other estimate did not, and that instead of a projection of 400–650 medium bombers and tankers for 1969, the figure would be 900. Other differences can be portrayed graphically:

Table 4-2—Estimated Soviet Heavy and Medium Bombers over the U.S.

	1964	1966
Projection 1	250+[a]	100+[a]
ACSI, USAF	500+[b]	400[c]

[a] Two-way missions
[b] One and two-way missions
[c] Type of mission not clear

Table Source: See Footnote 1

Evidence exists of similarly divergent opinions among key intelligence personalities over the Leningrad "ABM" system in 1962. The Director, DIA, ACSI, DA, ACNO(I), ACSI, USAF, and the Director for Intelligence, Joint Staff, believed that the system should not be characterized as one with an operational anti-ICBM capability since this fact could not be substantiated.[7]

All of these examples point to the complexity of reasonably assessing the existing threat posed by various Soviet systems. While other reasons surely existed for the divergent opinions expressed in these cases, our available evidence does not offer an insight into what they might be. It can at least be said that a major variable in dissimilar perspectives was the lack of definite information on the threat, and varying interpretations of that information which existed.

[4] Ibid.
[5] Ibid., 1963.
[6] Ibid., 1963.
[7] Ibid., 1962.

Annex 5

Changing Threat Estimates, 1954–1956

This annex provides a "snapshot" of changing U.S. estimates of the Soviet strategic threat during the 1951–1956 period. The time frame is particularly crucial because of the previously described impetus given to the U.S. air defense system during these years; it also shows early precedents which contributed directly to the post-Sputnik step-up of the U.S. IRBM/ICBM programs. Because of the sources of these estimates, they offer a very real insight into the outlook of the estimators at the time, unbiased by retrospective reflections which may tend to color the salience and potency of the ascribed threats. A total of six major descriptive vehicles are used in this annex to portray the threat:

(1) NSC 5422/1, approved by President Eisenhower on 7 August 1954;
(2) The Robert C. Sprague estimates of July 1954 and their interface with the NSC Net Capabilities Evaluation Subcommittee estimates of fall, 1954;
(3) A USAF-RCAF estimate of fall, 1954;
(4) The Killian Report, spring, 1955;
(5) WSEG Report No. 15 of fall, 1955; and
(6) NSC 5606, June 1956.

Conclusions about the judgments reflected in these documents are assembled in summary fashion at the end of the annex.

1. NSC 5422/1

In the summer of 1954, U.S. Basic National Security Policy (NSC 162) took specific account of the perceived improvements in Soviet strategic capabilities. Approved by the President on 7 August 1954, NSC 5422/1 contained a statement of policy guidelines under NSC 162/2 which appears, in retrospect, to have set the tone and ordained the framework of subsequent U.S. national strategy. These 1954 guidelines built on the view that:

> There have been substantial changes in the intelligence estimates of certain current and future capabilities since the adoption of NSC 162/2 particularly in regard to estimates of increased Soviet nuclear capabilities in weapons and delivery systems. . . .
>
> It is estimated that . . . an increasing fear of Soviet nuclear capabilities will continue to influence adversely the cohesion of our alliances for the foreseeable future. . . .
>
> With the growth both in Soviet nuclear capabilities and in the power of nuclear weapons themselves, in the period 1956–1959, a total war involving the strategic use by both sides of nuclear weapons would bring about such extensive destruction as to threaten the survival of Western civilization and the Soviet regime.
>
> Under the circumstances, the freedom of either side to initiate the use of strategic nuclear bombing against the other may be circumscribed by:
>
> a. The fear of the effects of retaliatory use of such strategic bombing.
> b. The possibility that neither side would gain a decisive military advantage from such an exchange of nuclear blows.
>
> This situation could create a condition of mutual deterrence. . . .

Projected Soviet strategic capabilities for attack caused substantial U.S. efforts to reduce the vulnerability of strategic forces overseas. Concepts of basing changed. SAC mobility plans were put aside in favor of increased procurement of B-52's; basing aircraft in the United States; and providing augmented capabilities for prestrike air refueling and post-strike recovery and staging overseas. The estimated threat foreseen in the capabilities of Soviet Long-Range Aviation also prompted the subsequent development of a counterforce strategy and an effort to reduce SAC vulnerability in the United States by increasing emphasis on, and defense programs for, improved warning, dispersal, ground alert, reflex, and airborne alert. (Section 11, Chapter IV refers to active defense of SAC bases.)

Paradoxically, as the vulnerability of the U.S. strategic deterrent grew as a function of Soviet capabilities, the Eisenhower Administration made strategic air power central to U.S. security policy and strategy. NATO strategy was, in the mid-1950's, made dependent upon the early availability of nuclear weapons in a major military conflict. The burden of European defense shifted and NATO's defensive posture depended less on the U.S. mobilization base than on in-being nuclear ready forces. The credibility of the U.S. guarantee of NATO security became linked to the vulnerability of American strategic forces.

These developments gave rise to an increasing need for judgments on the relative military balance. In the early summer of 1954, the NSC called for preparation of a report assessing the net capabilities of the U.S.S.R., in the event of general war, directly to damage the continental United States and key U.S. installations overseas (NSC 5423). The report, due to be submitted to the NSC on 1 November 1954, was to cover the period through 1 July 1957. Among other factors bearing on the development of the report of the Net Capabilities Evaluation Subcommittee[1] of the NSC was a concern for U.S. second-strike capabilities derived from substantial tornado damage to SAC aircraft in Texas the year before and a recently completed report to the NSC (NSC 143/1) concerning the estimated effects of a Soviet surprise attack on SAC, which had been prepared by a group headed by retired Air Force General Idwal H. Edwards.

2. The Sprague Estimates and the NSC Net Capabilities Evaluation Subcommittee

While the existing U.S. continental defense policy (NSC 5408) built on and repeated earlier intelligence judgments which held that although the Soviets had "a growing capability to launch an aggressive attack on the United States," it was "unlikely that the Kremlin will deliberately initiate general war during the period covered by current estimates," in the spring of 1954, revised Intelligence on Soviet bomber production and special estimates developed for the Net Capabilities Evaluation study caused Robert C. Sprague, a special consultant to the NSC Net Capabilities Evaluation Subcommittee to drastically revise his estimate of the threat to the United States. Sprague considered the continental defense policy inadequate for U.S. security; in July 1954, as a consultant to the NSC, he recommended changes in the current continental defense program (NSC 5408), intended to achieve by 1957 a U.S. air defense objective of 95 percent kill capability against attacking aircraft. Sprague, who was close to Senator Saltonstall, James Killian, and Robert Cutler, visualized the only alternative would be preemptive action by the United States against the U.S.S.R. before 1957. He, therefore, recommended to the NSC in July 1954 that the Net Capabilities Evaluation Subcommittee be directed to include in its November report an estimate of

[1] Subcommittee established by NSC would consist of chairman, JCS; Director of Central Intelligence; Chairman of the Interdepartmental Intelligence Conference; Chairman of the Interdepartmental Committee on Internal Security; Director of Defense Mobilization, the Director of the Federal Civil Defense Administration; and the Chairman, Atomic Energy Commission.

the overall maximum acceptable damage to U.S. cities and key target areas based on assessments of the maximum acceptable number of U.S. deaths and other casualties and the maximum acceptable damage to U.S. military installations and war Industries. He urged adoption of one basic assumption for use in the Subcommittee's evaluation: viz., by 1 July 1957, the Russians will probably be able to attack the continental United States with bombers carrying as many as 80 ten-megaton bombs and 400 sixty-kiloton bombs. (Soviet bombers would include not only the TU-4s, but Type 37 [heavy jet] and Type 39 [medium jet] aircraft in approximately equal numbers.) Sprague recommended that, since it was probable that an adequate U.S. defense against such capabilities could not be obtained by 1 July 1957 without the use of nuclear warheads on air-to-air and surface-to-air missiles, the NSC might wish to direct the Department of Defense to provide for the development of such warheads, to be operational by 1 July 1957. Sprague looked to the possibility of greatly improving U.S. air defense capabilities and visualized very high kill probabilities to result, particularly if the planned U.S. 1957 fighter-interceptor force were equipped with air-to-air missiles with atomic warheads.[2] (While Sprague had been nominated to be Undersecretary of the Air Force in 1953, he turned down the position because it would have required him to give up substantial stock in his company, the Sprague Electric Company.)

Complementing and extending Sprague's thinking, the Killian report in early 1955 also urged adoption of nuclear warheads as the major armament for U.S. air defense systems (already approved by the JCS) and the development, procurement, and deployment of sufficient weapons to provide high kill probabilities by U.S. air defense systems. Killian, like Sprague, stressed the need for more effective defense at low and very high altitudes. Their views conceivably derived from, or were influenced by, the detailed analysis, review, and critique of the "probable Soviet strategy and plan of attack as of mid-1957" which was developed and used during the fall of 1954 by the NSC Net Capabilities Evaluation Subcommittee.

In summary, as the Subcommittee then visualized it the Soviet plan of attack would include the following principal elements:

a. Probable Soviet Strategic Concept

(1) By 1957, strategic air capabilities have increased but not enough to permit the U.S.S.R. to rely on decisively defeating the United States by direct attack. The main weight of Soviet military capabilities (in quantitative terms) would still be geared to a continental strategy.
(2) Highest priorities in timing and allocation of resources, though not in weight of effort, would go to the attack of U.S. and Allied strategic retaliatory power, secondarily to attack other targets in the U.S.
(3) Soviets would be willing to delay mobilization and assembly in forward areas to avoid Allied detection of preparations.
(4) The Soviets would prefer non-nuclear war, but regarded surprise attacks with nuclear weapons against Western strategic installations and forces as a vital first move in any war plan.

b. Soviet Objectives

(1) Protecting the warmaking capabilities of the U.S.S.R. and the Soviet Bloc from Allied attack
(2) Preventing or neutralizing U.S. warmaking potentials
(3) Driving U.S. and Allied forces back from proximity to the Communist power center to the extent that a successful counter offensive would be extraordinarily difficult.

[2] Record Group No. 319, Records of Joint Actions, Department of the Army, Army Staff, DCSOPS, JCS Papers, National Archives Building (hereafter RG 319), JCS 1899/245, 28 September 1955.

c. Soviet Allocation of Resources

Aircraft—Estimated operational long-range air strength 1,400 aircraft. Of these, 900 aircraft would be launched from the Chukotski-Leningrad-Kola areas, backed by 300 refueling tankers launched from the Moscow area. (Light bombers would be committed to a maximum effort against Eurasian targets with range.)

Nuclear—Total Soviet stockpile—800 Crits[3] of fissionable material. Allocations:

(1) D-Day attacks on the United Kingdom and Canada—80 Crits (10%)
(2) D-Day attacks on U.S. overseas installations—100 Crits (16.5%)
(3) D-Day attacks on the continental United States—540 Crits (67.5%)
(4) Reserve for reattack on the United States—40 Crits (5.0%)
(5) Reserve for reattack and support of land battle—20 Crits (2.5%)
(6) Reserve for "political" targets—20 Crits (2.5%)

d. Probable Soviet Plan of Attack on Continental U.S. (Excludes Canada)

Aircraft Launched	Aborts and Gross Errors	Interceptor Kills	AA Kills	Aircraft on Target
763	189	251	245	62 Atomic Bombers
	(25%)	(33%)	(32%)	6 ECM (10%)

Data used by the NSC Net Capabilities Evaluation Subcommittee provided a basis for review by the JCS and military Services because they had furnished much information and input. Mr. Sprague also commented to the NSC on the Soviet strategy and plan envisaged by the Subcommittee. He was increasingly concerned with:

(1) The probability that the Soviets soon would have a significant stockpile of 5–10 MT bombs;
(2) The devastating hazard to unprotected persons of radioactive fallout resulting from ground bursts of multimegaton nuclear weapons;
(3) The growing problem of providing the U.S. air defense system with adequate early warning, interception, and kill of Soviet Type 39 (medium) jet bombers at high altitude.

He had analyzed the Subcommittee data and noted among other basic assumptions used that U.S. GCI, AEWC, and Texas Tower radars and picket ships were expected to have good range capabilities at 50,000 feet against Type 39 aircraft. He pointed out, however, that while the Subcommittee report assumed a 250 NM range capability for those radars at 50,000 feet as of mid-1957, the actual capability would approximate 120 NM at 40,000 feet. He observed that U.S. B-47s regularly overflew U.S. defenses at altitudes above 40,000 feet and were undetected. Sprague also questioned the Subcommittee's assumption that, by mid-1957, 1,400 of 1,725 fighter interceptors programmed to be operational with the Air Defense Command would have the capability for "fighting effectively" at altitudes between 50,000 and 60,000 feet, noting that while the defensive fighters F102A and F86D could reach 50,000 feet and the F89H about 45,000 feet, the latest U.S./UK intelligence assumed that the Type 39 bomber could arrive over the United States at 50,000 feet. Sprague then pointed out that a fighter performing a high altitude maneuver to accomplish an intercept

[3] Assumed to mean "critical masses."

could be expected to lose 8–12,000 feet in attitude. He conceded the possibility that low altitude deficiencies in the U.S. air defense system could be corrected by 1957. Such critiques emphasized the need for detailed analyses of a variety of technical capabilities in net assessments and encouraged the development of different groups for the purposes.

3. The USAF-RCAF Estimate

U.S.-Canadian defense planning also stepped up with the revised 1954 estimates of Soviet capabilities. An approved basis existed in a U.S.-Canadian "Basic Security Plan" (MC 100/9) dating from the summer of 1951. Under it, two recurring documents were called for. These were:

(1) Canada-U.S. Emergency Defense Plan which was a capabilities plan for the employment of such defense forces as were currently allocated. (As of mid-1954, the approved plan was MCC 300/5—-i.e., Military Cooperative Committee 300/5.)
(2) Canada-U.S. Future Defense Analysis, a continuing study of desirable measures for defense of the warmaking capacity of Canada and the U.S. in the period beyond presently approved national defense policy.

During the summer and fall of 1954, the Canadians demonstrated particular interest and concern for continental defense. Based upon the 3rd interim report of the Canada-U.S. Military Study Group dated 23 June 1954, the Canadians proposed the DEW line be established. In addition, they called for seaward extensions for the developing U.S.-Canadian radar nets in order to provide more adequate early warning for Southeastern Canada and the Northeastern United States.[4] Canada showed specific concern for fallout problems associated with active defense against Soviet attack and, in October 1954, called for a joint U.S.-Canadian study of the matter.[5]

During the fall of 1954, the U.S. and Canadian Chiefs of Staff agreed that current intelligence estimates used in 1954 in preparing "Future Defense Analysis," and contained in ACAI, 18 February 1954 ("Agreed Canadian American Intelligence 31 Soviet Capabilities and Possible Courses of Action Against North America in a Major War Occurring in Mid-1958"), had underestimated the Soviet capacity for conducting an air offensive against North America.[6]

To determine the required military characteristics of the DEW line, a reevaluation was needed and they noted that current estimates, in addition, covered the situation only to 1958. They felt it would be necessary to extrapolate the most recent, agreed intelligence, using the best information available, on future Soviet capabilities, and to project these through at least 1965 in order to assist in the development of the DEW requirement and to determine the characteristics needed in that system.

On the basis of the latest U.S. Air Force estimate of the Soviet threat, a combined U.S.-Canadian committee (USAF-RCAF Military Characteristics Committee) soon concluded in the fall of 1954 substantially that:

> High performance jet bombers were available in Soviet operational units. Performance characteristics of these aircraft and numbers available by 1957 would provide a capability for conducting large-scale opera-

[4] RG 319, Enclosure "A," Memo for the Director, WSEG, Subject: WSEG Report No. 15, JCS 1899/251, 15 February 1956.
[5] RG 319, JCS 1899/248, 7 February 1956.
[6] Ibid. This estimate, which included no thermonuclear weapons in its statements of the Soviet nuclear weapon stockpile, provided no data other than mid-1954 and mid-1955 estimated weapon totals and possible yields. It qualified these with the remark ". . . the specified models assumed may be as low as one-third less or as high as twice the figures stated."

> tions with atomic and thermonuclear weapons against all critical target areas in North America. Radar cross-section (head-on) would approximate one square meter. Altitude capability would approach 55,000 feet and the aircraft would have a speed near Mach 1.
>
> Cruise missiles would be available to the Soviet Union in the 1960–1965 period which could threaten North America. Performance characteristics would approximate those of the U.S. missile Navaho. A warning requirement was to have a detection capability against this weapon system up to 100,000 feet.
>
> Soviet intercontinental ballistic missiles would be operational by 1960 and be a major threat by 1965.[7]

4. "Meeting the Threat of Surprise Attack," Technological Capabilities Panel (Killian) Report

Early in 1955, the Science Advisory Committee of the Office of Defense Mobilization submitted a report to the President which had been prepared at his suggestion to consider, from the point of view of science and technology, steps which could be taken to reduce the danger of surprise attack on the United States. A panel, headed by Dr. James R. Killian, Jr., prepared the report, which examined the relative technological capabilities of the U.S. and Soviet strategic attack and homeland defense systems. A specific feature of this report was the provision of a time table which compared anticipated future relative strengths of the United States and Soviet Union. This time table evolved into a period of technological stalemate which might occur as early as 1965 during which both the Soviet Union and the United States would have essentially the same capabilities, in that attack by either side would result in mutual destruction. Both the United States and the Soviet Union would be in a position from which neither could derive a winning advantage. Circulated in the Executive Branch during the first half of 1955, this report influenced U.S. security policy which then closely focused on the question of U.S. vulnerability to surprise attack. The Killian report, entitled "Meeting the Threat of Surprise Attack," stated:

> . . . Clearly the consequences of surprise are so great that every effort to eliminate it is justified.
>
> For the first time in history, a striking force could have such power that the first battle could be the final battle, the first punch a knockout. Thus, surprise takes on a wholly new significance.[8]

The Killian report pointed up current Soviet capabilities for intercontinental attack, stated that critical U.S. targets were relatively few and that "200 nuclear bombs of megaton and kiloton yield . . . could decisively defeat us and . . . a first attack could be fatal if we were surprised and unprepared."[9] After underscoring SAC vulnerabilities, the report specified deficiencies of the U.S. continental air defense system saying:

> The system now sketched out for continental defense is the largest integrated system ever conceived to perform a specific task. It is, unfortunately, not yet being planned as an integrated entity. There exists no agency with both the competence and the authority to do this planning. There is inadequate coordination between operating and development agencies. The development of specific weapons and equipments is often spread through a number of laboratories and contractors with insufficient attention to overall system needs. The procurement and operational introduction of already-developed equipment is slow and cumbersome. Promptness and decisiveness are lost through wide dispersion of the decision-making process.[10]

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[7] RG 319, Tab "A," Background, DCSOPS, Memo for: Chief of Staff, U.S. Army, 11 June 1956, Subject: Continental Defense (NSC 5606) (JCS 1899/272).
[8] RG 319, JCS 1868/584, 3 April 1956.
[9] U.S. intelligence estimates of the Soviet nuclear weapons stockpile at the time generally credited the U.S.S.R. with this level of capability.
[10] RG 319, JCS 1899/278, 1 August 1956.

The Killian report included in its recommendations the development of: (a) U.S. ICBM, and (b) IRBM—(both ship-based and land-based versions), (c) nuclear warheads for air defense weapons, and (d) through intensified efforts, effective low-level and high-altitude defenses. Specific U.S. air defense measures recommended provided for:

(1) Further development of air-to-air and ground-to-air missile systems.
(2) Drastic revision of the function and traditional form of interceptor aircraft in order to fit them as launching platforms for guided missiles.
(3) Strong, balanced programs of theoretical and experimental investigation of problems in the interception and destruction of ICBMs.

The NSC noted and discussed the report on 17 March 1955 and referred it to Executive Branch departments and agencies for study and requested their reports and recommendations by 15 May 1955.[11]

Killian's recommendations for rapid development of strategic offensive missile systems echoed in part the 1954 report of the "Teapot Committee," officially known as the Strategic Missiles Evaluation Committee set up by the Secretary of the Air Force, Harold Talbott, who had been asked by the Secretary of Defense, Charles E. Wilson, to review all U.S. missile programs with the idea of eliminating duplication and determining which systems should be accelerated and which should be dropped. The group was to "prepare a combined comparable analysis of the results of the individual Services' efforts to date in the development of the guided missile."[12] Talbott gave the job to his special assistant for research and development, Trevor Gardner, who decided to get an eminent scientific panel to carry out the missile study. The group set up included scientists of repute like Millikan, Kistlakowsky, and Wiesner plus a number of others under Von Neuman. This panel, using data on weight reduction prepared earlier for the Air Force by Von Neuman, had stated that the ICBM was feasible in the light of the thermonuclear breakthrough and urged a greatly expanded ICBM program. Von Neuman's figures on weights and yields were confirmed in the 1954 U.S. nuclear tests in the Pacific and, the month before Killian's report was submitted, the Air Force awarded Convair a contract for detail design and development of the reconfigured Atlas.

Killian's report, however, appeared to emphasize more the growth of Soviet strategic capabilities and projected a rapid rate of Soviet progress in long-range missiles. Its circulation in early 1955, therefore, gave added impact to the increasing number of intelligence reports and estimates indicating a growing Soviet threat. The Killian report provided another instance of a high-level ad hoc group proposing a variety of priorities for DOD programs and calling for specifically accelerated air defense measures.

5. WSEG Report No. 15—"Continental Defense"

On 4 May 1955, the JCS asked the Weapon Systems Evaluation Group to study the field of continental air defense.[13] Specifically, WSEG was asked: (a) to compare the basic assumptions, conclusions, and recommendations of five recent studies in the air defense field; (b) to analyze the conflicts between these studies and define areas not adequately covered by any of them; (c) to identify "hot spots" requiring special

[11] DOD Report RD 302/4, Subject: Report of the Ad Hoc Group on Low Altitude Aircraft Systems, July 1956, p. 6; Manuscript, Office, Chief of Ordnance Light AA Development Program, 1957, OCMH.
[12] RG 319, Enclosure to JCS 1899/263, 7 May 1956.
[13] RG 319, Enclosure A, JCS 1899/265, 5 June 1956.

action; and (d) to provide the Secretary of Defense and the JCS with WSEG's findings and recommendations, including a proposed continuing program of research and analysis in continental defense.

In its action on this JCS request, in addition to the Killian report, WSEG considered:

(1) A study by MIT, "Defense of North America" (Project Lamplight), 15 March 1955, which looked at the problems of extending outward the continental defense system including the probable role of the U.S. Navy
(2) A RAND study, "Active Air Defense of the U.S. 1954–1960," (R-250), 1 December 1953, which dealt with the attrition the defense system could inflict on a vigorous Soviet air attack carried out during the period 1954–1960
(3) A study by ORO, Johns Hopkins University, "Air Defense of the United States 1956–1965" (ORO-5-534) June 1955, which concerned the Army's contribution to continental air defense during the period with emphasis on the role of surface-to-air missiles in that defense
(4) A study by the USAF Air Defense Command, "Air Defense Requirements, 1954–1960" (ADR54-60), 1 July 1954 which developed requirements in manpower, logistics, intelligence, and research and development and proposed deployments of various weapon systems to defend the United States.

WSEG Report No. 15, "Continental Defense," concluded that the plans to extend the U.S. protective combat zone several hundred miles would be effective only if accompanied by realistic rules of engagement.[14] WSEG noted the need for both operations and requirements plans and pointed out that a formalized, established, and rehearsed air defense decision structure was required to meet the sudden needs of war and to make immediate decisions to initiate defense measures. WSEG also noted the existing disagreements on the location of the seaward extension of the DEW line and called attention to the air defense requirements for rapid handling of peak loads of warning and combat information in the face of possibly sudden surges, system failures, and enemy jamming.[15]

WSEG's report stressed the need for an effective, secure identification (IFF) system and concluded that guided missiles with atomic warheads were the only practicable air defense weapons to destroy, or nullify the fallout from, megaton weapons. The report called for increased high-altitude capabilities for fighters and improved low-attitude capabilities. WSEG considered the U.S. air defense system to be extremely vulnerable to enemy electronic countermeasures and indicated that, because the ICBM threat would be serious by 1960, supporting research for measures to deal with that problem was a particular requirement.[16]

The JCS reviewed the WSEG report, circulated summaries of the five basic documents considered by WSEG, and their comparative analysis as carried out by WSEG. However, the JCS concluded that their objective of establishing a continuing program of research and analysis by WSEG for the purpose of evaluating the distribution of the U.S. national effort and resources between defensive and offensive programs still remained to be realized.[17]

The mid-summer Department of Defense response to the NSC on the Killian report indicated agreement by the JCS and the Secretary of Defense with the ICBM development being made a national effort of the highest priority. The DOD noted the great increase in that program during the preceding year, with an

[14] NSC 5408, the U.S. national policy on continental defense, provided (paragraph 180, revised page 17) ". . . all possible efforts should be made to expedite the equipping of adequate forces with aircraft and missiles which will achieve a high 'kill ratio' before the enemy attack reaches our borders."
[15] RG 319, JCS 1899/281, 23 August 1956 with Note to Holders, and JCS 1899/283, 4 September 1956.
[16] RG 319, Enclosure A to JCS 1899/286, Subject: "Air Defense Requirements for U.S. Overseas Installations," 12 October 1956.
[17] RG 319, SM-902-56, dated 10 November 1956, and CM-400-56, 7 November 1956.

augmentation in planned funds for FY 1955 growing from $32 million to $180 million. DOD also agreed with the proposal for an IRBM program to include both land- and sea-based versions. The DOD response, however, evidenced some concern for the concept of nuclear warheads for air defense weapons. In part, at least, this reflected the Navy and Air Force view that this would affect established priorities; in particular, they believed that provision of nuclear warheads for Nike Ajax, because it would use the gun-type warhead, would be inefficient and reduce the atomic stockpile. (Implicitly the primacy of the offensive requirement for nuclear weapons may have been involved.) The Navy and Air Force indicated in the Spring of 1955 that providing nuclear warheads for Nike Ajax which was then operationally deployed, would compete for critical materials with "more efficient missiles" such as Nike B (Hercules) and Talos.

WSEG Report No. 15 had provided the JCS a variety of conclusions and recommendations that were technical in nature and wide-ranging in their implications for U.S. continental air defense programs. But, despite its evident focus on unresolved potential problems, WSEG 15 did not induce significant action. "Hot Spots" identified by WSEG 15 included (1) the organization of the continental defense effort; (2) defense deployment concepts; (3) information handling and weapons control; (4) weapons performance; (5) countermeasures for enemy ECM; (6) defense against ballistic missiles; and (7) supporting research for air defense.

One specific recommendation proposed that WSEG make an independent evaluation of the SAGE system including its capabilities, vulnerabilities, and its expected role within the overall continental defense structure.

While the review of WSEG Report No. 15 was going on, the Director, WSEG, also submitted a schedule of major studies to the JCS recommending, as a first priority effort, evaluation of the 1960 threat and the SAGE system. In February 1956, they informed the Director, WSEG, of their review and distribution of WSEG 15 and separately, requested WSEG to study the 1960 threat to CONUS and the SAGE system as a first priority and later to analyze:

(1) The effectiveness of surface-to-air and air-to-air missiles;
(2) The implication of fall-out from enemy atomic weapons on defensive weapon systems;
(3) The tactical employment and effectiveness of defense weapons against air-to-surface and intercontinental ballistic missiles; and
(4) Operational degradation of defense weapons by the use of ECM by an attacking force.

Thus, another in a continuing series of U.S. studies and assessments on continental air defense, both in and out of the Defense Department, got under way. Reasons for the continuing pattern and study of and revisions to "approved" programs included the changing intelligence, technological developments and differing interpretations of basic roles, functions and missions.

6. NSC 5606

Current intelligence (Annex D-NIE 11-56) on Soviet nuclear capabilities indicated that the U.S.S.R. might be able to strike a crippling blow at the United States by 1958, even earlier than was recognized to be significant during the course of the NSC Planning Board's 1956 revision of NSC 5408. Structuring from that estimate, the President asked the NSC Net Evaluation Subcommittee to prepare a statement on the effect which the new intelligence might have upon the conclusions contained in the 1955 net evaluation report.

The NSC Planning Board draft statement of policy (NSC 5606) was reviewed and commented on by the JCS in the light of the requirement it posed for an updated national policy statement on continental defense. NSC 5408 was being revised for the "long pull" and would, according to the Planning Board, no longer reflect details but constitute a fundamental policy. In the Planning Board draft, NSC 5606 delimited continental defense more narrowly than before to include only those elements of the U.S. national security structure, essentially defensive in nature, contributing directly to the defense of the North American continent and to the protection of U.S. capabilities to retaliate. Essential elements of U.S. continental defense considered by the JCS to be necessary included:

(1) Protection of U.S. retaliatory capabilities
(2) Improved strategic and tactical warning of enemy attack
(3) Development of an antiballistic missile capability
(4) Establishment of measures to deter covert nuclear attack
(5) Continuity of essential Government and industrial functions, and
(6) Improved and strengthened civil defense programs.

Summary

The central thrust of each of these various estimates can be summarized briefly for an overview of the perceived changing threat during these years. NSC 5422/1 (summer, 1954) revised upward both Soviet nuclear capabilities and available delivery systems. It bespoke the fear of Western allies of these capabilities, and suggested the possibility of an emerging mutual deterrence. If these factors indeed constituted the perception, it was surely not far from this portion of the estimate to its later indication of a U.S. desire for mutually beneficial arms limitation discussions and consideration of means to reduce the likelihood of holocaust.

The Sprague estimates (which received high level support in the summer of 1954) drastically revised his previous threat assessment based on: (a) an increasing Soviet bomber capability, (b) expectations of a large Soviet nuclear weapons stockpile by l July 1957. Sprague's call for a 95 percent kill capability against aircraft was likely a result of the perceived havoc which could be caused by delivery of even a small number of nuclear weapons to CONUS. Thus the concept of an "unacceptable loss" resulting from Soviet attack was different than what would follow later—a small loss was "too much" in this estimate, whereas the loss of millions became acceptable during years to follow because there was no adequate defense against the ICBM threat. While one of Sprague's solutions to the defense problems was nuclear warheads for air-to-air and surface-to-air missiles, the "solution" itself engendered complex population protection problems the likes of which would later plague ballistic missile defense.

The USAF-RCAF estimate (fall, 1954) reinforced the bomber threat to CONUS by anticipating a Soviet capability of attacking all critical U.S. targets with bomber-delivered nuclear weapons by 1957. Since it also suggested that a Soviet ICBM IOC would not occur until 1960 and that these ICBMs would become a threat only by 1965, the midterm threat was primarily an air-breathing one.

The Killian Report of spring, 1955 virtually picked up a ball that had not been successfully carried earlier. While seconding Sprague's estimates of our air defense deficiencies and the need to correct them, it also called for the rapid development of strategic offensive missiles (which had been judged feasible by other efforts listed here). Thus Killian portrayed *both* offensive might and an efficient defense as necessary to counter a rapidly growing Soviet threat.

WSEG 15 (fall, 1955) continued the appreciation for the complex problems of defense against the air-breathing threat in conjunction with the desire for early warning and rapid identification of the enemy. It upgraded the Soviet ICBM threat from that of the USAF-RCAF estimate by proclaiming it as a "serious threat" by 1960, suggesting the shortening distance between 1955 and an ICBM threat.

NSC 5606 (June, 1956) furthered this direction by describing the general threat as even closer downstream than had been anticipated. The focus of air defense was further honed to specific problem areas within it; continued reassessments were thus seen in this chain of estimates.

Four factors characterize these estimates and suggest antecedents to the topics covered in the body of this chapter. First, the Soviet manned bomber threat was revised and enlarged in light of changing intelligence. Secondly, the massive destruction engendered by nuclear weapons suggested the need to provide as close to a 100% defense against delivery systems as possible. Third, ICBMs/IRBMs came to be given the highest priority because of the anticipated threat; and fourth, the drive for detente was strongly impelled by the potential seriousness of nuclear holocaust.

Chapter III

Soviet Air and Defense Strategy

A. Introduction

The evidence which defines the nature and rationale of Soviet air and missile defense strategy is neither specific nor comprehensive. At the same time there is a question as to whether the Soviets themselves are completely clear on the what and why of their strategy. Still, this chapter attempts to define and analyze the what and why. In doing this it successively treats: (1) Soviet behavior in two of the more detailed records which exist; (2) major Soviet decisions in strategic defense to determine the extent to which they reflected or shaped strategy; (3) the major factors, based on the foregoing evidence, which appeared to shape strategy; and (4) a synthesis of the strategy.

B. Studies of Behavior

1. Introduction

The factual record for the period from 1955 to 1972 as to why the Soviets behaved as they did in developing their air and ballistic missile defenses is painfully thin. There are, however, several kinds of records which can be examined to see how the Soviets behaved. Three records, in particular, lend themselves to analysis, and in each case the data base is drastically different from the others.

The first record is the series of issues of the Top Secret Soviet journal *Military Thought* which was provided by Col. Oleg Penkovskiy. This record spells out the details of a major debate among the Soviet military on the conduct of modern war and the organization for it. The second record is the open press and radio account of Soviet public statements with regard to the question of antiballistic missile defense. We will examine these two sources in turn for the purpose of drawing tentative conclusions about the decisive factors that dictated Soviet air defense behavior. The third record, related in detail in Chapter V, draws upon most diverse sources and is the account of what the Soviet did physically in shaping each component of their air and missile defense forces.

2. The Great Debate In Military Thought

a. Introduction

The Penkovskiy reports provided a unique window for examining the Soviet military establishment of the 1960–1962 time frame. One of the more interesting parts of the reports from Penkovskiy consisted of a special Top Secret series of issues of the Soviet military journal *Voyennaya Mysl'* (Military Thought). The series served as a forum for debating the current and future needs of the Soviet Armed Forces and the doctrine for their employment. The authors of the articles were mostly in the grade span from colonel through general, although some marshals (for example, Chief Marshal of Artillery S. Varentsov and Marshal of the

Soviet Union R. Malinovskiy) also participated. Thus, those involved in the debate were clearly prestigious high-ranking officers of broad experience. The time was also a critical one. The Soviet Armed Forces had experienced heavy cuts and were undergoing major organizational changes. Missiles and nuclear warheads were being distributed throughout all of the offensive forces. The extensive deployment of surface-to-air missiles was changing the face of air defense. The problem of combating offensive ballistic missiles with defensive antiballistic missiles was adding the dimension of missile defense to what had previously been simply a requirement for air defense. The Berlin issue, stewing since 1958, had reached crisis proportions in 1961. Khrushchev had loosened up things in the military with his changes. If ever there was a time in Soviet history for debate over military roles and missions, this was it. If ever there was a time for thoughtful and innovative approaches which would help in the assimilation of the new weapons and concepts and save resources in the process, this was also it. But, as will be evident, with respect to air and missile defense the great debate was mostly a non-debate.

No single article of the series dealt comprehensively with the subject of the air and missile defense of the country. Two articles discussed antimissile defense in general, but did so mainly in light of foreign sources. Most of the attention devoted to air defense went to problems of air defense of theater forces. For these reasons, problems of national air and missile defense received mostly tangential treatment.

b. Main Issues

Four main issues were drawn:

(1) The future requirement for fighters in light of surface-to-air missile capabilities;
(2) Delineation of zones of operation for fighters and surface-to-air missiles;
(3) The possibility of gaps upon the movement of air defense elements of field forces out of the country;
(4) Gaps in defense against low altitude targets and targets in the stratosphere and space.

c. Fighters or SAMs?

Some controversy occurred over the future role of aircraft and surface-to-air missiles, and it started with an article by Col. Gen. A. Gastilovich in the first issue of the special series. In this article, he stated the case for missiles briefly and bluntly:

> The principal antiaircraft defense of troops and the country must be an automatic system of antiaircraft missile installations of various ranges which could cover, not installations, but separate large areas, and could resolve the task of protecting both the troops and the territorial installations of the country (in these areas). Separate antiaircraft defense of troops, except for the self-defense of small subunits mentioned above, appears to us to be an antiquated tradition. Fighter aircraft aviation within the system of antiaircraft defense will also become archaic in the near future. It is needed only until antiaircraft missiles have achieved the necessary technical perfection.[1]

On the other hand, there were also the defenders of fighter aviation who saw a continuing, but not exclusive, role for it. Lt. Gen. of Aviation N. Ostroumov and Maj. Gen. of Aviation M. Kozhevnikov, although speaking of frontal aviation, made a point which applies equally to the fighters of the National Air Defense Forces: "The role of Front Fighter Aviation is increasing even more with the delivery of the newest types of supersonic fighters armed with air-to-air missiles. In essence, these aircraft represent flying antiair-

[1] Gastilovich, A. "The Theory of Military Art Needs Review," *Voyennaya Mysl'* (Military Thought), Top Secret First Issue, 1966, p. 19.

craft guided missile batteries capable of executing a deep maneuver into enemy dispositions and destroying enemy missile delivery aircrafts before they release 'air-to-surface' missiles."[2]

Another defender of the fighter aircraft was Col. Gen. of Aviation S. Mironov. After a detailed discussion of the shortcomings of the air defense missiles at the time (short range, comparatively weak protection against jamming, and large limitations of a design nature in the launching of missiles),[3] he noted that:

> Modern fighter aircrafts armed with missiles of the "air-to-air" type also possess a high probability of target destruction (0.8 to 0.9) and can destroy one aircraft or one cruise missile of any type in one attack. Thus, the modern fighter, in essence, has become a highly maneuverable flying air defense guided missile launching mount, while retaining its most valuable and most important quality—the high probability of target destruction.[4]

Such was the general tenor of the debate over fighters versus SAMs. The arguments were not too deep and not well buttressed. Missiles at this early stage clearly had their limitations and, regardless of their potential, did not offer the possibility of immediate replacements of fighter aircraft. Subsequent events have reflected a practical, albeit expensive, solution to the problem. The number of aircraft in fighter aviation has gradually declined, while the number and kinds of air defense missiles have continued to increase. The supporters of fighter aircraft did not suggest the decline, although they might very well have done so. The subsequently realized possibilities for improved range, avionics, and armament could have been suggested with the admission that improved destructive power and capability for massing would mean a requirement for fewer aircraft.

d. Zones of Operation

The problem of closely coordinating the use of surface-to-air missiles and fighter aircraft can be an emotional one in which the missile personnel feel they are being unnecessarily restricted in their employment because of fighter safety procedures, whereas the pilots can feel their lives are in danger from friendly but inadequately controlled missile defenses. Actually, the debate in the special series centered not on whether there should be close coordination but rather on how it should be accomplished. One article by Lt. Gen. V. Razuvayev and Col. M. Yegorov took a positive approach, noting that experience gained from exercises conducted by the National Air Defense Forces had confirmed the feasibility of coordinating use of antiaircraft missile troops and fighter aviation in the same zone. They pointed out that in exercises of the North Caucasus Air Defense Army in 1960 such coordinated operation was safe and feasible if certain conditions were observed, namely: "radar stations for target detection and direction of antiaircraft guided missiles must provide identification and separate observation of fighters and targets, while fighters must terminate their attacks against air targets at distances exceeding . . . several times over the lethal radius of antiaircraft missiles (not less than 1,000 meters)."[5]

A more critical view was expressed by Marshal of the Soviet Union V. I. Chuykov and Gen. M. M. Popov. They wrote:

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[2] Ostroumov, N., and Kozhevnikov, M., "Aviation Operations in an Initial Front Offensive," *Voyennaya Mysl'* (Military Thought), Secret Fifth Issue, 1961, p. 3.
[3] Mironov, S., "Several Questions on Evaluating the Effectiveness of the Basic Means of Antiair Defense of a Front," *Voyennaya Mysl'* (Military Thought), Top Secret First Issue, 1962, p. 8.
[4] Ibid., p. 8.
[5] Razuvayev, V. and Yegorov, M., "On Zonal Protection of Troops and Installations in the Operational Rear Area by the Forces of Antiaircraft Missile Units of a Front," *Voyennaya Mysl'* (Military Thought), Secret Third Issue, 1962, p. 14.

> The coordination . . . was carried out essentially by distributing their efforts [of a front's air defense troops and the fighter aviation air army] through the zones of operation. . . . However, three of the four zones of operation in the air were located within the limits of the killing divisions of the antiaircraft missile units covering the first operational echelon. In a combat situation such organization of coordination would have led to the destruction of our own fighters. Furthermore, it is not advisable because of the small capabilities offered by the limited fighter forces assigned to duty in these zones.[6]

e. Gaps in Capabilities During Movement

The problem of possible gaps in air defense coverage during the initial phase of a war was brought up in a number of articles. Although the point was not expressed, it seems that there was some confusion over the extent to which tactical air defense forces were needed to contribute to the national air defense system and to what extent their presence, even temporarily, represented a bonus to national air defense.

In reviewing the Carpathian Exercise of July 1961, Marshal Chuykov criticized the lack of planning which allowed the development of a gap in air defense: "In planning the operation, it should . . . have been taken into account that when the troops turn to the offensive, the air defense means of the armies and of the divisions will go forward together with the troops, and the antiaircraft defense of the front rear area will weaken."[7]

In another article, Maj. Gen. Yu. Novikov pointed out the contradictory views of high-ranking officers, noting that Marshal of the Soviet Union S. Biryuzov "considers that toward the end of an offensive operation, a significant gap may occur between organic air defense and National Air Defense," whereas Marshal of Artillery V. Kazakov, "indicated that in reality no gap arises."[8]

Still another writer saw the problem of providing air cover for tactical forces during movement as being mainly the task of the National Air Defense Forces.[9] Although this writer was reflecting the normal concern of an army commenter for his formations, at the same time the likelihood that aircraft attacking strategic targets inside the U.S.S.R. would strike at columns of troops moving along a highway would have to be considered very remote.

f. Altitude Gaps in Coverage

At a time when the Soviet SAM capabilities consisted mainly of the SA-1 and SA-2, there were obvious high and low altitude gaps in coverage which were identified by some authors. The requirement for low altitude SAMs was not pushed very strongly. One author, Lt. Col. Ye. Ryvkin, noted the need for antiaircraft missile systems for use against low altitude targets; however, he did not discuss the problem in any detail.[10] Another pair of officers, Lt. Gen. of Aviation S. Sinyakov and Maj. Gen. of Aviation M. Kozhevnikov, examined the employment of aviation in the new stage of development of the Soviet's Armed Forces and came up with some conclusions regarding the employment of Soviet strategic bombers which led to parallel conclusions with respect to air defense:

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[6] Chuykov, V. I. and Popov, M. M. "Critique of the Front Two-Stage Operational-Rear Area Exercise Conducted in July 1961," Top Secret report of the Ministry of Defense, Moscow, 1961, p. 90.
[7] Ibid., p. 89.
[8] Novikov, Yu., "Defense of the Operational Rear," *Voyennaya Mysl'* (Military Thought), Top Secret First Issue, 1962, pp. 10–11.
[9] Stepshin, P. "On Regrouping a Combined Arms Army from the Depth of the Country," *Voyennaya Mysl'* (Military Thought), Secret Sixth Issue, 1961, pp. 21–22.
[10] Ryvkin, Ye., "Some Pressing Problems of Antiair Defense of the Country," *Voyennaya Mysl'* (Military Thought), Secret Sixth Issue, 1961, p. 4.

> One of the main conditions for fulfillment of tasks by long-range and strategic bombers, as regards the destruction of targets in the enemy rear areas, is their successful overcoming of enemy air defense means. Wide use of low flight altitudes by bombers and the use of passive and active jamming are highly effective. It was determined during training exercises that the percentage of aircraft attacked by enemy fighters in daylight at high altitudes was 5 or 6 times greater than at lower altitudes and at night it was quite insignificant. Destruction of aircraft by guided antiaircraft missiles during low altitudes flights is limited by the combat characteristics of the antiaircraft missiles. Thus, absolutely clear-cut determination was made of the direction of the use of existing long-range and strategic bombers against targets located in theaters of military operations—at night and at low altitudes. Low altitudes are becoming the basic operational altitudes for long-range and front aviation. [For this reason] It is advisable to assign low altitudes to [air defense] fighters wherever guided missiles are still limited in their operation.[11]

In the stratosphere and in space a different kind of problem was identified. In an article on the organization of antimissile defense, Col. N. Maksimov and Col. V. Savko noted that "the ability of modern attack weapons to deliver strikes from low levels, from the stratosphere, and in the near future, from space has produced a need for broadening the scope of air defense. Air defense is developing into air defense and space defense."[12]

g. Other Possible Issues

Numerous other issues suggest themselves as logical candidates for treatment in the debate, and the fact that they were not examined reflects the shallowness of what was actually done. The basic problem is that despite the long Soviet history of having a national air defense organization, there was a lack of an overall perspective in the way in which the problem of strategic defense was treated. This was true with respect to air defense, the combined problem of air and missile defense, and the even larger problem of the coordination of strategic offense as an active offensive means of strategic defense and of civil defense as a passive means of strategic defense.

There was little discussion of specific foreign strategic offensive capabilities and what was needed to cope with them. Here there was an obvious need to understand the strengths of the foreign offensive systems and the related weaknesses of the Soviet defenses. Instead, the Soviet analysis was primarily internally oriented and was focused on the improvement of the functioning of strategic defense.

There was little analysis of the future threat to strategic defense as reflected in the trends and possibilities for the development of strategic offensive capabilities, a subject which could have been examined both in terms of foreign and Soviet programs.

There was no discussion of the proper mix of surface-to-air missiles and fighter aircraft. This was despite the fact that the deployment of the SA-2 was still in progress during the period of the debate—which meant that there was only limited practical experience from exercises on how well the two kinds of weapons systems were complementing each other. Future projections of developments in surface-to-air missile range and in the range, avionics, and armaments of fighter aircraft could easily have suggested forthcoming shifts in the SAM/fighter mix.

h. An Assessment of the Debate

Several hypotheses suggest themselves as explanations for the shallowness of the debate:

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[11] Sinyakov, S. and Kozhevnikov, M., "The Air Forces in the New Stage of Development of the Soviet Armed Forces," *Voyennaya Mysl'* (Military Thought), Top Secret Third issue, 1960, pp. 18–19.

[12] Savko, V. and Maksimov, N., "The Organization of Antimissile Defense," *Voyennaya Mysl'* (Military Thought), Top Secret Issue, 1962, p. 2.

(1) Serious debate was not a customary thing for the military and therefore was not something which was easily joined even when authorized and encouraged;
(2) No real debate was desired and the exercise was simply a pro forma thing;
(3) Soviet strategic defense concepts and capabilities were so well defined and established that there was no need to debate them;
(4) Inadequate information hampered the conduct of debate;
(5) It was not intended that strategic defense receive much attention in the overall debate.

Which of these hypotheses or others might have been the explanation is difficult to say. One fact is that there has not been any evidence of any prior or subsequent debate with such extensive involvement of high-ranking officers. There could have been some concern about criticizing the system although such a concern apparently did not reside in Gen. Gastilovich. At the same time, Gen. Gastilovich was advocating solutions which could well have been popular with Khrushchev—which would allow him to be a bit more outspoken than his fellow debaters. From the nature of the participants and the demands of the time it seems likely that the debate was supposed to be sincere. The points which were made in the debate, limited as they were, suggest that Soviet strategic defense concepts did need some sharpening and that this fact was recognized. Some of the writers were able to buttress their arguments with hard facts which suggests that many facts were available for those who sought them out. At the same time, some issues—for example, ABMs—were apparently sensitive from a security viewpoint, and few hard facts were presented. Much more attention was devoted to air defense of the front than to national air defense, although the latter subject was by no means ignored. In any case, there is no clear-cut explanation for why the debate was no better than it was.

i. Conclusions

The conclusions which derive from the unique window which the special series provided for examining classified Soviet military writings relate more to what was not said than to what was said.

Based on the lack of serious debate over air defense roles and missions at what should have been a time of searching for solutions to a host of new problems, it seems unlikely that there is much tradition of meaningful debate among the Soviet military. There was also little sense of a strong push from the military for the improvements of military capabilities.

There was little indication of an awareness on the part of the military of a strong interaction with the United States in relation to air and antiballistic missile defense capabilities. Although there was some identification of U.S. weapons systems, there was little indication of difficulties to be anticipated in coping with either then current or future U.S. capabilities. In fact, a security device which was frequently used was to discuss problems—ballistic missile defense, for example—in terms of U.S. efforts, with a thinly veiled implication that Soviet programs, although too sensitive to discuss, were substantially better.

There was a lack of concern over resource limitations. Issues were debated in light of their merits in terms of requirements and capabilities and not with respect to possible resource constraints.

3. Public Statements on Antiballistic Missile Defense Capabilities

a. Introduction

Soviet public statement on their antiballistic missile defense capabilities provide an interesting record of behavior in which public assertions frequently diverged from reality. Prior to the U-2 incident of May 1960, the Soviet public statements dealt primarily with the impossibility of defense—specifically by the

U.S. and implicitly by the Soviet Union as well—against strategic offensive missiles, which had been incorporated into the Soviet military arsenal.

The public record of Soviet antimissile program statements traces back to 1956 when the prominent Soviet physicist Peter Kapitsa argued in *New Times* against the development of antimissile weapons on grounds of their exorbitant cost and the inevitable stimulus it would give to the arms race. While granting that the technological prospects for creating an antimissile program were favorable, Kapitsa called for the establishment of international conventions to prohibit the possibility of the creation of effective means of defense.[13]

Triggered by a Khrushchev remark at the Rumanian party congress in June 1960,[14] Soviet statements fell into three periods of increasingly greater claims and then subsided as the practical accomplishments fell short of what were probably the initial expectations and Soviet policy moved in the direction of negotiation. The first period after the Khrushchev remark involved a series of intimations that the Soviet Union was engaged in an antiballistic missile defense program. The next period was initiated by Defense Minister Malinovskiy's assertion at the 22nd Party Congress in October 1961 that the Soviet Union actually possessed an antimissile defense capability.[15] The third period was highlighted by Malinovskiy's statement in late October 1962 that the U.S.S.R. had now deployed an operational antiballistic missile defense system.[16]

Each of the major Soviet disclosures either coincided with or closely followed periods of heightened tensions in East-West relations—periods during which the credibility of Soviet military capabilities was brought into question. Khrushchev's statement in June 1960 was in direct response to the U-2 incident the previous month. Malinovskiy's claim at the 22d CPSU Congress was made during a period of aggravated international tensions connected with the Berlin crisis and closely followed official U.S. statements that the strategic power balance was overwhelmingly in favor of the United States. And Malinovskiy's claim on 25 October 1962 regarding operational deployment of an antimissile defense system was made at the height of the Cuban missile crisis.

Since the latter part of 1962, the Soviet public discussion of an antimissile defense capability has been characterized on the one hand by allegations that an antimissile system is currently operational but limited in scope, and on the other hand by assertions that only prototypes of an antimissile weapon have been developed.

b. Initial Allusion to an Antimissile Weapon

As in other Soviet claims to the development of new types of weapons, the early claims to possession of an antimissile weapon seemed couched in terms intended for maximum psychological effect. Following the destruction of the American U-2 aircraft in May 1960, Khrushchev for the first time publicly alluded to a Soviet antimissile capability. Speaking at the Rumanian party congress on 21 June 1960, he commented at length on the downing of the U-2 and declared that "if other methods of espionage are applied, they also will be paralyzed and rebuffed." Khrushchev's vague remark was translated into more specific military terms in an article by legal expert G.P. Zhukov in the October issues of *International Affairs*. Zhukov recalled the

[13] Kapitsa, Peter in *Novoye Vremya* (New Times), No. 39, September 1956, translated in *FBIS Propaganda Report*, 10 February 1967, pp. 1–2.
[14] *FBIS Propaganda Report*, 10 February 1967, p. 7.
[15] *FBIS Propaganda Report*, 10 February 1967, p. 9.
[16] *Krasnaya Zvezda* (Red Star), translated in *FBIS Propaganda Report*, 10 February 1967, p. 20.

remark and asserted that the U.S.S.R. possessed the capability to "paralyze U.S. military espionage both in the air and in outer space."[17]

Contradictory Soviet statements made before and around the time of Khrushchev's remark and the Zhukov article suggested that Zhukov's language was contrived to imply a capability that did not in fact exist. At the January 1960 Supreme Soviet session, Marshal Malinovskiy stated categorically that it was as yet "impossible" to destroy ballistic missiles in flight.[18] In an off-the-cuff remark to reporters in New York later that year, on 25 September, Khrushchev in effect confirmed Malinovskiy's statement by conceding that "there is as yet no way to control outer space."[19]

In the fall of 1960, at about the time Soviet spokesmen began modifying their description of strategic rocket weapons from "invulnerable" to "practically invulnerable," there were signs of a serious attempt to incorporate the concept of an antimissile defense into Soviet military doctrine. Writing in *Red Star* on 18 November 1960, in what appeared to be one of the first Soviet statements on the importance of antimissile weapons in a future rocket-nuclear war, military theorist S. Krasilnikov emphasized the "Extremely great significance" of "antimissile defenses" in combating the enemy's "nuclear-missile and rocket-carrying forces."[20]

On 5 September 1961, Khrushchev publicly disclosed that Soviet scientists had been engaged for some time in the development of an antimissile defense capability. In an interview with Sulzberger of the *New York Times*, Khrushchev answered a question on Soviet antimissile capabilities with the guarded statement that "at the time we told our scientists and engineers to develop intercontinental rockets, we told another group to work out means to combat such rockets." As for successes achieved in rocket technology, Khrushchev expressed "great satisfaction" with ICBM development but stated simply that he was "very satisfied" with progress made in the development of an antimissile weapon.[21]

c. Claims to an Antimissile Capability

Marshal Malinovskiy's statement at the 22nd CPSU Congress on 23 October 1961 that "the problem of destroying rockets in flight has also been successfully solved" was the first direct Soviet claim to the achievement of an antimissile weapon. Seemingly calculated to imply a more advanced operational system than could be claimed in fact, this statement became the standard official formulation on Soviet antimissile capabilities for the next year. At the same time, during the course of 1962, new elements began to appear in the propaganda which suggested the perfection of a fully operational system, now referred to by military spokesmen as antimissile "systems" or "complexes." Another new element was the designation of the "antiair and antimissile defense forces" as an independent "type" of the armed forces—nomenclature which implied the reorganization of the former antiair defense forces to reflect an enhanced role for the antimissile forces.[22]

In a *Kommunist* article detailing Soviet defense capabilities in the spring of 1962, Malinovskiy referred to the "armament" and "combat training" of the "antimissile defense forces," which, he claimed, guaranteed

[17] Zhukov, G. P., in *International Affairs*, No. 10, October 1960, translated in *FBIS Propaganda Report*, 10 February 1967, p. 7.
[18] *FBIS Propaganda Report*, 10 February 1967, p. 5.
[19] *FBIS Propaganda Report*, 10 February 1967, p. ii.
[20] Krasil'nikov, S. *Krasnaya Zvezda* (Red Star), 18 November 1960, translated in *FBIS Propaganda Report*, 10 February 1967, p. 7.
[21] *FBIS Propaganda Report*, 10 February 1967, p. 8.
[22] Ibid., p. 9.

"a successful repulse of an attack of an adversary from the air."[23] Several months later, in a speech to the World Congress on General Disarmament and Peace on 10 July, Khrushchev cited Soviet possession of an antimissile weapon in the context of ridiculing the ongoing U.S. reevaluation of the U.S.-Soviet strategic power balance that had been initiated the previous October. Khrushchev said that any reassessment of the balance of forces must take into account not only the high megaton yield of Soviet nuclear warheads and the Soviet Union's possession of ICBMs and "practically" invulnerable "global" rockets, but also Soviet development of an "antimissile missile." Elaborating on the newly claimed antimissile capability to American journalists a few days later, Khrushchev declared that the Soviet "antimissile means" can "hit a fly in outer space." Only concern about world public opinion, he said, prevented him from showing a "documentary film of an antimissile in action" to the world disarmament congress.[24]

d. Operational Deployment of ABM Claimed

At the height of the Cuban missile crisis on 25 October 1962, *Red Star* published an account of Malinovskiy's speech to a military ideological conference which contained the first explicit Soviet claim to operational deployment of an antimissile defense system. Malinovskiy stated that "complexes of numerous means" for defense against rocket attack had been "developed" and "built."[25]

Subsequent propaganda treatment of antimissile defense capability was inconsistent and on several occasions seemed to diverge from Malinovskiy's claim. Writing in *Red Star* on 4 December 1962, strategic rocket troops commander Marshal Biryuzov reiterated Malinovskiy's 22d CPSU Congress formulation on successfully solving the problem of destroying rockets in flight, but stopped short of claiming the actual deployment of antimissile weapons. Biryuzov simply stated that "complexes of numerous means" for defense against rocket attack had been "worked out."[26] In an article on 22 February 1963, however, Biryuzov repeated Malinovskiy's October 1962 formula.[27]

An Armed Forces Day statement by Marshal Rotmistrov on 23 February 1963 not only placed in question the credibility of assertions regarding the deployment of an antimissile system, but implicitly challenged existing Soviet technological capabilities. Playing on Malinovskiy's congress formulation, Rotmistrov asserted that the "successful solution of the problem of destroying enemy rockets in flight is of the greatest importance." Rotmistrov implied that while the problem of developing an effective antimissile capability was of the "greatest importance," it had yet to be solved.[28]

While some military spokesmen during 1963 and 1964 professed confidence in Soviet antimissile capabilities by citing Malinovskiy's claim to an operational system, others implied that only a prototype of an antimissile weapon had been developed. Commenting on the military hardware display during the October anniversary parade in November 1963, Marshal Biryuzov intimated that the antimissile weapon that was publicly viewed for the first time was simply one in a "family" of antimissiles still in a developmental stage and requiring further "perfection."[29] Another military commentator, Major General Baryshev, writing in *Red*

[23] Malinovskiy, R. Ya. in *Kommunist* (Communist), No. 7, translated in *FBIS Propaganda Report*, 10 February 1967, p. 17.
[24] *FBIS Propaganda Report*, 10 February 1967, p. 18.
[25] Malinovskiy, R. Ya. in *Krasnaya Zvezda* (Red Star), 25 October 1962, translated in *FBIS Propaganda Report*, 10 February 1967, p. 20.
[26] Biryuzov, S. S. in *Krasnaya Zvezda*, 4 December 1962, translated in *FBIS Propaganda Report*, 10 February 1967, p. 21.
[27] *FBIS Propaganda Report*, 10 February 1967, p. 25.
[28] Ibid., p. 26.
[29] Ibid., p. 27.

Star on 13 November 1963, implied the same thing by invoking Western views on the problems connected with developing an antimissile weapon. He quoted one observer as noting that it was the "system," not the antimissile itself that was involved, and he implied that the U.S.S.R. had accomplished the technological feat of creating the system.[30]

Diverging from these carefully qualified statements on Soviet antimissile capabilities, other prominent military spokesmen claimed that the deployment of an "invulnerable net" of antimissile weapons "reliably protected" the entire country from missile attack. In an article in *Izvestiya* on 5 January 1964, PVO commander Marshal Sudets implied that the Soviet antimissile capability was based on the detonation of nuclear devices in the atmosphere: "Rockets with nuclear warheads of various strengths have considerably increased the combat capabilities of the antiaircraft rocket troops."[31] By its emphasis on increased U.S. budgetary outlays to antimissile development programs, the Sudets article could also be read as a special-interest argument for preferential treatment of similar programs in the Soviet Union.

A major two-part theoretical article in *Red Star* in late August 1964 by Marshal Sokolovskiy and Major General Cherednichenko suggested that, at least for the present, the most effective defense against missile attack was the threat of an effective retaliatory capability. Citing Defense Secretary McNamara's statement to the effect that ICBMs must be "fired in salvoes" to penetrate enemy defenses, Sokolovskiy and Cherednichenko countered with the claim that there would be a "no less powerful salvo" of Soviet strategic rockets. And in discussing the methods of conducting the armed forces under nuclear war conditions, they implied that while Soviet antimissile forces would play a definite role in intercepting and destroying enemy rockets in "various sectors of their trajectories," this capability had yet to be translated into operational terms: "Even now the development level of antimissile means makes it possible to pose and successfully solve complex problems such as the destruction of the enemy's attacking ballistic rockets."[32]

e. More Restrained Claims

Since early 1965, the statements of Soviet military spokesmen have reflected a greater effort to define more precisely the scope of the alleged antimissile defense capability. In contrast to the expansive and open-ended claims of earlier years, the statements of military leaders during the past few years have suggested that antimissile weapons have been deployed only in certain areas of the Soviet Union. In his Armed Forces Day speech on 22 February 1965, Malinovskiy asserted that the U.S.S.R. possessed antimissile weapons capable of destroying "any" enemy ballistic rockets "at immense distance" from "defended installations."[33]

Statements alluding to a limited deployment of antimissile weapons have been accompanied by other references to "recent" but unspecified developments which are said to have enhanced the defense capabilities of the antimissile forces. In his speech to military graduates on 3 July 1965, Brezhnev became the first top Soviet political leader to refer directly to an antimissile capability. Pointing to Soviet achievements in developing an antimissile weapon, Brezhnev stated that "it has been possible recently to make important steps which sharply increase their effectiveness."[34]

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[30] Baryshev, I. in *Krasnaya Zvezda*, 13 November 1963, translated in *FB1S Propaganda Report*, February 1967, pp. 28–29.
[31] Sudets, V. A. in *Izvestiya*, 5 January 1964, translated in *FBIS Propaganda Report*, 10 February 1967, pp. 31–33.
[32] Sokolovskiy, V. and Cherednichenko, M. I. in *Krasnaya Zvezda*, 28 August 1964, translated in *FBIS Propaganda Report*, 10 February 1967, p. 35.
[33] *FBIS Propaganda Report*, 10 February 1967, p. 39.
[34] Ibid., p. 43.

Both Malinovskiy's claim to a limited antimissile defense system and Brezhnev's assurance of recent successes in that field became the standard propaganda formulations until the 23d CPSU Congress. In his congress speech on 2 April 1966, Malinovskiy introduced yet another qualifier regarding Soviet antimissile capabilities that tended to obscure earlier claims. He asserted that the U.S.S.R.'s antiaircraft defenses insured the "reliable" destruction of "any" aircraft and "many" rockets.[35] Whether Malinovskiy's statement was intended as a clarification of earlier claims to a limited deployment of antimissiles or whether it was designed to imply that even areas within the antimissile network were vulnerable to missile attack remains unclear. It is noteworthy, however, that shortly after the congress and in his last public statement as commander of the PVO, Marshal Sudets returned to the unqualified claim characteristic of the earlier period. Writing in *Soviet Russia* on 19 April 1966, Sudets stated that Soviet antiaircraft defenses ensure the destruction of "all" means of air attack under any conditions. In the same context, however, Sudets emphasized that only certain "protected areas" and "objectives" were defended by an antimissile system.[36]

An unusually explicit acknowledgment of the vulnerability of Soviet territory to missile attack was contained in an October 1966 interview of Marshal Chuykov, head of Soviet Civil Defense. Seemingly on behalf of his own institutional interests, Chuykov asserted that despite the high level of preparedness of the Soviet Armed Forces, "there is no complete guarantee that a portion of the enemy's means of mass destruction will not reach the target."[37]

f. A Period of Reticence

In contrast to numerous references to the U.S.S.R.'s antimissile defense capability which continued in a restrained form until early 1968, a two-year period ensued in which there were very few public comments on the subject. This was undoubtedly part of Soviet preparations to engage in strategic arms limitation talks and a reflection of concern not to disrupt matters once the talks had begun.

A brief flurry of statements occurred in February 1970 on the occasion of Soviet Armed Forces Day when several military spokesmen referred to Soviet antimissile defense capabilities. After this the reticence to speak on the subject resumed and continued through 1972.

g. Conclusions

The record of what the Soviets actually did in developing and deploying antiballistic missile defenses (see Chapter V.B.3 on ABM Systems) bears but limited relationship to the public statements. The public declarations had a high propaganda content and were designed to convey to both foreign and domestic audiences an image of Soviet strength and inviolability.

C. Major Decisions

1. The Role of Major Decisions

On the surface it would seem appropriate to ask what were the main decisions which shaped Soviet air defense strategy. The problem is that the Soviet strategy did not really change during the period from

[35] Ibid., p. 50.
[36] Sudets, V. A. in *Sovetskaya Rossiya* (Soviet Russia) 19 April 1966, translated in *FBIS Propaganda Report*, 10 February 1967, p. 50.
[37] Chuykov, V. I. in *Sovetskaya Moldaviya* (Soviet Moldavia), 28 October 1966, translated in *FBIS Propaganda Report*, 10 February 1967, p. 54.

1955 to 1972. Instead, Soviet decisions on strategic defense reflected a technologically more sophisticated continuity of Soviet strategy rather than the change of its direction. The setting, therefore, for an examination of the role of "decisions" is the strategy which existed at the beginning of the period.

By 1955 the strategy which had emerged was typically Russian. It was to defend in depth with the use of massive forces. Geography and technological limitations had combined with the nature of the perceived threat to dictate the solution. The area to be defended was huge; the border to be protected was long; and there were no overseas bases from which forces could be committed, offensively or defensively, to frustrate an attacking force before it could approach the Soviet frontier. The limited range of the available fighter aircraft also meant that it was not possible to use them to achieve a significant outward extension of a defensive barrier and that any attempt to create a barrier force along the frontier would fail because of an attacker's ability to mass his forces and penetrate the frontier at selected points. And, the threat, since it could come from virtually any direction, dictated that the defense be focused on protecting key centers and facilities.

A commitment had been made to the development and deployment of technologically more and more advanced weapons systems and this had become institutionalized in Soviet industry. The rate of introduction of the new weapons systems was extremely rapid, the conversion to jet fighters being accomplished completely in about five years.

The concept of an integrated defense had also been institutionalized with the creation of the National Air Defense Forces as a separate major component of the armed forces, although at this stage there was still much emphasis on decentralized execution of operations.

In concept the desirability of zonal or area defense had been accepted although the limited capabilities of the available weapons systems and the dispersion of many of the targets to be defended dictated that in practice a point defense would still be frequently employed.

The massive commitment of resources to strategic defense also signified acceptance of the idea that defense was useful and that the possession of a deterrent offensive capability alone would not be enough. At the same time the commitment of huge resources to theater forces for employment in Europe signified a joint strategy of holding Europe hostage to the theater forces in conjunction with strategic defense of the homeland.

Against this backdrop there were six major strategic defense decisions which ensued. They were:

(1) The decision to deploy surface-to-air missile extensively;
(2) The decision to revamp the National Air Defense Forces and achieve a quick and drastic restructuring of the forces;
(3) The decision to upgrade the importance of civil defense and strengthen its integration into the overall strategic defenses to the country;
(4) The decision to continue a major role for fighter aviation;
(5) The decision to deploy an ABM force;
(6) The decision to negotiate an ABM treaty.

2. The Decision to Deploy SAMs Extensively

The decision to deploy surface-to-air missiles extensively was bypassed in the case of the SA-1, presumably because of the limitations of the system, especially in terms of altitude coverage, the flexibility and maneuverability of the system, and cost. Although there was a difference of some four or five years between the IOCs of the SA-1 and SA-2, the time from the completion of the deployment of the SA-1 to the start of

the deployment of the SA-2 was only two or three years. Thus the imminent availability of the SA-2 was apparent at the time of the stopping of the SA-1 deployment, if indeed it ever had been intended to deploy the SA-1 much more extensively than around Moscow and possibly Leningrad.

With the SA-2 a different situation existed. The weapons system was simple, flexible, reliable, and—in terms of the tactics being employed at the time by U.S. strategic bombers—effective. Thus, as long as new tactics and technological aids and improvements were not considered for an attacking force, the SA-2 was a promising system.

Given the previous deployment rates for the MiG-15 and MiG-17 and even for the SA-1, the rate of introduction of the SA-2 became a consistent manifestation of an already established weapons and resource strategy. In terms of its replacement of antiaircraft artillery, the SA-2 represented a quantum improvement in the capabilities needed to cope with the individual high-flying strategic bomber, but at the same time its deployment pattern followed that of the antiaircraft artillery and thus its deployment was a continuation of past patterns rather than something new.

The SA-2 still had significant weaknesses in terms of low attitude capabilities and the range to cope with stand-off air-to-surface missiles. These deficiencies necessitated the deployment of the SA-3 and SA-5, although again the same pattern of point and zonal defense underlay their deployment. Thus, the entire sequence of surface-to-air missile deployments represented a continuation of a strategy which existed in its basic outlines before 1955.

3. The Decision to Revamp the National Air Defense Forces

The decision to revamp the National Air Defense Forces and achieve a quick and drastic restructuring of them was part of Khrushchev's general reorganization of the armed forces. The principal elements of the restructuring were the reduction in the number of fighter aircraft and the virtual elimination of antiaircraft artillery from the strategic defense system. These two steps led to a reduction in the commitment of resources to strategic defense which persisted from 1961 through 1967. This savings in resources was one of Khrushchev's major goals in the overall reorganization. Thus, this goal was achieved in strategic defense as well as in the armed forces as a whole. And in this respect performance was better for strategic defense than for the armed forces as a whole. The total budget dropped only from 1959 to 1960 and then began to rise again. The strategic defense budget dropped slightly at the same time and then continued lower for the next seven years.

In terms of capabilities the strategic defensive system improved substantially and thus met Khrushchev's other goal which was to weed out obsolescent capabilities while improving overall military capabilities. This improvement in capabilities was manifested almost immediately in the case of surface-to-air missiles with the bulk of the SA-2 deployment having been completed by 1962. At the same time the introduction of new fighters with improved capabilities, especially for all-weather operations, was resumed in 1960 after having been in a state of hiatus since 1955.

Again, the revamping of the National Air Defense Forces which was accomplished from 1959 to 1961 did not represent a break with previous concepts but rather their reinforcement and enhancement.

4. The Decision to Upgrade Civil Defense

The decision to upgrade the importance of civil defense and strengthen its integration into the overall strategic defenses of the country occurred almost simultaneously with the restructuring of the armed forces

as a whole, lagging by only a year or two. The context of this decision included not only the indicated restructuring of the armed forces but also the substantial deployment of strategic offensive missiles by both the United States and the Soviet Union, the Soviet "solution" of the ABM problem, and the persistent tension over Berlin.

Against this backdrop the upgrading of civil defense which was entailed in putting it under the Ministry of Defense and generally increasing the attention paid to it was a natural step, deriving both from the review of organizational relationships and the need to take prudent steps in times of heightening capabilities and tension.

In a country in which the transfer of civil defense from outside the military establishment into it would be of no significance to the general public, this step had no political constraints. And even though civil defense had been under the Ministry of Internal Affairs, its leadership had been military since the early 1950's. In fact, the transfer of the function to the Ministry of Defense can be viewed as simply a logical sequel to the previous naming of military personnel to head civil defense.

5. The Decision to Continue a Major Role for Fighter Aviation

The decision to continue a major role for fighter aviation was made despite some voices asserting that the surface-to-air missile was making fighter aviation unnecessary. This was an issue which received some attention in the special *Military Thought* series; however, the arguments which were advanced to indicate the rapid demise of fighter aviation were more theoretical than practical.

Marshal Sokolovskiy in *Military Strategy* indicated in 1962 that "fighters will evidently play a considerable role in the National Air Defense system in the coming years."[38] He went on to note that "by increasing their speed, altitude, and range and by improving their range, fighters can continue to combat enemy bombers successfully."[39] Given the then existing and still persisting shortcomings of surface-to-air missiles, the decision to continue a major role for fighter aviation followed easily, if indeed the issue was ever seriously raised.

Actually, to have initiated a phase-out of fighter aviation from the National Air Defense Forces would have been a departure from previous practice in that it would thus have been a retrogressive step. In no case since 1945 have the Soviets decreased their strategic defense capabilities, even temporarily.

On the surface it might appear that the decrease in the number of fighter aircraft in the National Air Defense Forces (about a 35 percent drop from 1959 to 1972) would represent a decrease in capabilities. But this is the same time frame during which the fighter force was converted from one with practically all such fighters and the range, avionics, and armament were all improved along with the speed and altitude. Thus the smaller force of 1972 had individual aircraft of substantially better combat characteristics, to include a much better capability to maneuver and mass aircraft, of itself a major factor in compensating for smaller numbers. Given the fact that the capabilities of U.S. strategic bombers were improving at the same time the Soviet fighters were being improved, it is difficult to say whether the fighter aviation of the Soviet National Air Defense system is relatively better off with its smaller number of better aircraft. In any case, the fighters continued to play a significant role throughout the period and at the end of the period were helping to make the long-standing Soviet desire for a zonal air defense much more of a reality than it had ever been before.

[38] Sokolovskiy, V. D. (ed.), *Voyennaya Strategiya* (Military Strategy), Moscow, Voyenizdat, 1962, translated as *Soviet Military Strategy* by H. S. Dinerstein, L. Goure, and T. W. Wolfe, Englewood Cliffs, N. J., Prentice-Hall, Inc., 1963, p. 345.
[39] Ibid.

6. The Decision to Deploy ABMs

The decision to deploy an ABM system was consistent with previous Soviet approaches, both in strategic defense and also in other parts of the Soviet military system. Up until this time the Soviets had not been satisfied with a position of strategic inferiority or vulnerability and had sought persistently to eliminate such inferiority or vulnerability. In other words, in the interaction with the United States the comfortable feeling which derives from strategic superiority was a goal which was pursued without concern for the economic impact. Even Khrushchev's cut-back in the size of the Soviet Armed Forces was to be accompanied by an increase in capabilities rather than their weakening.

The need for an ABM system was manifest and had been recognized upon the appearance of the V-2 during World War II. The Soviet commitment to an ABM system had been publicly avowed with Khrushchev's 1960 assertion that the problem of ABM defense had been solved and subsequent statements conveyed the image of a steady march toward the deployment of an ABM system. Although the limited ABM deployment around Moscow was eventually accomplished in fact rather than just in rhetoric, it remains unclear whether cost, technological limitations, or political considerations of U.S.-Soviet detente were more significant in the decision to halt further ABM deployment.

In any case the decision to deploy ABMs was consistent with the overall Soviet approach to strategic defense. The decision to limit ABM deployment was not. Whether the Soviets would have resumed their ABM deployment within the timeframe to 1972 if there had not been SALT negotiations is another question, one which cannot be answered. If the decision to stop ABM deployment was based at least in part on recognition of technological limitations, the decision would, of course, have been consistent with previous actions. In such a case additional deployment would have followed elimination of the shortcomings in the system.

7. The Decision to Negotiate an ABM Treaty

The decision to negotiate an ABM treaty represented the single real departure from the Soviet behavior with respect to strategic defense. It took an area of clear military vulnerability and, rather than pursue the creation of the military capability to eliminate the vulnerability, went the route of negotiation.

This decision had a further impact in that it undercut the rationale for continuation of much of the defense against the air-breathing threat. But rather than lead to a decrease in the size of air defense (as contrasted to missile and space defense), there was a continuation of the strengthening of the air defenses; especially with the additional deployment of SA-3 and SA-5 sites, right to the end of the period and the signing of the ABM treaty. It should also be noted that the further deployment of the SA-3 and SA-5 has continued into 1975.

D. Major Factors Shaping Soviet Strategy

1. The Factors

If behavior is difficult to analyze in terms of the actions of individual players and institutions, and major decisions did not shape strategy but rather reflected it, what were the major factors which conditioned the nature, evolution, and rationale of Soviet strategy? Aside from the political dynamics of the country which were discussed in Volume I in their relation to the history of Soviet strategic defense, five factors merit analysis:

(1) The perceived threat posed by U.S. and other offensive weapons systems and their deployments;
(2) The Soviet capacity and penchant for reaction to the perceived threat and interaction with U.S. forces and programs;
(3) Soviet perceptions of the likelihood of attack, expressed in responses to various international events, crises, and conflicts;
(4) The relative importance, within the context of overall military strategy and posture, attached to national air and missile defense by the Soviet leadership; and
(5) Budgetary constraints.

2. Threat Perception

The general Soviet strategy for strategic defense derived from a threat perception which had six main elements:

(1) The growing and adapting threat, especially from U.S. strategic offensive forces, necessitated continuing vigilance and a strong commitment of forces to strategic defense;
(2) The multidirectional nature of the threat necessitated an all-around point and area defense, especially in view of the ease with which any kind of barrier defense could be penetrated;
(3) The omnipresent air-breathing bomber threat was real and close at hand and had to be dealt with;
(4) The United States was constantly pushing the state of the art in new technology which meant that the appropriate countering technology had to be obtained somehow and had to be adopted and deployed quickly;
(5) The missile threat could not be handled effectively with the capabilities of the National Air Defense Forces; therefore, it was necessary to target MR/IRBMs and strategic bombers and then ICBMs against the missile launching sites.
(6) Targeting the U.S. means of strategic attack still did not guarantee defense against the missile threat and therefore necessitated acquiescence in strategic arms limitation talks.

3. Reaction and Interaction—the APVO Case

a. Introduction

On the surface, it might appear that Soviet strategic defensive forces were engaged in a constant reaction to or interaction with U.S. strategic offensive forces. In actual fact the case for such an assertion is more superficial and intuitive than it is ingrained and demonstrable. The problem is that while the Soviets were clearly aware of most U.S. strategic offensive capabilities, the evidence of reaction and interaction depends more on correlation than on documented demonstration of cause and effect. Because of the inconclusive results which derive from looking at individual weapons systems for specific reaction or interaction, the approach here is to look at fighter aviation as a whole to determine all of the major factors which have driven its development, but with particular concern for identifying the occurrence of reaction and interaction and their significance.

Throughout the inquiry into the postwar history of Soviet interceptor design, a picture emerges of dedicated and extremely competent people united in "socialist competition"[40] to relieve the constraints of technology. The impression is one of great continuity and sustained effort well supported by the Soviet

[40] The role "socialist competition" in the aircraft industry should be interpreted with equal emphasis on "socialist." See V.I. Tikhomirov, *Organization and Planning of an Aircraft Construction Enterprise* (FTD Trans) p. 14 and Section V. B.2. below.

government. To some extent, such a picture is accurate. The design bureau system does produce a series of prototypes which represent both an advanced technology and an intended compatibility with mass production processes. However, one must view the design process in a broader context than technology or "socialist competition."

The following section looks at three possible alternative contexts which might illuminate the patterns of Soviet force building and strategic decisions as they apply to fighter aviation. The first context is time; the second is capability; and the third is quantity. The first effort arranges data in a sequence of interest for historical inquiry. The other two array that data against the U.S. bomber force to develop some hypotheses about the APVO force which relate to the "threat" of U.S. strategic power.

b. Design Cycle Decisions

Figure 7 illustrates the design cycles of post war Soviet jet interceptors. The figure illuminates some aspects of "competition" among aircraft design teams.

First, "competition" has been less frequent as time has passed. That this is in part a product of the increasing lead times required for more complex designs is also indicated by the figure.

Second, the evidence of the designs themselves is that major competitions coincide with significant changes in technology. At least six such advances are implied which impact on the interceptor force: (1) jet engines, (2) swept wings, (3) long-range and AI radar, (4) Delta wing design (tailed delta), (5) side inlets, (6) variable geometry wings, and (7) lift engines.

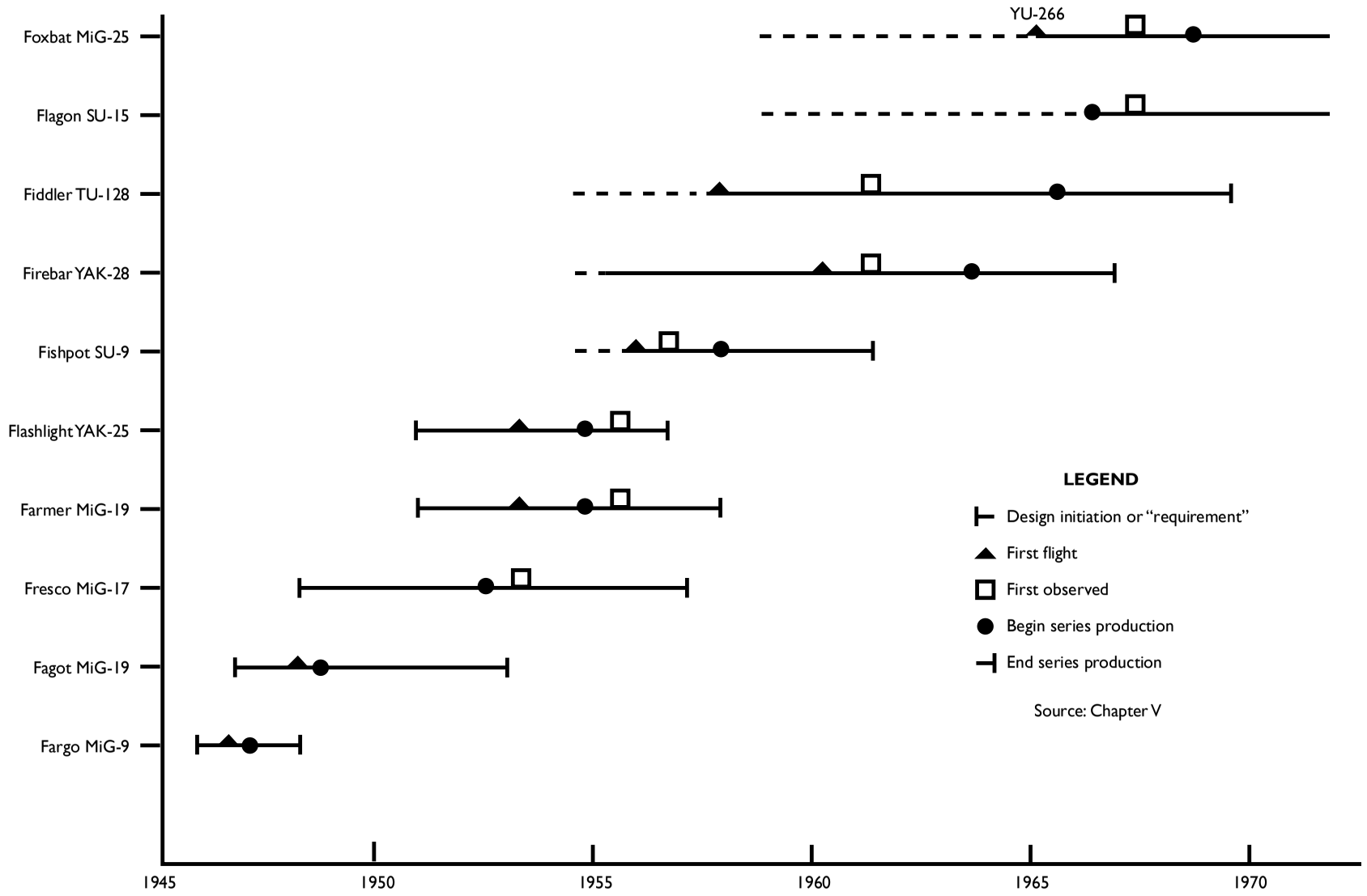
While the last two advances, thus far, appear not to be directly relevant to PVO Strany, they illustrate how design resources may be diverted from APVO priorities.

Third, a requirement—competition—selection cycle is not the universal rule. In the case of the MiG-19 and YAK-25 complementary design efforts were the product of a direct negotiation with Stalin. In the case of the SU-7/SU-9, "competition" was between two designs of the same bureau. That there might have been some confusion about a "requirement" is indicated by the fact that the SU-7, predominantly deployed as a ground support aircraft, appears in the APVO order of battle. This anomaly raises the possibility that the aircraft that entered the force were the product of a set of engine production and allocation decisions. The SU-7 swept-wing aircraft designed around the heavier Lyulka engine may have become merely a convenient aircraft to assign to the tactical force. Further, of the eleven aircraft types known to have been active in the APVO force, only the MiG-9, MiG-15, and TU-128P seem to have been the product of a straight forward fly-off competition. In these cases too an engine allocation prejudiced two of the outcomes. One other example is relevant. In the 1948–1950 competition for a long-range, radar-equipped interceptor, none of the aircraft were selected for production. The requirement was evidently cancelled due to technological considerations.[41] Thus, it appears that both the "requirement" and "competition" are rather flexible concepts as they apply to APVO decisions.

In summary, the Soviet design process includes a number of technological and production considerations which are unrelated to the "requirement." If the "requirement" represents the "decision" to design a new aircraft of specific characteristics, the process of aircraft design as it is practiced in the Soviet Union modifies the decision substantially.

[41] Book I, Vol. I, Chap. V of this study discusses the 1948–1950 unsuccessful attempts at an all-weather interceptor.

Figure 7—Design Cycle of Major APVO Aircraft



c. Requirements Reactions

Figure 8 arrays data to examine some hypotheses about the relationship between the "threat" and the "requirement" for a new aircraft. The vertical lines represent the ostensible issuance of a requirement; their width indicates the degree of uncertainty associated with the estimated requirement data. Taking a period immediately before the requirement issuance, milestones of the U.S. bomber development cycle appear which may have triggered a reactive design. At least three hypotheses are widely held among experienced intelligence analysts about such reactions:

(1) The MiG-15 was a reaction to the B-36[42]
(2) The TU-128P was a reaction to the AGM28 (Hound Dog)[43]
(3) The MiG-25 was a reaction to the XB-70.[44]

It would appear that at the time of the MiG-15 requirement, the intelligence, planning, and technological forecasting elements of the Soviet hierarchy had more to consider than the B-36. The B-47 and B-52 were sufficiently well under way to create a fairly accurate estimate of future U.S. strategic capabilities. Among those capabilities the B-36 was only the most proximate. Likewise, the hypotheses about reactive designs of the TU-128P and MiG-25 are viable in this context, but the point remains that multiple considerations about the "threat" may have entered the decision.

d. Qualitative Interactions[45]

Although more sophisticated indices of aircraft capability exist in both the Soviet Union and the U.S., the prevalence of speed and altitude in Soviet design thinking make these two factors useful indices of bomber and fighter capability.[46] Moreover, they are somewhat relevant to the tactical problem of interception, especially in the early post-war era when sophisticated air-to-air and air-to-surface missiles were not a consideration.

1) Speed

Figure 9 illustrates the relationship between the speeds of U.S. offensive and Soviet defensive strategic aircraft. The horizontal lines indicated the maximum speed represented in the operational force. In this form of interaction, the interceptor should have the natural advantage. The bomber must trade speed for payload and range. However, the interceptor needs a speed advantage to close on the target and to position itself for attack. The comparison is useful for examining the hypothesis of XB-70/MiG-25 qualitative interaction. Although the AA-6 missile serves to compensate for the hypothetical disadvantage in speed, the comparison shows that the MiG was both late and slow. It could as well be an imitative reaction to the SR-71 or a late attempt to cope with the AGM-28.

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[42] CIA, *National Intelligence Survey, Vol. 26, Section 83,* October 1957.
[43] By implication from DIA, *Fighter Aircraft (Trends) (ECC)*, ST-CS-09-006-75. pp. 104–112.
[44] Interviews with a former Assistant Air Attache to Moscow, 11 November 1974; a DIA aircraft industry analyst, 21 April 1975; and a CIA aviation industry analyst May 5, 1975. Only CIA provided a reference to detailed rationale, but the document was made available too late for consideration in this report. It is understood that the CIA document is now available; it will be considered in the final report of this study.
[45] Definitive data to support this analysis are contained in DIA, *Aircraft Characteristics and Performance Handbook (ECC)* 1968 with changes. (SECRET/Controlled Dissemination). Updates to individual systems books are contained therein. Although BDM formally requested this document in June 1974, October 1974, and March 1975, it has not been made available. Despite CMH arrangements to access the document at DIA, access continued to be denied as of the week of 5 May 1975. Likewise, U.S. data on the B-29, U-2, YF12A, and SR-71 are from unofficial sources.
[46] DIA, *Fighter Aircraft Trends (ECC)*, ST-CS-09-006, November 1974, pp. 94–97. Also see Section VB below.

Figure 8—Design Interactions

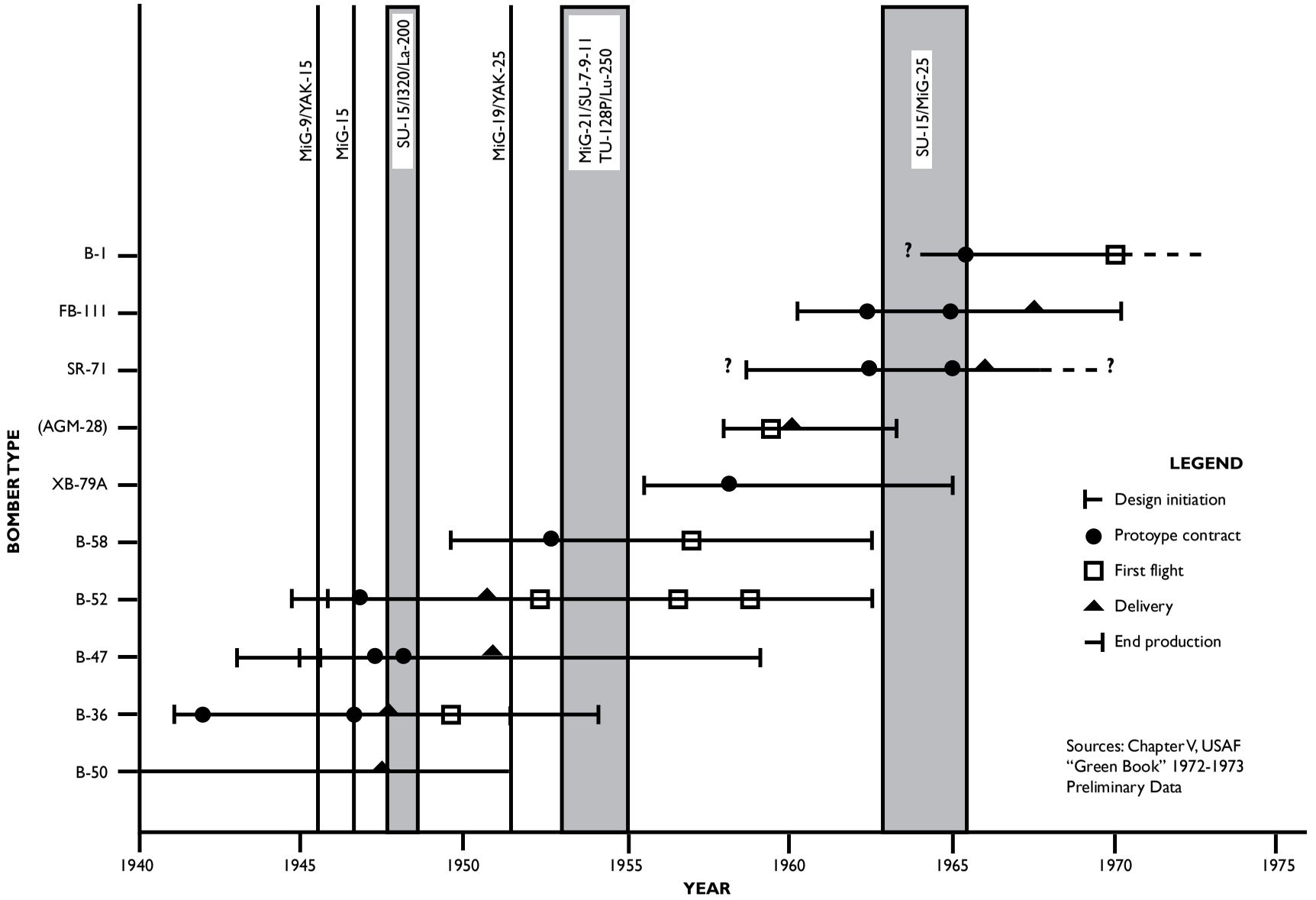
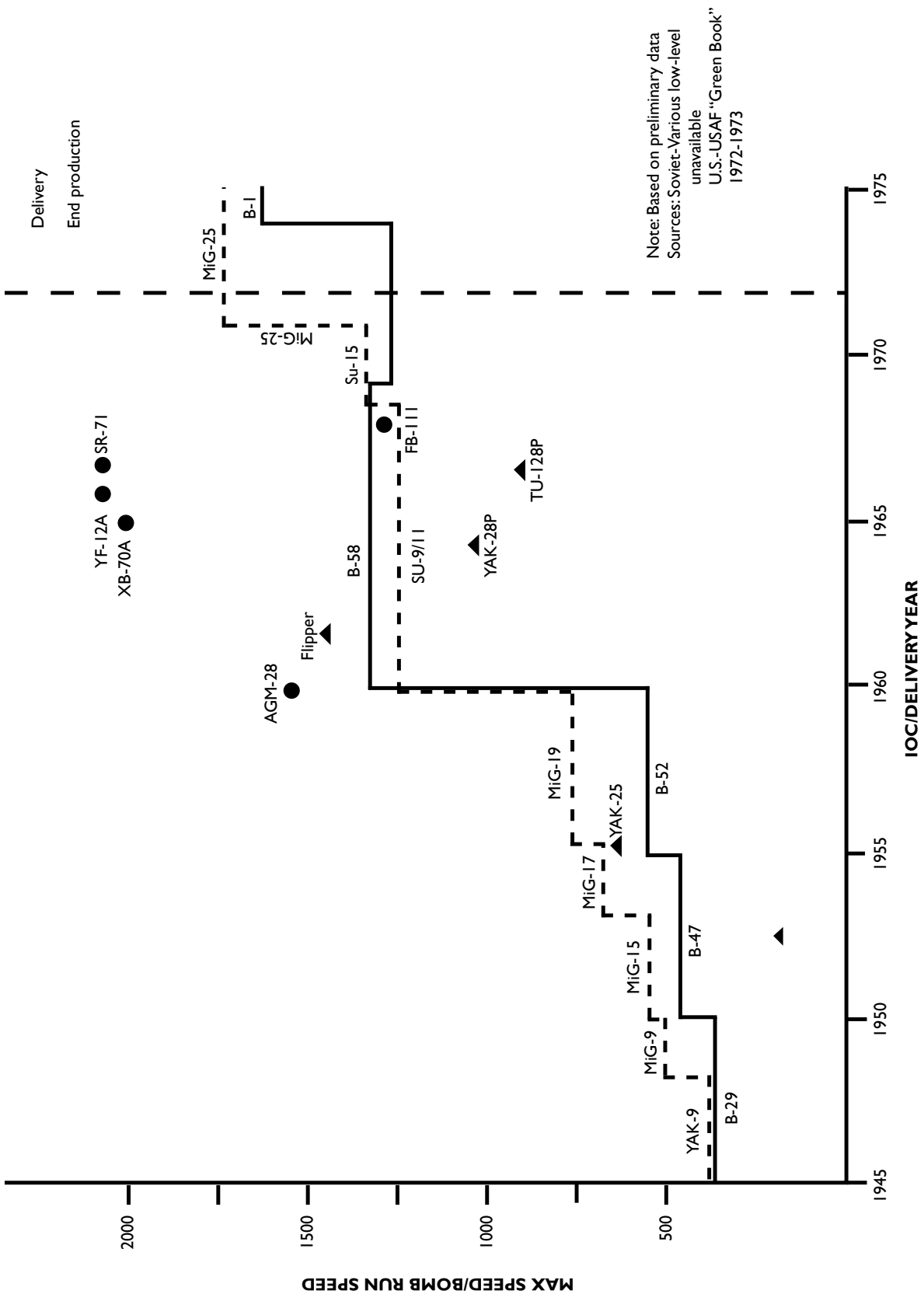


Figure 9—Speed Interactions



2) Altitude

A similar comparison (Figure 10) applied to altitude serves to confirm the MiG-15/B-36 interaction and further confuse the relationship between the MiG-25 and the XB-70. The illustration serves to introduce a most important aspect of possible qualitative interaction. The Soviets, in the first decade after the war, attained a capability to contest the high altitude regime. However, the change of U.S. tactics which emphasized low-level penetration rendered their capability largely obsolete. To contest the low-level regime required a competence in electronics which found them at an extreme disadvantage. Thereafter, the predominant Soviet operational objectives, speed and high altitude, became largely irrelevant.

3) Range

The quality of range (Figure 11) has been of lesser importance in Soviet interceptor design than speed or altitude. Whereas deployed aircraft have shown steady progression in the latter two qualities, range shows no trend. It is for this reason that range is of interest; it segregates technology considerations from mission considerations among the design criteria. Thus, the TU-128P stands out as a special aircraft. The explanation that it is designed to counter the B-52/Hound Dog combination is quite credible in this context. The MiG-25/XB-70 relationship remains confused, however. As discussed in Section V.B.2.c., the MiG-25 may well represent a state of technology where severe trade-offs among range, speed, and altitude are avoided.

The tactic of low-level penetration radically altered the basis of qualitative interaction. For twenty years the Soviets have had the "requirement" to cope with the low-level threat. By 1973 the requirement had not been met. From what is known about Soviet avionics, the requisite Doppler radars and moving target indicator circuitry had not emerged to enable a Soviet interceptor to look down on a penetrating bomber against the clutter of radar returns from the ground. While some measures were taken,[47] the qualitative interaction ceased to be clear.

e. Quantitative Interactions

Figure 12 illustrates the numbers of aircraft associated with the active U.S. offense and U.S.S.R. defense inventories. It would appear that a correlation exists between the two trends. It can be observed that the Soviets, since 1955, have maintained from 2.4 to 6.0 interceptors in their inventory for each U.S. bomber. While no one who is serious about numbers would contend that there is causation implied by the declining trends in both offensive and defense aircraft, the concurrence of the decline implies that both sides are responding in a like manner to some external variable.

The assertion of too simple a correlation is preempted by the trend in Soviet surface-to-air missiles, however. One is limited to an observation that both the offense and defense reduced the emphasis on numbers of aircraft at about the same time. To extend the statement, one would point out that the Soviets embarked on a program of surface-to-air missiles in the early fifties that sustained itself until 1973.

[47] The Moss aircraft represents a limited "Look-down" capability over calm water or smooth ice.

Figure 10—Altitude Interactions

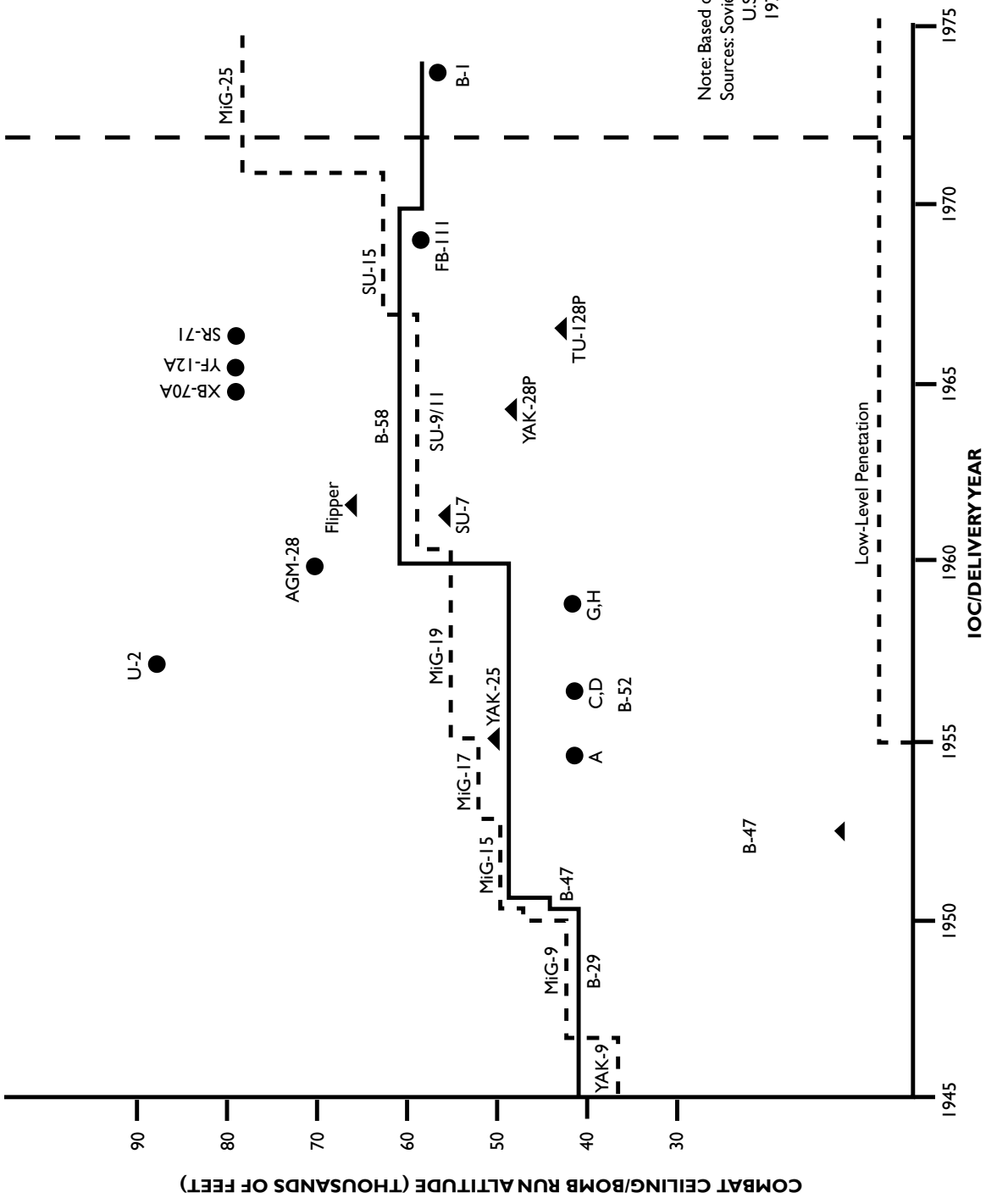


Figure 11—APVO Fighter Ranges

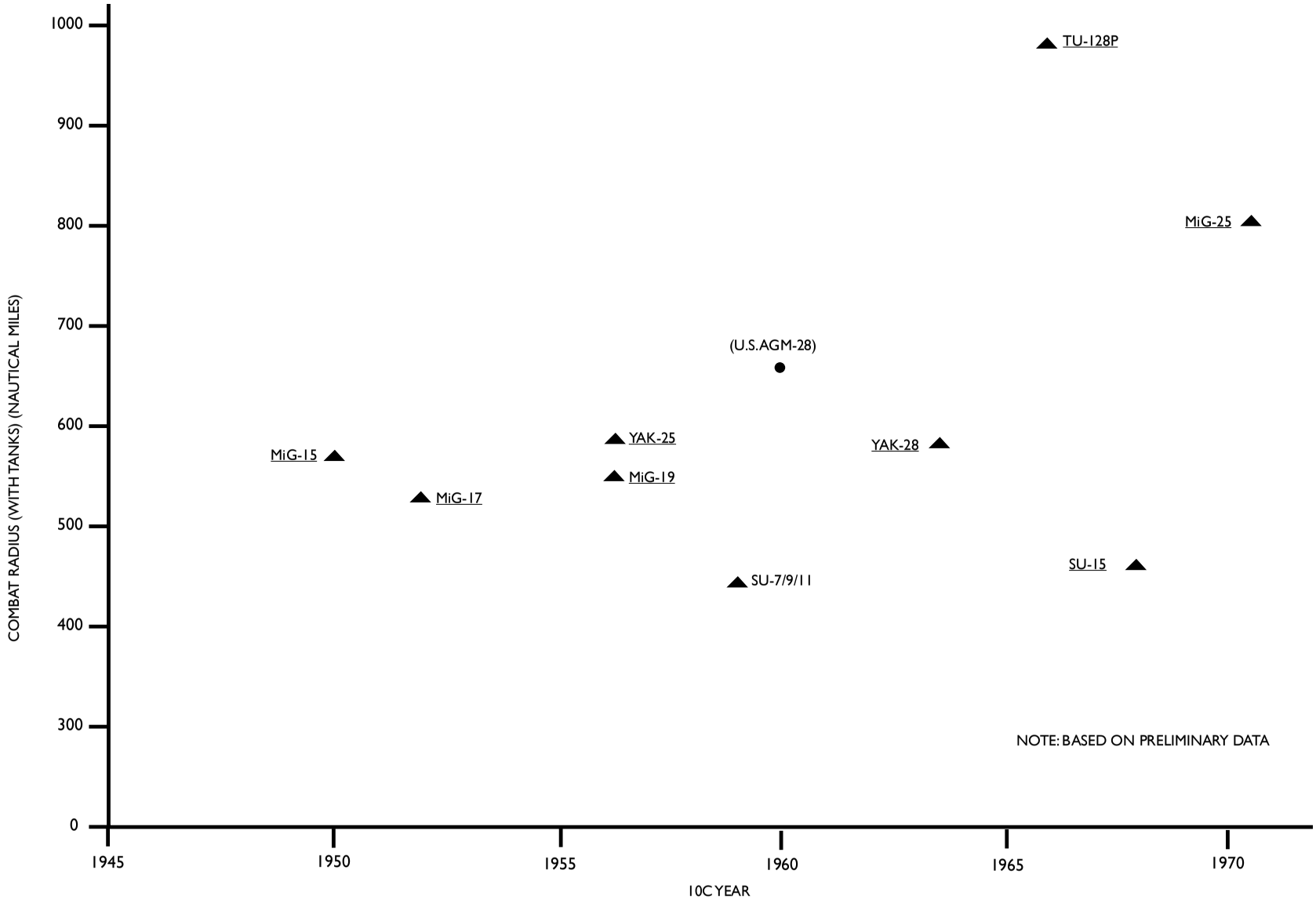
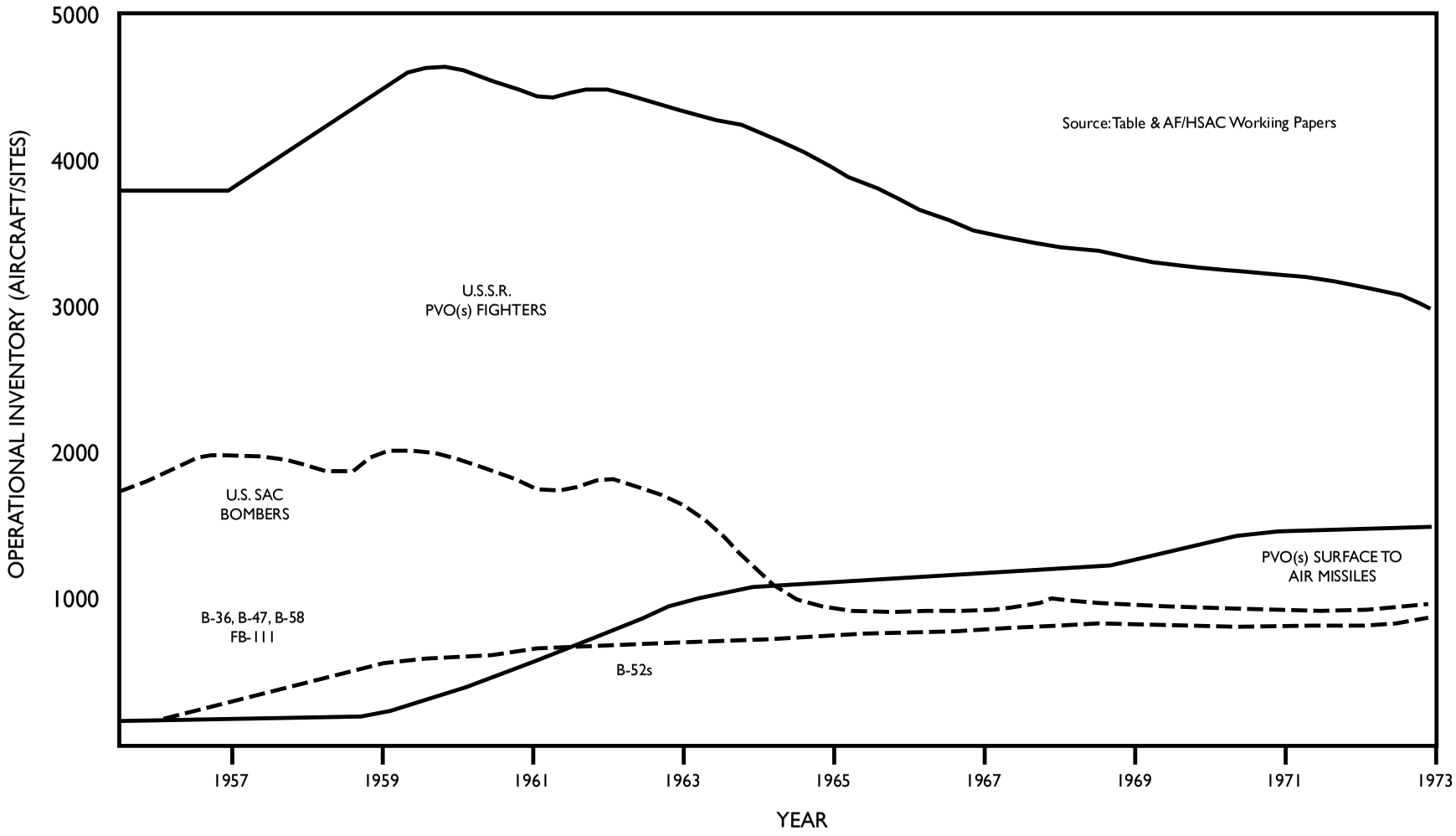


Figure 12—Defense/Offensive Comparison



f. The Nature of Soviet Reactions

The above formulations of interaction generate more questions than they answer. Viewed over the whole post war period, however, several generalizations emerge. They will be discussed, as in the previous exposition, in the contexts of time, capability, and quantity.

In the context of time, there is a recurring Soviet design cycle that is affected by technological considerations at least as much as by U.S. strategic programs. Within the cycle, the requirements decision takes place earlier than may have been generally expected and in an environment where several "threats" may be apparent. In the absence of a "stop decision" the cycle will produce prototypes that appear to be inappropriate to the strategic environment. Whereas jet technology and airframe design were well synchronized in the cycle (facilitated by central management in the Ministry of Aviation Industry), electronics and weapons (not under MAP control) were not.

In the context of comparative quality, the traditional Soviet objectives of speed and altitude were followed after the war with some success—at least until the B-58. Thereafter, American technology, as demonstrated in the XB-70-and SR-71, proved superior to the Soviets' own performance (as opposed to mission) objectives. The cause of this is generally traced to different design priorities which evolved from British technology acquired in 1947. The Soviets focused on the air mass and the U.S. focused on temperatures. The Soviet approach led to early success and greater producibility. But early success prejudiced later success at a higher technological level where temperatures became critical. In the meantime, the U.S. changed the rules of qualitative competition with low-level penetration tactics. The Soviet pursuit of altitude and speed, became inappropriate. Electronics, already a constraint on weapon effectiveness, became a particularly critical technology. Thus, earlier decisions, which appeared successful, prejudiced later decisions.

In the context of quantity, production of fighter aircraft sustained a large part of the momentum gained in WWII Khrushchev's shake-up of the aviation industry in 1953, and reorganization of the economy in 1957 slowed the production momentum and reoriented it. A part of that momentum was transferred to non-combat aircraft. Another part was transferred to surface-to-air missile development in line with Khrushchev's general themes about modernization and missile armament. The familiar pattern of cyclical mass production then appeared in the SAM program.[48]

4. Response to Major Events and Crises

a. Introduction

Various events from 1955 to 1972 reached crisis proportions or in other ways served as possible stimuli for the Soviets to strengthen or otherwise shape their strategic air and ballistic missile defenses. Such events would include the Hungarian Revolution, the Berlin crisis, the Cuban missile crisis, the 1967 Middle East War, the Sino-Soviet rivalry, and the invasion of Czechoslovakia. Acting as a possible stimulus in the opposite direction were events such as the U.S. preoccupation with Southeast Asia—although this situation also had a substantial element of tension because of Soviet support of and identification with Hanoi—and the initiation of SALT.

[48] Attributed to Krushchev is the remark: "We started turning them [missiles] out like sausages at our aircraft plants." *Khrushchev Remembers, The Last Testament*, p. 51. Pending official verification of the origins of this document, it is used sparingly in this study. The cycle of SAM deployments is observed in Figure 44.

b. The Pattern of Response

Referring to the analysis of budgetary constraints in section 6 below, there is little which suggests that the Soviet air defense strategy reacted to any of these events. Nor does an examination of the detailed deployment data which underlie the tables and figures of section 6 reveal any patterns which can link to these events. The successive crises of 1961 and 1962 over Berlin and Cuban missiles were clearly major confrontations which could well have stimulated the Soviets to take drastic steps to improve their strategic defensive capabilities. But even as the Cuban crisis was brewing the Soviets were reducing their commitment to strategic defense from what it was in 1961. By 1963 the commitment of resources to strategic defense had fallen to its lowest level for the entire 1955–1972 period. From 1964 through 1967 the same low pattern continued with resource allocations remaining below the 1962 level. This period did witness the deployment of an ABM system; however, the deployment was limited and the resource allocation to the system peaked in 1967, never having reached a very high percentage of the strategic defense budget.

In 1968 new deployments were initiated and there was a sharply higher level of resource allocation which persisted through 1971, before declining somewhat in 1972. The 1967 Middle East War obviously just preceded this spurt and the invasion of Czechoslovakia coincided with its onset. The bulk of the new costs was for actual weapons systems on which the developmental work had been occurring for a number of years beforehand.

5. The Relative Importance of Strategic Defense

a. General Patterns

The relative importance of strategic defense is reflected in the overall Soviet resource strategy for the armed forces as a whole. As is evident from Table 19, the Soviets maintained a large, stable commitment of resources to the armed forces as a whole and relatively stable commitments to each of the components. The overall strategy was thus to maintain a large, balanced force with both offensive and defensive capabilities. The element of stability was particularly strong. Once a good capability was established, it was not reduced. At the same time the Soviets did not rush to create strong capabilities in every area, in particular not mirroring U.S. capabilities in the areas of heavy bombers and aircraft carriers. These areas received limited resources or none at all.

The share of resources going to strategic defense remained roughly at the level of 10 percent of the military budget. As a percentage of the total budget this was not a large figure. But in absolute terms an annual commitment of 1.6 to 2.7 billion rubles provided a large strategic defense establishment.

This was a share of resources which was relatively uninfluenced by events. The analysis below in section 6 reveals no significant change in resource allocation in response to major events or crises. An examination of the resource allocations in comparison with the starting years of the five-year plans reveals no associated surges or declines.

What emerges is a pattern of behavior in which a certain substantial amount of strategic defense is viewed as a good thing. There is no apparent continuing quest to save resources at the cost of less defense. There are no institutional voices which are attacking the level of strategic defensive effort. In fact, for a good Communist it is more in character to argue for defense than for offense (until the point is made that the

best defense is a good offense). A moralistic tone and a basic insensitivity to costs are evident in a statement which Kosygin made in London in 1967:

> What weapons should be regarded as a factor making for tension—offensive or defensive? I believe that the defensive systems, which prevent attack, are not the cause of the arms race, but constitute a factor preventing the death of people. Some argue like this: What is cheaper, to have offensive weapons which can destroy towns or whole states, or to have defensive weapons which can prevent this destruction? At present the theory is current somewhere that the system which is cheaper should be developed. Such so-called theoreticians argue as to the cost of killing a man—500,000 dollars or 100,000. Maybe an antimissile system is more expensive than an offensive system, but it is designed not to kill people but to preserve human lives.[49]

Within the general Soviet strategy the use of strategic offensive systems to strike enemy strategic offensive systems while they are still on the ground is a basic concept. This would suggest the possibility of resource shifts between strategic offensive and defensive programs. Here again no conclusive patterns exist. The lower resource allocation pattern of 1962–1967 for strategic defense does coincide with the highest period of resource allocation to strategic offense. But this was a period which began as the SA-2 deployment was being completed and ended as the SA-5 deployment started. Thus it was not a period during which more resources could necessarily be assimilated in order to produce a substantial improvement in capabilities. At the same time the resource commitments to the strategic offensive program was yielding a significant enhancement of capabilities.

A major challenge to the Soviet resource strategy began in the middle 1960's with the deployment of an ABM system. Although the limited deployment which was accomplished required less than 8 percent of the strategic defense budget even in the peak year of 1967, the cost of full deployment would have drastically altered the size and structure of the budget. In turn, this could have been a significant factor in the Soviet decision to sign the ABM treaty.

b. Budgetary Analysis

In terms of size of budget allocation, strategic defense has one thing in common with both the overall military budget and most of its component elements—the relative stability of the allocations. This can be seen in Table 19. The overall budget is extremely stable. Taking 20.53 billion rubles as the median for the 1955 to 1972 period, the deviation from the median is only 13.3 percent, with the low swing in 1960 and highs in 1970 and 1971. For a strategic defense median budget of 2.13 billion rubles the deviation is 23.9 percent, although if the years 1963 and 1969 are ignored (they represent an unusual low and high respectively), the deviation becomes only 13.8 percent, which makes it almost exactly in line with the deviation figure for the total budget.

A further examination of Table 19 reveals the relative positions of strategic defense and strategic offense. In only one year (1957) is the allocation to strategic defense (2.27 billion rubles) greater than that to strategic offense (2.08 billion rubles). In several years (1962, 1963, and 1967) strategic offense received more than twice as much as strategic defense. Finally in 1972 the two allocations are almost equal again after having diverged sharply all throughout the 1960's. This illustrates the fact that although the Soviet commitment to strategic defensive has been a massive and continuing thing, its priority, at least in terms of its claim on resources, has been less than for strategic offense.

[49] *Izvestiya*, February 11, 1967.

Table 19—Strategic Defense Share of the Soviet Military Budget

(billion 1970 rubles)

	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
Strategic Defense	2.14	2.33	2.27	2.41	2.30	2.25	2.16	2.00	1.62	1.88	1.88	1.89	1.97	2.32	2.65	2.48	2.42	2.21
Strategic Offense	2.83	2.48	2.08	2.53	2.97	3.29	3.62	4.07	3.85	3.34	2.91	3.70	4.06	3.84	3.78	3.59	2.90	2.39
Ground (including Tactical Aviation)	7.21	6.09	5.51	5.19	4.92	3.69	3.56	3.67	3.77	3.98	4.24	4.30	4.27	4.60	4.33	4.65	4.78	5.03
Naval	2.91	2.68	2,28	2.17	2.14	2.10	2.09	2.19	2.22	2.15	2.30	2.19	2.35	2.27	2.29	2.21	2.15	2.13
Military Transport Aviation	0.36	0.57	0.66	0.76	0.80	0.85	0.99	0.93	0.85	0.74	0.72	0.69	0.70	0.73	0.76	0.83	0.88	0.92
Military RDT&E	0.87	1.09	1.36	1.63	1.92	2.42	2.85	3.18	3.40	3.41	3.36	3.45	3.43	3.36	3.80	4.67	5.18	5.44
Command and Support	2.68	2.81	2.79	2.62	2.52	2.19	2.35	2.48	2.56	2.76	2.98	3.09	3.30	3.53	3.69	3.75	3.84	3.87
DOSAAF	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Military Security Forces	0.70	0.62	0.54	0.53	0.46	0.46	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38
Reserve and Retired Personnel	0.44	0.45	0.47	0.48	0.49	0.51	0.52	0.53	0.54	0.55	0.56	0.57	0.59	0.61	0.63	0.65	0.67	0.69
Total	20.19	19.16	18.00	18.36	18.57	17.80	18.58	19.49	19.25	19.24	19.38	20.32	21.11	21.72	22.36	23.26	23.26	23.10

6. Budgetary Constraints

a. Introduction

The Soviet commitment to national air and missile defense has involved the creation of extensive inventories of deployed weapons systems and the fielding of large numbers of personnel to man them. For the timeframe under consideration the accuracy with which the physical parameters of Soviet resource management are known has become increasingly good. Thus, while there is substantial room for debate over the methodologies by which the cost of Soviet air and missile defense is determined, there is little basis for debate over the numbers of weapons systems which are involved. In turn, because the numbers of weapons systems are so large and because the numbers themselves drive much of the costing, analysis of Soviet resource expenditures provides useful insights into the question of whether budgetary considerations significantly constrained the development of strategic defense.

b. Resource Patterns

The discussion of individual air and missile defense systems in Chapter V provides details of Soviet resource management procedures, especially with respect to fighter aviation. A comparative analysis reveals that there is considerable consistency with respect to procedures within force elements (for example, within fighter aviation) and substantial variations in practices between force elements (for example, between fighter aviation and air defense missile forces).

Tables 20 and 21 reflect deployment patterns for fighter aircraft and surface-to-air missiles (more detailed data are given in Tables 36 and 35). From the fighter portion of Table 20 it is evident that new fighters were introduced with great regularity throughout the bulk of the period and that maximum deployments were normally achieved in four to seven years. At the same time, some fighters, as evidenced by higher maximum deployment numbers, were more successful than others, although mission also dictated the numbers to be procured. Also, because the total number of fighters was declining, some models reached fairly high figures in terms of maximum percentage of the force, although their maximum numbers still did not approach the earlier highs for the MiG-15 and MiG-17. Thus, the pattern for fighter aircraft has been one of the regular development and deployment of new fighters which have gradually grown to maximum deployment while many of the older models were still retained in the active inventory. Essentially the pattern has been one of replacing older models with new ones which have better capabilities and doing so on a regular basis.

Although mass missile deployment began substantially after mass jet fighter deployment (1959 for the SA-2 versus 1948 for the MiG-15). Soviet surface-to-air missiles have nevertheless been in operation for what is now a prolonged period of time. Despite this fact, each new SAM system has served to complement rather than replace earlier ones (only in 1971 is there the first cut in the number of sites and launchers as a gradual cutback in SA-2 deployment was begun). In another sense, however, there has been a certain amount of replacement as the SA-1, SA-2, and SA-3 have all undergone various modifications which have improved their capabilities. The continuous and clear-cut thickening of SAM defenses is depicted in Table 21. On the surface, it would appear from the same table that the density of fighter deployments is decreasing. Here the true picture is less certain because of the qualitative changes which have been occurring, namely improvements in range, avionics, and armament and the metamorphosis of the fighter force from one which had less than 15 percent all-weather aircraft in 1960 to one with more than 90 percent in 1972.

Table 20—Comparison of Fighter and SAM Deployment to 1972

Fighters	Year of Introduction	Maximum Number in Force	No. of Years to Maximum Deployment	Maximum Percent of Total Force	Remarks
MiG-15 (FAGOT)	1948	2000	4	100.0	
MiG-17 (FRESCO)	1952	3000	3	78.9	
MiG-19 (Farmer)	1955	750	6	19.8	Maximum percent of force in 1975 is 28.8
YAK-25 (Flashlight)	1955	400	4	9.5	
SU-9/11 (Fishpot)	1960	780	7	24.7	
SU-7 (Fitter)	1962	35	3	1.0	
YAK-28P (Firebar)	1964	360	4	11.7	
TU-128P (Fiddler)	1966	162	6	5.3	
SU-15 (Flagon)	1968	530*	8	17.3	Deployment continuing, 26.0 percent in 1975
MiG-25 (Foxbat)	1971	63*	5	2.1	Deployment continuing, 7.0 percent in 1975
SAM Launchers	**Year of Introduction**	**Maximum Number in Force**	**No. of Years to Maximum Deployment**	**Percent of Force in 1972**	
SA-1 (Guild)	1954	3360	3	26.5	
SA-2 (Guideline)	1959	4650	6	34.2	Decline in deployment began in 1971
SA-3 (GOA)	1961	908*	5**	7.1	Deployment resumed in 1968, still continuing in 1975
SA-5 (Gammon)	1966	4086*	—	32.2	Deployment began in 1966, still continuing in 1975

* Total in 1972
** For initial deployment, 1961–1965

Table 21—Numbers of Weapons Systems in Soviet National Air Defense Forces

	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
Fighters	3800	3800	3800	4200	4675	4600	4400	4380	4180	3980	3785	3580	3476	3406	3350	3278	3213	3071
SAM Launchers	1800	3360	3360	3360	3540	4320	5588	7232	7980	8362	8394	8466	8628	8954	10,308	12,010	12,384	13,004
ABM Launchers	—	—	—	—	—	—	—	—	—	—	—	—	—	24	48	64	64	64

c. Resource Allocation to Air Defense Elements

Turning from simple numbers of aircraft and launchers to the cost of the overall Soviet air and missile defense establishment and of its components, a pattern emerges which reflects a strong, continuing allocation of resources to this field with occasional peaks and valleys occurring as major weapons systems procurements are Initiated and completed. Figure 13 and Table 22 present the story, graphically and quantitatively, of Soviet expenditures on National Air Defense Forces. The amounts are given in billions of 1970 rubles.

As is evident, the budget for the National Air Defense Forces has been quite stable since 1955, starting the period at 2.14 billion rubles and ending up at 2.21 billion rubles in 1972. Here the use of constant rubles makes it possible to present a consistent picture in which the impact of inflation has been eliminated but the transition from simpler systems to more complex ones is still reflected.

The pattern of expenditures starts with an early spurt in the SAM area as the SA-1 was deployed, a continued role for antiaircraft artillery, and heavy expenditures for fighters. With the completion of the SA-1 deployment SAM expenditures drop sharply but then pick up again sharply in 1958 as the extensive deployment of the SA-2 begins. In the meantime then is an abrupt drop in antiaircraft artillery costs which finally end by 1961. After reaching a high of 1.27 billion rubles in 1957, fighter costs begin a precipitous slide which does not end until a low of 0.57 billion rubles is reached in 1963. This 1963 figure is the lowest allocation to fighters during the entire period and, interestingly enough, occurs during the second year in which Marshal of Aviation Sudets served as Commander-in-Chief of National Air Defense Forces. It also occurs in a year after the Cuban missile crisis. And, finally, this was Khrushchev's last full year as leader of the Soviet Union and thus his last opportunity to shape military force structure throughout the full course of a year. The overall 1963 budget for strategic air defense is also at the lowest level for the period.

The above figures for 1963 illustrate a basic problem in analyzing the Soviet commitment to strategic defense. The facts of what was done fly in the face of other events which logically could have led to a different course of action. It seems a bit incongruous to have Marshal of Aviation Sudets associated with the smallest fighter budget and to have the lowest figure for overall strategic defense occur during the year after the Cuban crisis. Explanations for this include, on the one hand, the possibility that strategic defense was cut in order to free additional resources for building offensive missiles or, on the other hand, the possibility that this was a transitional period during which the Soviets were waiting for the completion of the development of their ABM system and the SA-5 while simultaneously restructuring their fighter force to reduce the percentage of older models.

Except for the sharp dip in 1963, the strategic defense budget for 1962 through 1967 was very consistent, remaining just at or somewhat below 2.0 billion rubles. This coincides with a period of limited new systems deployment—not much in the way of SA-2 or SA-3 deployments during these years, while the YAK-28p low altitude interceptor was the only new aircraft being deployed during most of this period (even its numbers were small—a total of 360 aircraft in four years).

In 1967, however, a sharp upturn was launched as the SA-5 was deployed, deployment of the SA-3 was resumed, and first the Tu-128p and then the Su-15 fighters were introduced into the force. By 1969 the strategic defense budget peaked at 2.65 billion rubles, the highest figure ever, and then went into a slow but steady decline to 1972.

Figure 13—Estimated Soviet Expenditures for National Air Defense Forces By Element

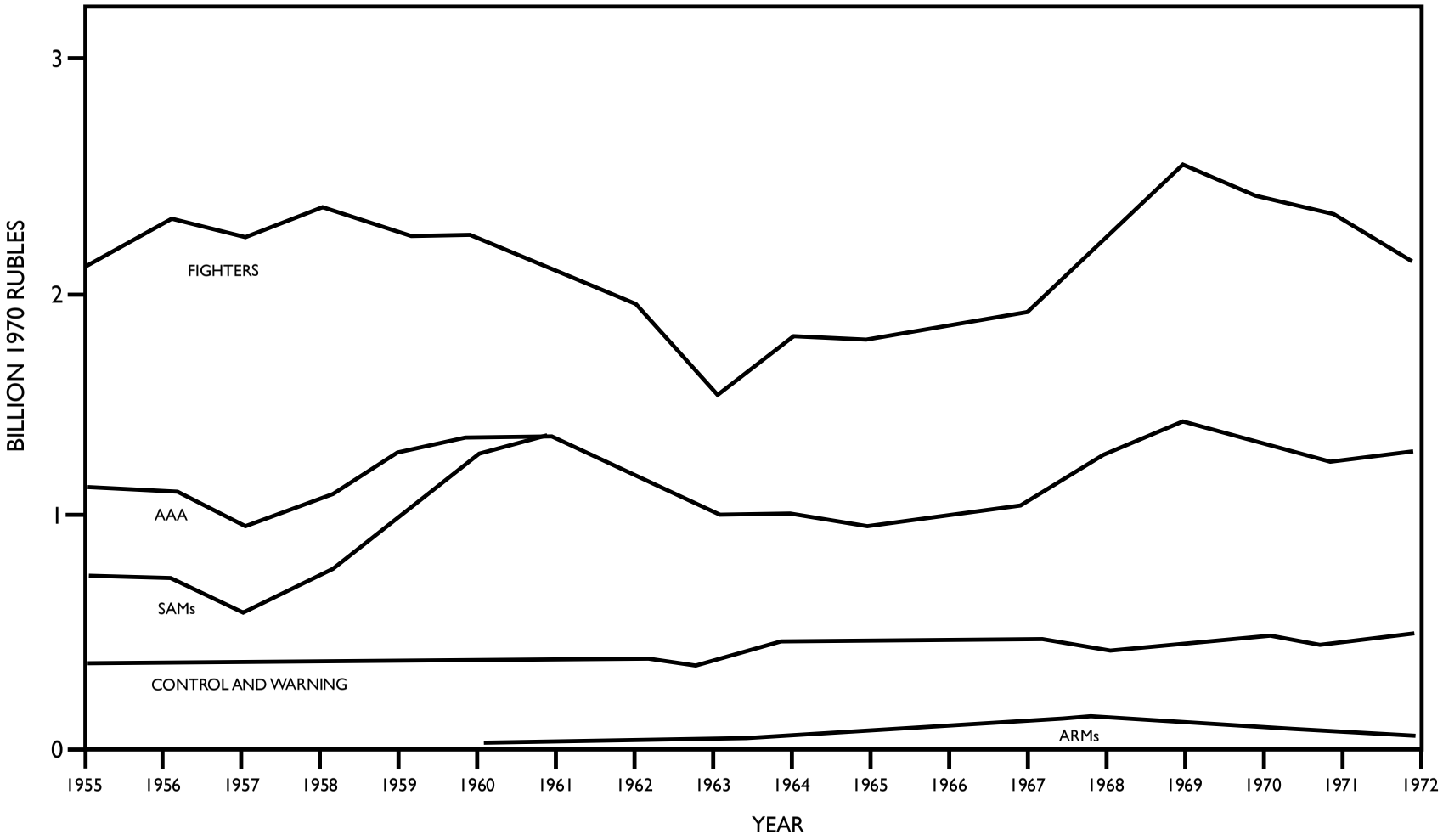


Table 22—Estimated Soviet Expenditures for National Air Defense Forces by Element

(billion 1970 rubles)

	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
Fighters	0.99	1.18	1.27	1.25	0.93	0.81	0.74	0.74	0.57	0.82	0.86	0.82	0.86	0.95	1.13	1.06	1.07	0.84
AAA	0.37	0.36	0.39	0.37	0.30	0.08	—	—	—	—	—	—	—	—	—	—	—	—
SAMs	0.37	0.38	0.20	0.37	0.65	0.94	0.98	0.82	0.60	0.57	0.51	0.54	0.59	0.89	1.03	0.91	0.84	0.83
Control & Warning	0.41	0.41	0.41	0.41	0.41	0.41	0.43	0.43	0.43	0.44	0.42	0.41	0.37	0.37	0.39	0.40	0.44	0.47
ABMs	—	—	—	—	—	—	0.01	—	0.01	0.06	0.09	0.11	0.15	0.12	0.10	0.11	0.07	0.07
Total	2.14	2.33	2.27	2.41	2.30	2.25	2.16	2.00	1.62	1.88	1.88	1.89	1.97	2.32	2.65	2.48	2.42	2.21

Once the current force structure had been basically established in 1960 with the substantial deployment of the SA-2 and the virtual elimination of antiaircraft artillery from the strategic defense system, there was substantial stability in the share of resources going to each element of strategic defense. The control and warning function actually had the greatest stability (extending even back to 1955), especially in absolute terms, since the annual resource allocation to it varied by no more than 60 million rubles over the entire period. But because of fluctuations in the resources going to other elements of strategic defense, its relative share of the total ranged from 15 to 26 percent. From 1960 the share for fighter aviation was also stable, ranging from 34 to 46 percent. The fluctuation in resources going to SAMs, however, was almost twice as large, running from 27 percent to as high as 45 percent, with the highs occurring during periods at major deployments and the lows occurring when deployments had been completed. ABM defenses garnered only a small share of the budget, receiving less than 8 percent of the total in the year of maximum spending for ABMs.

It is noteworthy that the Soviet expenditures for control and warning have been substantial, amounting to one-fourth of the budget at one point. At the same time this is in sharp contrast with the U.S. pattern where, in the U.S. system which has emphasized warning to alert strategic offensive systems more than to support strategic defense, control and warning have accounted for about one half of the much smaller U.S. budget for strategic defensive forces.

Upon examining the Soviet National Air Defense Budget in terms of expenditures by resource category (Figure 14 and Table 23), one can see a slow rise in the cost of pay and allowances, a sharper rise in the amount spent on operations and maintenance, and fluctuations in investment expenditures which coincide with the fighter and missile deployment programs which have been described.

E. Soviet Strategy—A Synthesis

1. The Basic Thrust of Soviet Strategy

Seemingly regardless of events, regardless of fluctuations in the threat, regardless of other demands which might exist for resources, the basic thrust of Soviet strategy has been that it is a desirable thing to have and continually maintain a strong strategic defensive posture. This posture has three basic elements: a massive air defense capability; a coordinated civil defense system; and a limited ABM system. It also has a parallel in an approach to strategic offensive forces, which emphasizes being able to strike enemy offensive forces before they can be committed.

2. The Rationale of Soviet Strategy

Two statements serve to underscore the rationale of Soviet strategy. One is by Col. Gen. A. Gastilovich: "The superiority of the socialist structure with its economic potential and the political unity of the people will enable the countries of the Socialist Camp to withstand the first nuclear strikes of the enemy. This is further favored by the enormous territory, the inexhaustible human resources, and the relatively great dispersion of industrial and administrative centers."[50]

[50] Gastilovich, A., op. cit., p. 4.

Figure 14—Estimated Soviet Expenditures for National Air Defense Forces by Resource Category

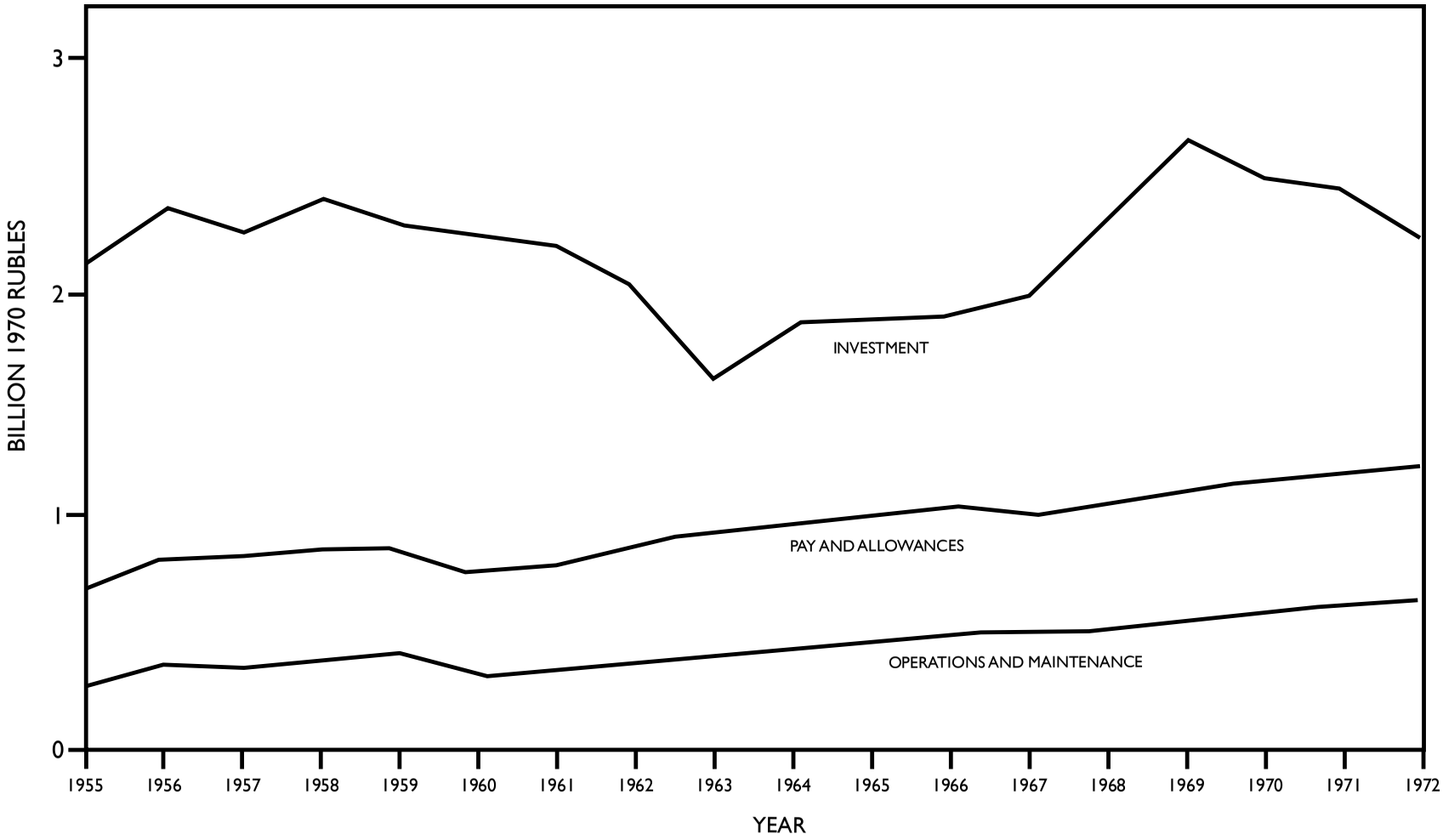


Table 23—Estimated Soviet Expenditures for National Air Defense Forces by Resource Category

(billion 1970 rubles)

	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
Investment	1.41	1.51	1.40	1.52	1.42	1.48	1.37	1.08	0.63	0.84	0.84	0.87	0.95	1.27	1.52	1.27	1.19	0.96
Pay and Allowances	0.41	0.45	0.47	0.48	0.46	0.45	0.45	0.53	0.55	0.56	0.55	0.55	0.54	0.54	0.58	0.60	0.61	0.61
Operations and Maintenance	0.32	0.37	0.39	0.41	0.42	0.33	0.34	0.38	0.44	0.47	0.49	0.48	0.48	0.51	0.55	0.60	0.63	0.64
Total	2.14	2.33	2.27	2.41	2.30	2.25	2.16	2.00	1.62	1.88	1.88	1.89	1.97	2.32	2.65	2.48	2.42	2.21

Three elements here are particularly significant to the Soviet approach to strategic defense: the will of the people, the enormous territory, and the relatively great dispersion of industrial and administrative centers. These three elements signify a readiness to accept substantial destruction in expectation that they will make is possible to survive. Based on this the strategy becomes one of limiting damage rather than one of having a very high assurance that there will be no significant damage. The inexhaustible human resources also have significance. Numerous cities can be destroyed, but the human resources with which to carry on are virtually inexhaustible. These thoughts are a combination of Communist attitude, Russian history, and World War II experience, and for that reason they are ingrained and not necessarily logical. But they do condition the Soviet approach to strategic defense.

The second statement, this time in *Military Strategy*, puts strategic defense in a large strategic context:

> Protection of the country's rear areas and formations of armed forces from nuclear strikes by the enemy has, as its aims, to preserve the vital activity of the state, to secure the uninterrupted functioning of the economy and transportation, and to safeguard the combat potential of the Armed Forces. These alms will be achieved primarily by destroying the enemy's nuclear weapons where they are based. However, there is no guarantee that significant aircraft and missile forces can be destroyed at their bases, especially at the outset of a war, if the enemy attacks by surprise. Therefore the necessary forces and weapons must be available to destroy large numbers of enemy aircraft and missiles in flight in order to prevent nuclear strikes against the country's most important targets. This can be done by conducting military operations to defend the country from enemy air and missile attack.[51]

Thus, according to *Military Strategy*, the strategic defensive forces have as their mission the destruction of attacking enemy strategic offensive air and missile forces which are not destroyed first at their bases. Here the problem is not one of cooperation between strategic offensive and defensive forces. The missions are complementary but not susceptible to integration. As *Military Strategy* implies, if the Soviet strategic offensive forces were to destroy all potential attackers, the strategic defensive forces would be unnecessary. But because this cannot be relied on, especially in the case of a surprise attack, the strategic defensive forces are necessary.

In the larger scheme of things the Soviet National Air Defense Forces receive related assistance from two sources: (1) the air defense forces of the East European countries which are coordinated under the Warsaw Pact and thus provide a western extension of the Soviet defenses, and (2) the air defense elements of Soviet theater forces which normally fall under the operational control of the National Air Defense Forces until they leave the country.

Strategic defense is thus a total commitment of all available resources—Soviet and East European, military and civilian, national and theater—to the defense of the country.

3. Weapons and Resource Strategy

a. The Basic Theme of Soviet Weapons Strategy

A statement in *Military Strategy* captures the basic theme of Soviet weapons strategy:

> The distinguishing feature of weapons development under current conditions is the appearance of qualitatively *new types of weapons and equipment* and their rapid and massive introduction into the armed forces. This has led to a pronounced improvement in the latter's capabilities and a radical change in the organiza-

[51] Sokolovskiy, *Soviet Military Strategy*, p. 417.

> tional forms of the armed forces and methods of conducting military operations on every scale. Military strategy and the art of waging war as a whole have undergone a revolution.[52]

Every point in this statement merits emphasis, including: (1) appearance of qualitatively new types of weapons and equipment; (2) their rapid and massive introduction into the armed forces; (3) the pronounced improvement in capabilities; (4) the radical change in organizational forms and methods of conducting military operations; and (5) the occurrence of a revolution in military strategy and the art of waging war. Each of these points applies to strategic defense.

b. Development of New Weapons

A basic question with respect to the development and introduction of new weapons and equipment concerns what drives the effort. This effort itself is analyzed in considerable detail in the Chapter V studies of fighter aircraft and surface-to-air missiles. Of the various possible influences the one which is most difficult to document specifically is the reaction to U.S. offensive weapons systems and operational concepts and tactics. As was noted in the analysis of Soviet behavior in the 1960–1962 debate on military concepts and operations, even in the records of secret deliberations which have been available there has been little in the way of specific linkage of U.S. capabilities and individual Soviet weapons developments.

As much as anything, the driving force behind new weapons development seems to be the fact that design bureaus have been created to turn out new weapons systems. They have this mission and with it there is an expectation that periodically they will turnout a new system which will represent a qualitative improvement over previous systems. At the same time they are aware through open source and espionage of what the U.S. currently has in the way of weapons systems and often of what is being developed for the future. How this knowledge impacts specifically cannot be determined, although a few cases can be made, as indicated in Chapter V, in the systems studies of fighter aircraft. One example, in this case a very slow reaction, was the deployment of the TU-128P fighter which incorporated an apparent new capability to combat the Hound Dog. Other inputs which could influence the designers would include knowledge of developments in Soviet strategic offensive systems and the practical experience from air defense operations and exercises. The latter would serve, in particular, to indicate deficiencies in existing systems.

c. Rate of Introduction

The rate of introduction of new weapons systems would be expected to depend on the criticality of the need and the availability of additional resources. In actual fact a case cannot be made for either of these factors being the determining criterion. Fighter aircraft were deployed at a rate which was consistent with the previous production record of the producing plants, unless, of course, the deployment pattern was shortened because of deficiencies of the aircraft. SAMs, on the other hand were deployed at a very rapid rate and in massive numbers.

One basic feature should be noted in these deployment patterns. The new fighters were replacing old ones; thus there was a capability already present which was simply being upgraded qualitatively rather than being increased quantitatively. In fact, the numbers of aircraft in operation were declining. In contrast, each successive SAM deployment were adding a new capability, although the SAM was also replacing anti-

[52] Ibid., p. 295.

aircraft artillery. And each successive SAM deployment added on quantitatively as well as qualitatively to that which was already there.

d. Improvement of Capabilities

The desirability of improving capabilities of weapons and equipment is obvious. The institutionalization of capability improvement so that new systems of improved capabilities, are turned out on a regular basis, regardless of whether an incremented improvement is needed in order to cope with a potential threat, is another matter. This essentially has been the pattern in Soviet strategic defense.

e. Change in Organizational Forms and Operational Methods

The new Soviet air defense weapons have had their impact on organization and on operational methods and the changes have been quite radical, although fare from complete. The most significant changes stem from the fact that constantly improving range and accuracy of the weapons have moved defensive concepts from a point approach to an area approach with the area in which weapons systems are integrated in the operation constantly growing larger.

f. The Revolution in Military Strategy and the Art of War

This theme is dear to Soviet military theoreticians because it parallels the politically desirable line that a communist approach to problems can revolutionize their solution. In this connection the improving weapons systems are the basic vehicle for accomplishing the revolution, and, since a continuing positive revolution is a desirable thing, those who can effect further improvements in weapons are acclaimed for their service to the state.

4. Summary

Despite the questionable logic of continuing to strengthen defense against the air threat while limiting defense against the ballistic missile threat, this is exactly what the Soviets were doing in 1972 (and have continued to do into 1975). Once set in the early post war years, the basic thrust of Soviet strategic defense continued without significant alteration throughout the period. Many details changed, but the emphasis on qualitative and quantitative improvement of strategic defense did not. The political leadership set priorities for strategic defense and allocated a steady and substantial amount of resources for their realization. A foreign threat—primarily U.S.—was omnipresent but difficult to trace in its impact on Soviet strategy. A system had been created—in industry and in the military—which continued with much interest to assimilate its allocated share of resources.

Chapter IV

American Systems

Section I. General

A. Limitations

The guidelines for preparation of supporting studies to the over-all effort, "History of the Strategic Arms Competition 1945–1972," indicate that historical "treatment will tend to be selective rather than exhaustive."[1] This guidance has been applied in this chapter so as to bring the expository problem regarding American air, ballistic missile, and space (antisatellite) defense systems within manageable bounds. There is no effort made to prepare a narrative history of *all* such systems, although mention of each major system is included in the air defense and ballistic missile and space defense chronologies (Appendices A and B, Volume II, "History of Strategic Air and Ballistic Missile Defense, 1956–1972").

B. Purpose

In the discussions of American systems for the period 1956–1972 the purposes have been to (1) outline the specific defense goals to be achieved by specific system development, production, and deployment; (2) indicate at selected times the system deployments that have resulted; (3) indicate significant modifications in system capabilities, production schedules, and deployments that have occurred; and (4) throughout all of the above considerations, focus on the question of *why*.

C. Approach

The analyses contained in this chapter are based on the following general approach:

(1) The situations in American air and ballistic missile defense systems at the end of 1955 are taken as points of departure.[2]

(2) Sequential system histories are included in Appendices A and B, A Chronology of American Air Defense Systems and A Chronology of American Ballistic Missile and Space Defense Systems.

(3) Significant events in system development, deployment, or modification are selected for narrative discussion and are included in this chapter.

D. Chapter Organization

American air, ballistic missile, and space defense systems since 1955 appear best considered as three separate functional subjects. Although slightly at variance with the format utilized in Chapter IV, Volume I,

[1] "Guidance for Preparation of Supporting Studies for History of the Strategic Arms Competition 1945–1972, Historical Office, Office of the Secretary of Defense, October 1944, p. 7.

[2] For details concerning American systems for the period 1945–1955, the reader is referred to Chapter IV, American Systems, Book I, Volume I, 1945–1955, "History of Strategic Air and Ballistic Missile Defense", and to Book II, Volume I, Appendix B, A Chronology of American Air and Ballistic Missile Defense Systems and Appendix D, Figures.

air defense, ballistic missile defense, and space defense will be discussed in separate sections of this chapter. The three sections will be supported by the chronologies, Appendices A and B.

E. Analysis Factors

In the analyses of why various events, decisions, and developments concerning the air, ballistic missile, and space defense systems occurred, certain categories of factors suggest themselves as important considerations. One factor of vital importance is the threat that is perceived to exist. This perception of the threat, however, must be tempered with an appreciation of the reliability of the intelligence on which the threat assessment is based and on the decision-maker's interpretation of that intelligence. At any given period, there may well be differing evaluations of the specifics of an air, ballistic missile, or satellite threat.

There may not be universal acceptance as to what the threat actually is. However, considerable uniformity on the subject is implied if a national strategy for air, or ballistic missile, or space defense is formally and officially established. Unfortunately for the historian such clear "guide posts" are rarely available. The national strategy often must be inferred from a variety of decisions and events, which in turn had been influenced by numerous other, frequently conflicting, considerations.

One of these additional factors which often was crucial in the matter of defense systems was that of the national defense budget. Decisions on which system to develop, how many to produce and deploy, what modernization modifications were to be applied were often based on their costs.

Quite apart from considerations of threat, national strategy, or costs is that of technological capability. The need for a system, its performance characteristics, even a national willingness to pay for it, were, in the final analysis, subordinated to the technological capability of industry to produce such a system. Advances in technological capability (e.g., development of solid state electronics) brought associated requests for defense system modifications which were not given impetus by threat, or strategy, or cost considerations. In fact, cost provided a "dampening" effect on many modernization proposals.

The threat received some modifications that were primarily technological rather than quantitative in nature. For example, the impact of ECM on established air defense systems was not initially appreciated by system planners. The need for improvements both to existing and developmental systems to facilitate operation in an ECM environment resulted. Understanding of the effects of EMP from a nuclear explosion is a relatively recent development. However, with this understanding came a costly and complex requirement for hardening. There are undoubtedly other examples of the impact of technology on both evaluating and countering the threat.

A hazy area that probably had some influence on development and deployment of American systems subsequent to 1955 was that of inter-Service rivalry stemming from disagreements over Service roles and missions. Whereas this was a primary issue in both air and ballistic missile defense during the earlier period, the effects of the occasional differences of opinion during the period 1956–1972 were of less overall significance and will, therefore, receive correspondingly less emphasis in this chapter.

An obvious point that merits mentioning is that all or most of the above factors operated simultaneously in the consideration of any American system. The final decision regarding system development, deployment, or modification was a compromise or adjustment of the influences of the various factors. Indeed for historical consideration, it is difficult—if not impossible—to ascribe with certainty a paramount importance to any one of the factors.

F. The Status End 1955

1. Approach

The status of the strategic air defense of the United States at the end of 1955 is summarized below to establish for the reader a point of departure for the consideration of American systems during the period 1956–1972 as covered in Section II of this chapter. Since there was no ballistic missile or space defense in existence in 1955, *all* coverage pertaining to those subjects is addressed in Sections III and IV this chapter.

2. Organization and Command

By the end of 1955 the United States had reached the threshold of its maximum commitment to air defense in terms of numbers of units and deployed systems since the close of World War II. Since September 1, 1954, a joint command, Continental Air Defense Command (CONAD), responsible for the air defense of the United States, had been in existence at Colorado Springs.[3] Forces for the CONAD mission were provided by the component commands: USAF Air Defense Command (ADC), USA Antiaircraft Command (ARAACOM),[4] Naval Forces CONAD (NAVFORCONAD), and various augmentation forces of all services made available to CINCONAD during periods of emergency. As an indication of the magnitude of the air defense effort, the authorized or programmed personnel strengths of ADC and ARAACOM, the two major component commands, were 93,120 and 42,552, respectively.[5]

Responsibility for air defense was assigned to ADC and ARAACOM subordinate commands on a geographic basis, with boundaries between commands influenced by operational principles and requirements such as span of control, air traffic density, and possible enemy air approach routes. In 1955 ADC was organized geographically into Eastern, Central, and Western Air Defense Forces (EADF, CADF, and WADF), each consisting of four air divisions.[6] ARAACOM was similarly organized geographically, except that the EASTARAACOM was further subdivided into three antiaircraft regional commands to facilitate logistical coordination with the First, Second, and Fifth ZI armies.[7]

Planning to accommodate the soon-to-be-available Semi-Automatic Ground Environment (SAGE) system was an important feature of late 1955. From point of view of geographic subdivision of the Continental United States for air defense purposes, the SAGE system would require eight divisions/sectors and thirty-four wing/subsector areas.[8]

By the end of 1955, problem areas in a field closely related to that of command and control, i.e., the Service roles and missions pertaining to air defense, had been largely resolved. During the previous decade the Army Air Force (AAF)—Army Ground Force (AGF) controversy over responsibility for air defense, the ADC-ARAACOM efforts to clarify and define operational control and rules of engagement, and the USAF-USA competition to develop the surface-to-air missile (SAM) system had raged and waned. With

[3] USAF was the executive agent for this joint command. Initially and until September 17, 1956, command of both CONAD and ADC rested with the same individual.
[4] On March 21, 1957, ARAACOM was redesignated U.S. Army Air Defense, Command; thereafter the acronym ARADCOM was used.
[5] "Continental Air Defense Command and Air Defense Command History, July–December 1955," Headquarters CONAD, p. 10.
[6] Ibid., p. 2.
[7] Ibid., p. 3.
[8] Ibid., p. 12.

few exceptions, the period subsequent to 1955 would be characterized by component awareness that their tasks were the provision and deployment of forces for air defense, and a generally cooperative pursuit of common air defense goals.

3. Surveillance and Early Warning

The earliest possible detection and identification of air traffic approaching the United States was essential to the adequate provision of early warning. Three to six hours warning of attack was an initial prerequisite to both active and passive defense response. This early warning and interceptor control were achieved primarily by electronic means (radar), supplemented by volunteer ground observers.

At the end of 1955, the active electronic surveillance network operated by ADC within the U.S. is shown partially by Figure 15 and consisted of 75 radar stations of the Permanent System, 15 radar stations of the Mobile Program, and 6 Lashup stations.[9]

Additionally, 375,000 Ground Observer Corps (GOC) volunteers were engaged in a program which resulted in manning 7,918 active posts.[10]

The primary search radars utilized at the stations of the permanent system included 64 AN/FPS-3, 7 AN/CPS-6B, and 4 AN/FPS-10. A variety of models of the height finder radars were in use.

The 1955 CONUS surveillance system was, not highly effective against low altitude targets. To compensate for this known weakness, a concept of "gap filler" radars was developed. This was a supplemental system of small, unattended radars (AN/FPS-14) specifically to provide detection of aircraft down to 500 feet. Initial planning had generated a requirement for 323 of these radars in the United States; new siting criteria reduced this number to 111.[11] The first increment of 22 gap filler radars was programmed to be operational by June, 1956.[12]

The radar surveillance network was integrated into the air defense system through 12 control centers. The GOC accumulated, evaluated, and updated their data through 53 filter centers.

Since the early warning generated by the surveillance system was a function of radar range, in addition to other factors, an important strategic concept was to locate radar surveillance stations as far from the vital areas of the United States as possible. With the dedication of defense planners of the period to the polar approach from the U.S.S.R., this meant locating ground radar stations north, on the continent and into Canada and Alaska and seaward off both the East and West Coasts of the CONUS.

By joint agreement with Canada in 1951, a northward extension of the CONUS permanent system was initiated. This project, called Pinetree, resulted in programming 33 radar sites in Canada, all of which were operational by December 1955.[13] Twenty-two of these stations were manned by USAF personnel.

Construction of a line of detection stations, unmanned and telemetered, crossing Canada at about the 55th parallel, was begun in October 1952. This system, the Mid-Canada Line, utilized the AN/FPS-503 CW Doppler radar, and consisted of 90 detection station and eight section control stations. All sections were operational by December 31, 1956.[14]

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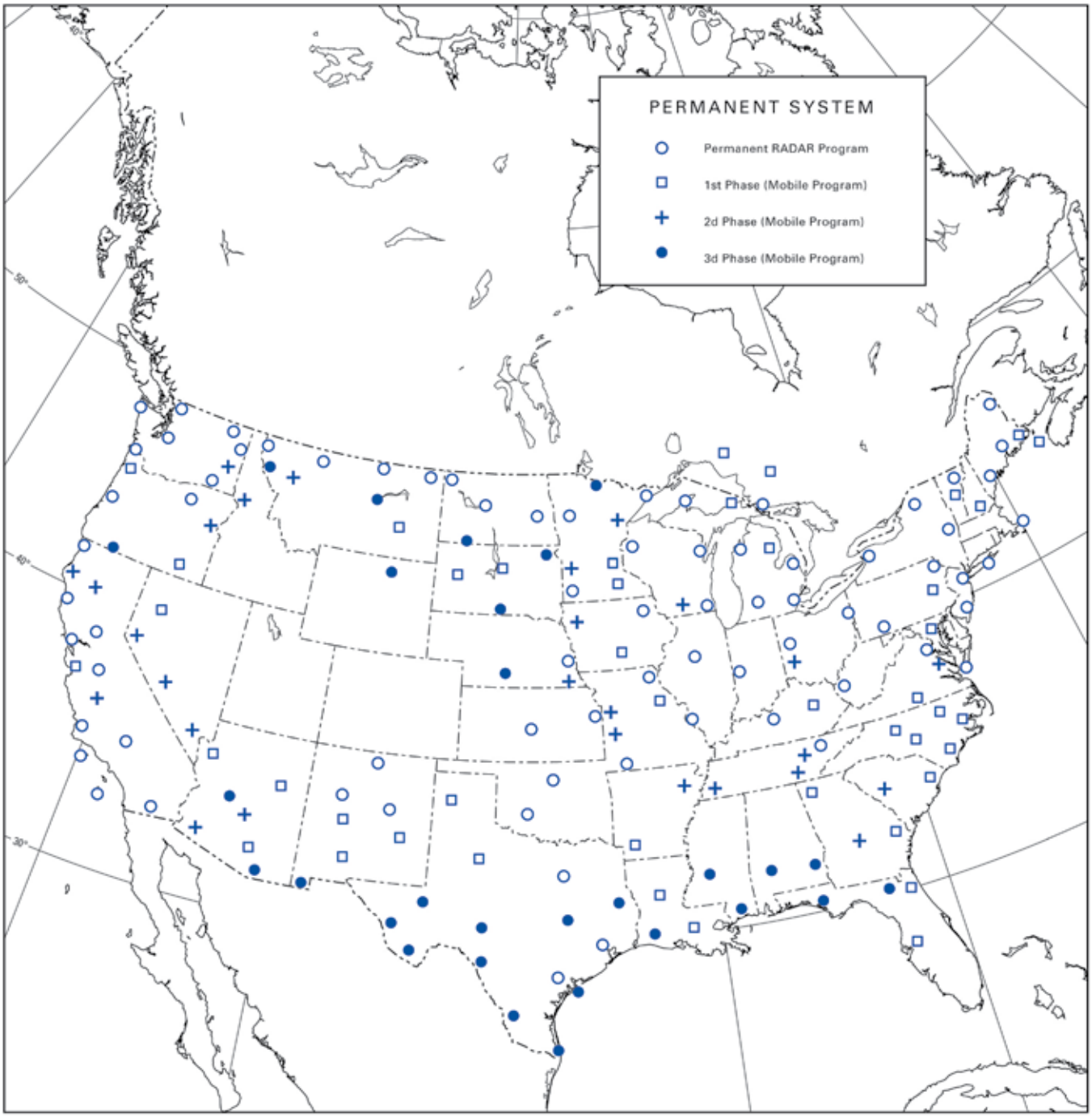
[9] Ibid., p. 17.
[10] A post was considered active if it were equipped with communications and manned at least two hours per day. 1,365 of these posts were manned 24 hours per day under the SKYWATCH program. Ibid., p. 50.
[11] Continental Air Defense Command and Air Defense Command History, July–December 1955," Headquarters CONAD, p. 45.
[12] "Continental Air Defense Command and Air Defense Command History, January–June 1956," Headquarters CONAD, p. 28.
[13] Ibid., p. 74.
[14] Ibid., p. 74.

Figure 15—ADC Electronic Surveillance Network, 1955*



*This figure has also been utilized in Volume I, titled as Figure 4—Permanent System.

A detection line at the 70th parallel (virtually the northern extremity of the continent), the Distant Early Warning (DEW) Line, was approved in January, 1955, and was, at that time, projected to be operational by July 1957. The land portion of the DEW Line was to run from Cape Lisburne, Alaska, to Cape Dyer, Baffin Island. Involved were 58 separate stations of three types—main stations, auxiliary stations, and intermediate stations.

The approximate locations of the Pinetree stations and the Mid-Canada and DEW Lines are shown by Figure 16.

There were several methods visualized for extending radar coverage seaward. The USAF program for Texas Towers involved construction of five tower-mounted radar stations on shoals at locations approximately 100 miles off the northeast coast of the U.S. The first of these Texas Towers (No. 2) achieved beneficial occupancy in December, 1955. Two more towers were programmed for FY 1956, and the final two of the program for FY 1957. A Texas Tower radar site constituted a limited ground controlled intercept (GCI) station.[15]

USAF also utilized an airborne early warning capability. Three AEW&C squadrons were stationed at each McClellan AFB, California, and Otis AFB, Massachusetts. These squadrons were equipped with RC-121 aircraft. Their mission was to fill low and medium altitude gaps in the radar coverage between shore based radars and the picket ships.[16]

The extension seaward of the continental radar coverage also involved the Navy and led to the requirement for NAVFORCONAD. One Navy involvement was the provision of picket ships off both coasts as a means of extending the "contiguous radar coverage." The program called for five picket ship stations off each coast, to be manned 24 hours per day. The East Coast had priority; all five stations had been manned since July 1955. Only the first station in the Pacific was manned by that date.[17] CONAD programmed a requirement for 19 picket ship stations—six more off the East Coast and three off the West Coast.[18] The exact locations of the picket ship stations varied. However, as a generality, the line of stations was located about 300 miles off coast; the distance between ships was approximately 150 miles.

The approximate locations of the elements contributing to the contiguous radar coverage system are shown by Figure 17.

Planning, not yet implemented during this early period, involved the Navy further. Both eastern and western sea extensions of the DEW Line, under the command of CINCLANT and CINCPAC, were planned. Additionally, the use of Navy lighter-than-air blimps on electronic surveillance missions as a part of the contiguous radar coverage was planned.

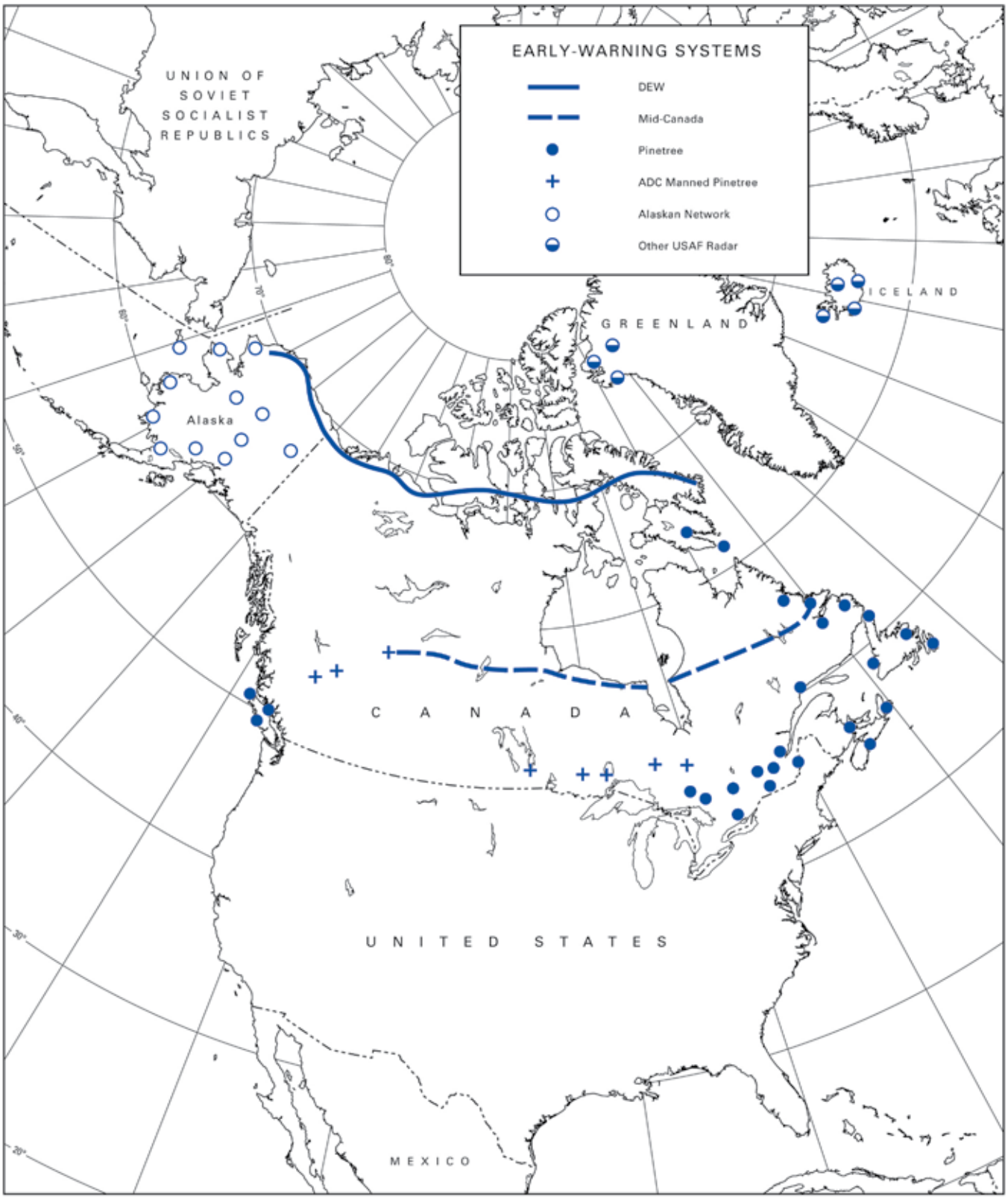
4. Fighter Interceptors

Whereas the USAF interceptor aircraft in the early 1950's were "day jets," an all-weather jet capability was general prior to 1955 with the appearance of the F-86D, F-89D, and F-94C. Pilot reflexes were soon too slow to control these sophisticated aircraft and their associated radar and weapons systems. SAGE provided an electronic command and control network. Air-to-air guided missiles and atomic rockets were added to the interceptor arsenal. Spectacular though these aircraft system developments were, they but presaged the appearance in 1956 of the first of the USAF "century series" of interceptors, the F-102A.

By the end of 1955, ADC had a total of 61 all-weather squadrons as follows[19]: 41 F–86D, 11 F–89D, and 9 F–94C.

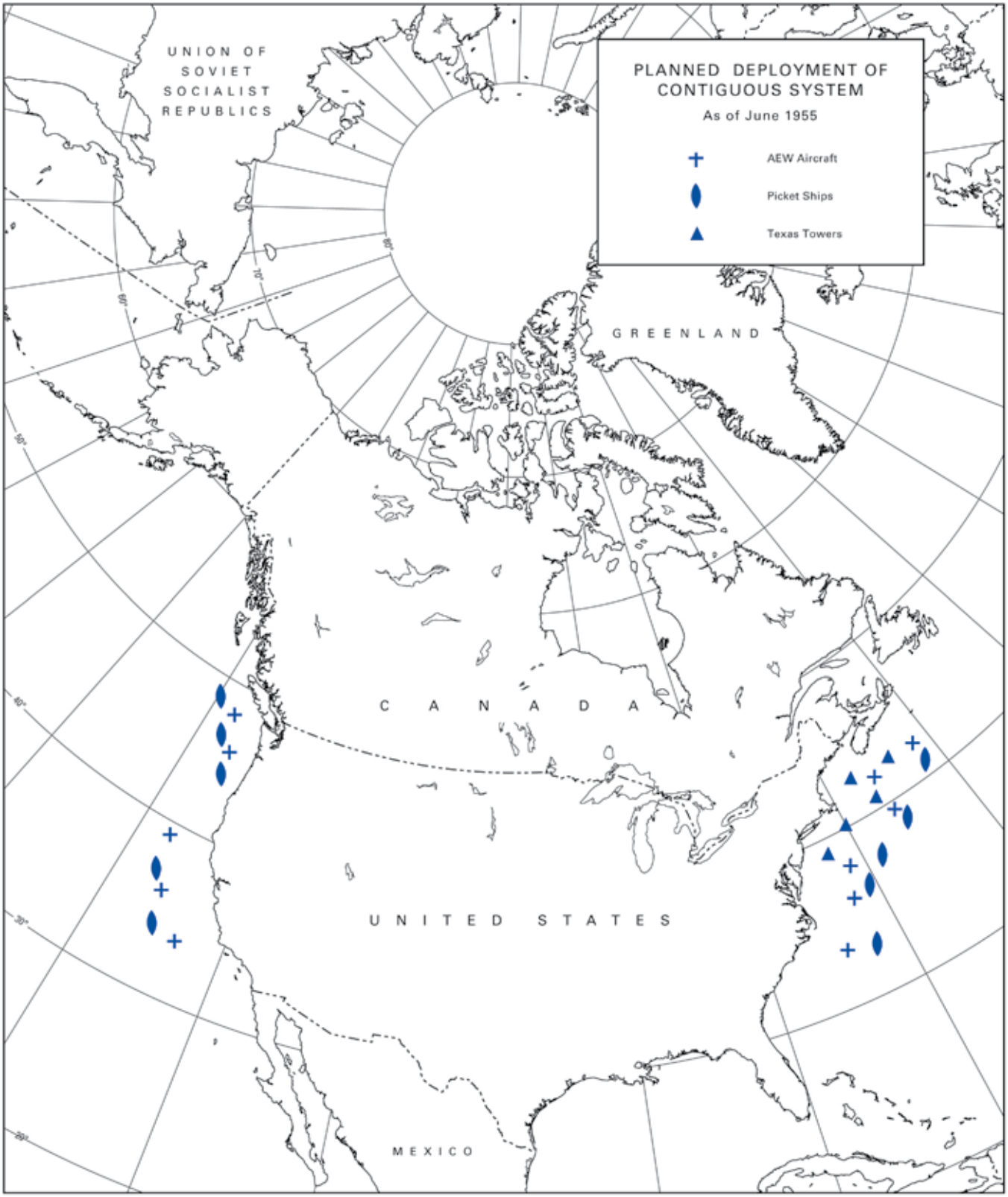
[15] Ibid., p. 37.
[16] Ibid., p. 36.
[17] Ibid., p. 32.
[18] "Historical Summary, July 1956–June 1957", Continental Air Defense Command, p. 60.
[19] "Continental Air Defense and Air Defense Command History, July–December, 1955," Headquarters CONAD, p. 80.

Figure 16—Early-Warning Systems



This figure has also been utilized in Chapter IV, Volume I.

Figure 17—Planned Deployment of Contiguous System (As of June 1955)



This figure has also been utilized in Chapter IV, Volume I, titled as Figure 19.

There were 1,490 operational aircraft assigned to the squadrons. They operated from 44 bases, 27 of which were controlled by ADC. Fighter interceptor squadron deployment at the end of 1955 is shown by Figure 18.

Plans were in existence for the augmentation of ADC in its air defense mission in the event of emergency. Approximately 4,000 additional aircraft were earmarked for this purpose from other USAF commands (SAC, TAC, and ATC), the Navy, the Air National Guard, and the Air Force Reserve.

In 1955 requirements for ADC interceptors projected to 1959 called for 69 squadrons. The current inventory of aircraft—the F-86D, F-89D, and F-94C—were to be converted to F-89H, F-89J, F-101B, F-102A, and F-102B.

5. Ground-Based Antiaircraft Defenses

By the end of 1955 the Army had established full-time antiaircraft defenses of designated targets, utilizing 75-mm. guns (Skysweeper), 90-mm. guns, 120-mm. guns, and the surface-to-air missile, Nike-Ajax. These deployments are shown by Figures 19 through 21. Distribution, by weapons types, of the ARAACOM battalions was[20]:

Battalion	BN December 1955	BN Projected March 1957
Nike-Ajax	38	61
75-mm. gun	8	13
90-mm. gun	29	{26
120-mm. gun	4	

On September 9 a milepost in antiaircraft defense was reached. The Nike SAM became the principal antiaircraft weapon when the number of Nike batteries (136) equaled the number of gun batteries.[21] Another point of significance is that, by the end of 1955, the number of antiaircraft batteries, the preponderance of which were SAM, exceeded the number of interceptor squadrons.

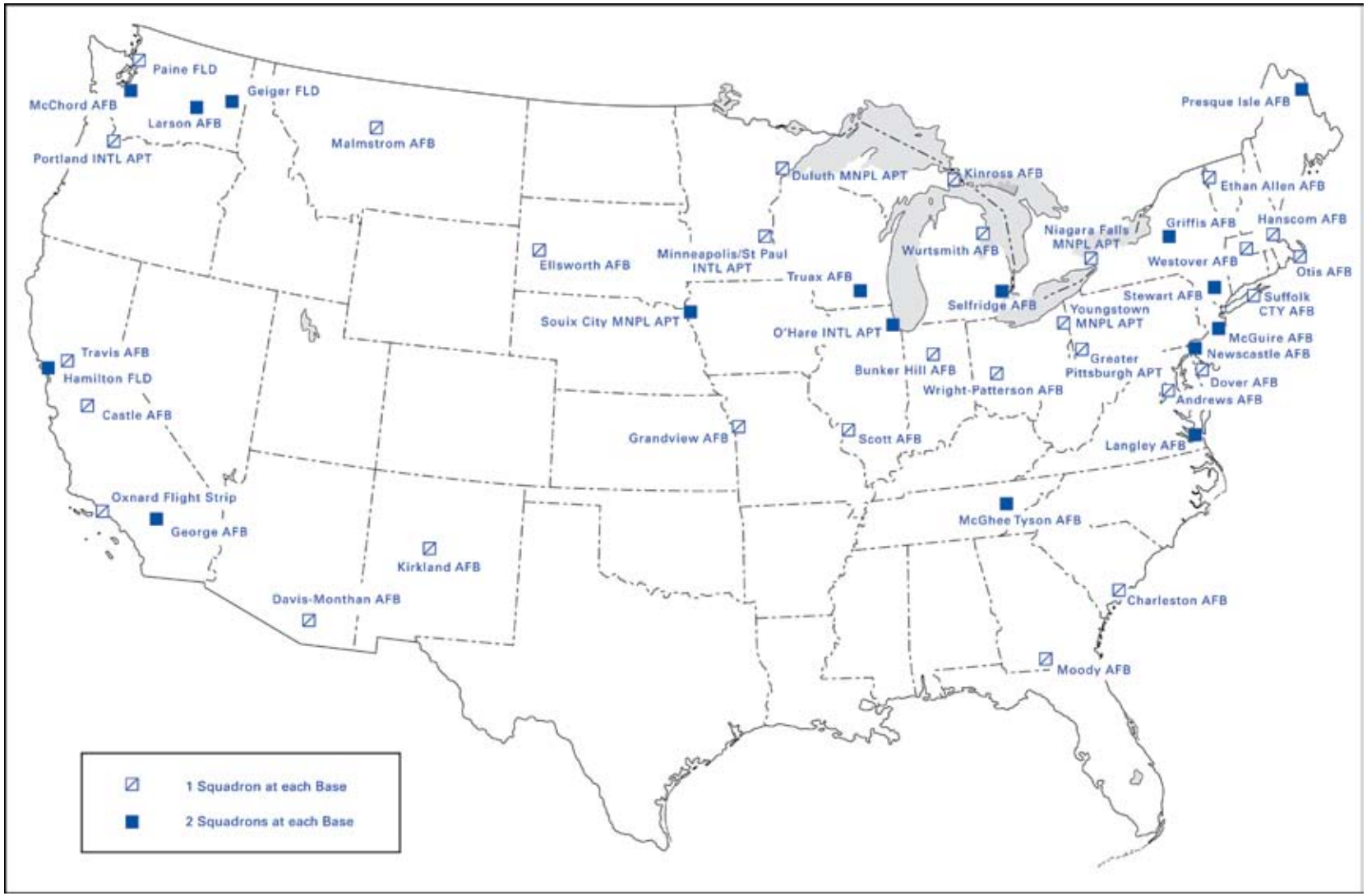
As had been true of the USAF, the army utilized augmentation forces to supplement the active units. Army National Guard batteries were incorporated into established defenses. By September, 1955, 53 batteries were so used. Additionally, NG battalions, after achieving proficiency and designation as "special security forces," would, upon proper notification, move to on-site positions under the command of CG ARAACOM.[22]

6. Strategy

Since there has been a general continuity in the locations within the United States receiving antiaircraft protection, historical inquiry may suggest the strategy applicable to this phase of air defense. In many cases units providing SAM protection had been converted "in-place" from an earlier deployed antiaircraft gun unit. A priority for defense can be inferred from the order of defense closing.

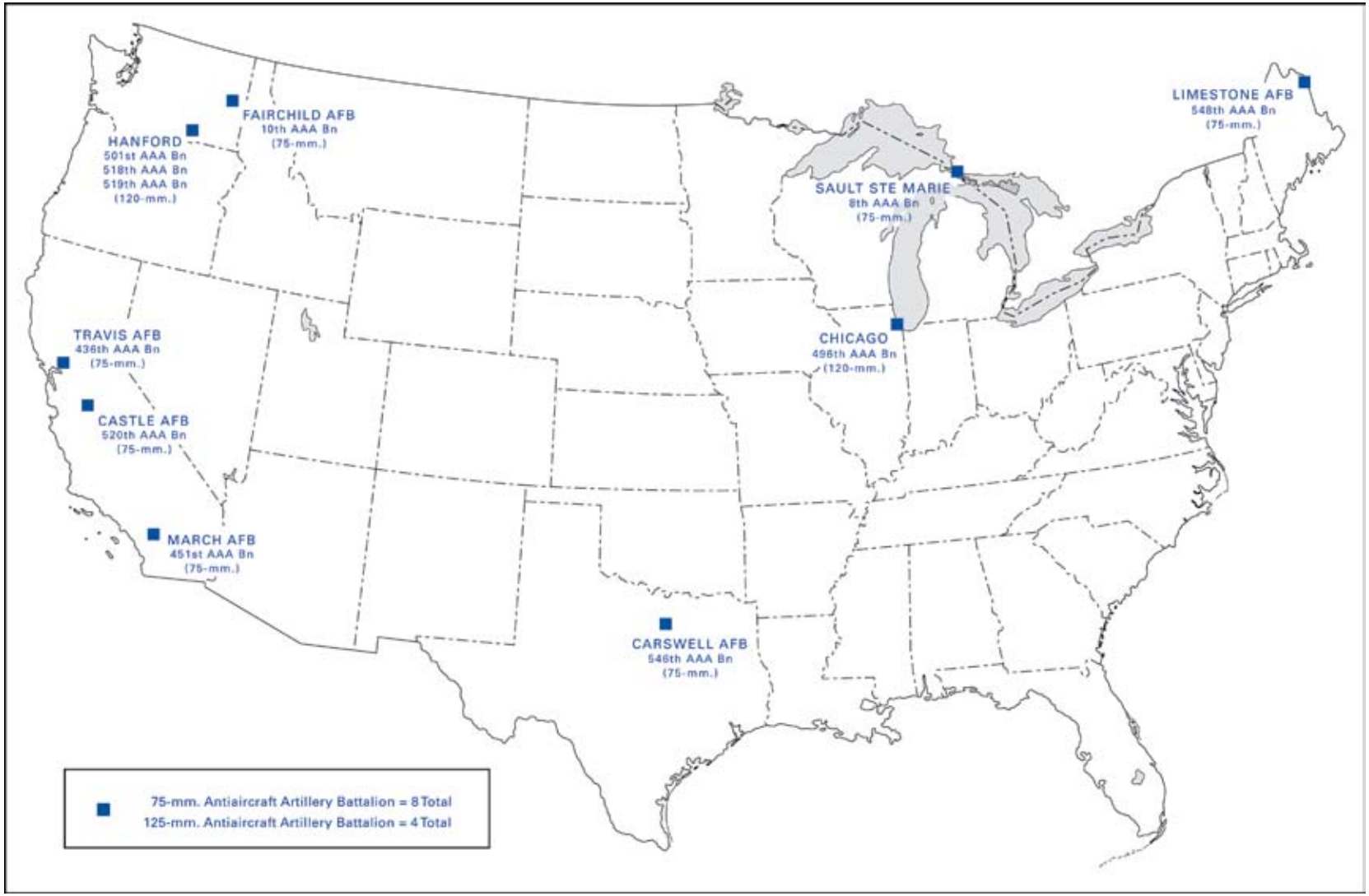
[20] Ibid., p. 114.
[21] Ibid.
[22] "The History of ARADCOM, Volume 1, The Gun Era, 1950–1955," Historical Project Number 5M-I, Headquarters, ARADC0M, p. 145.

Figure 18—ADC Interceptor Deployment (As of 31 December 1955)



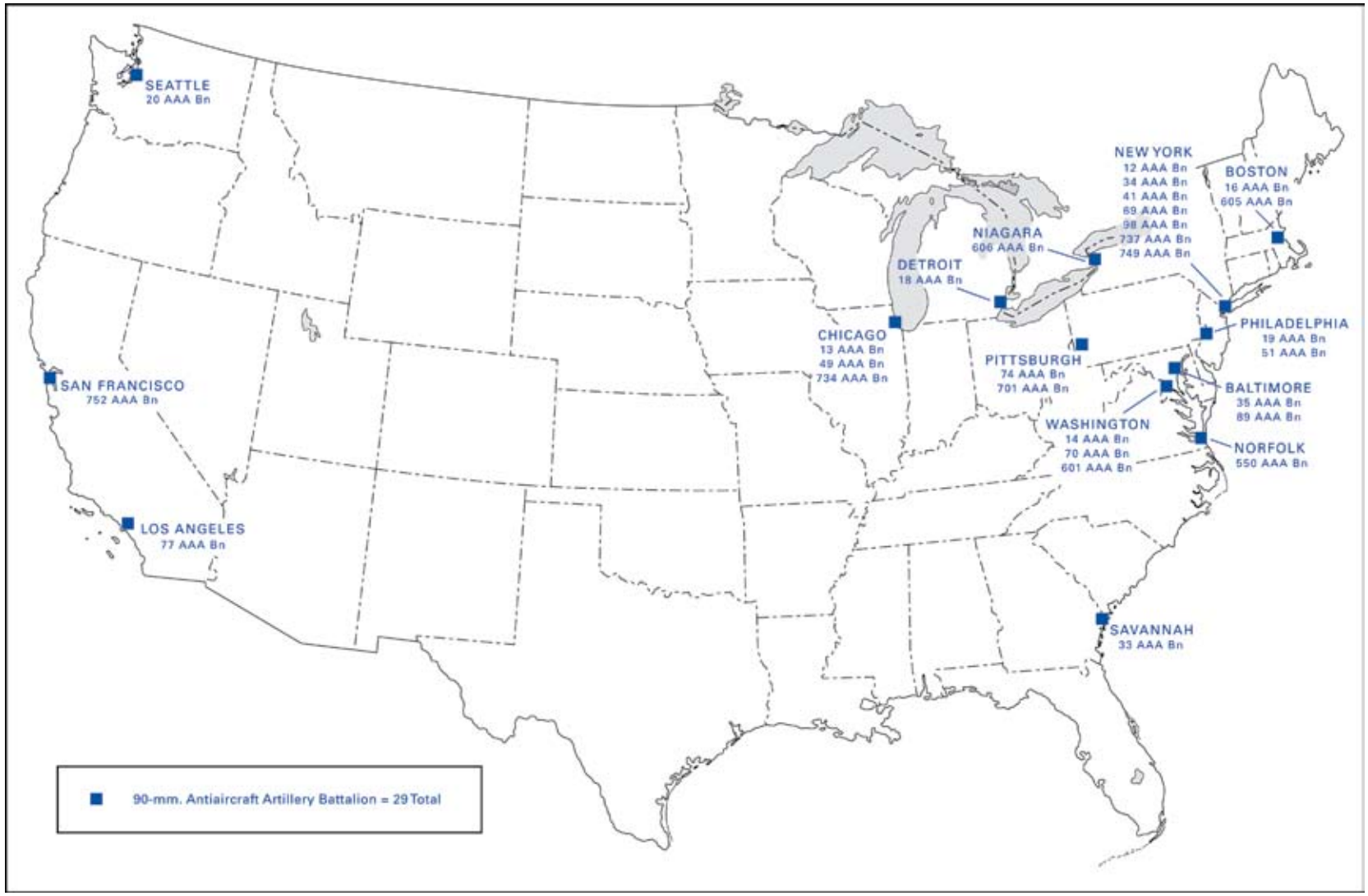
This map is based on tabular data from "Continental Air Defense Command and Air Defense Command History, July–December, 1955," Headquarters CONAD, 81, and map, ADC Statistical Book, Aircraft and Missiles, 33.

Figure 19—ARAACOM 75 ε~ 120-mm Deployment, 31 December 1955



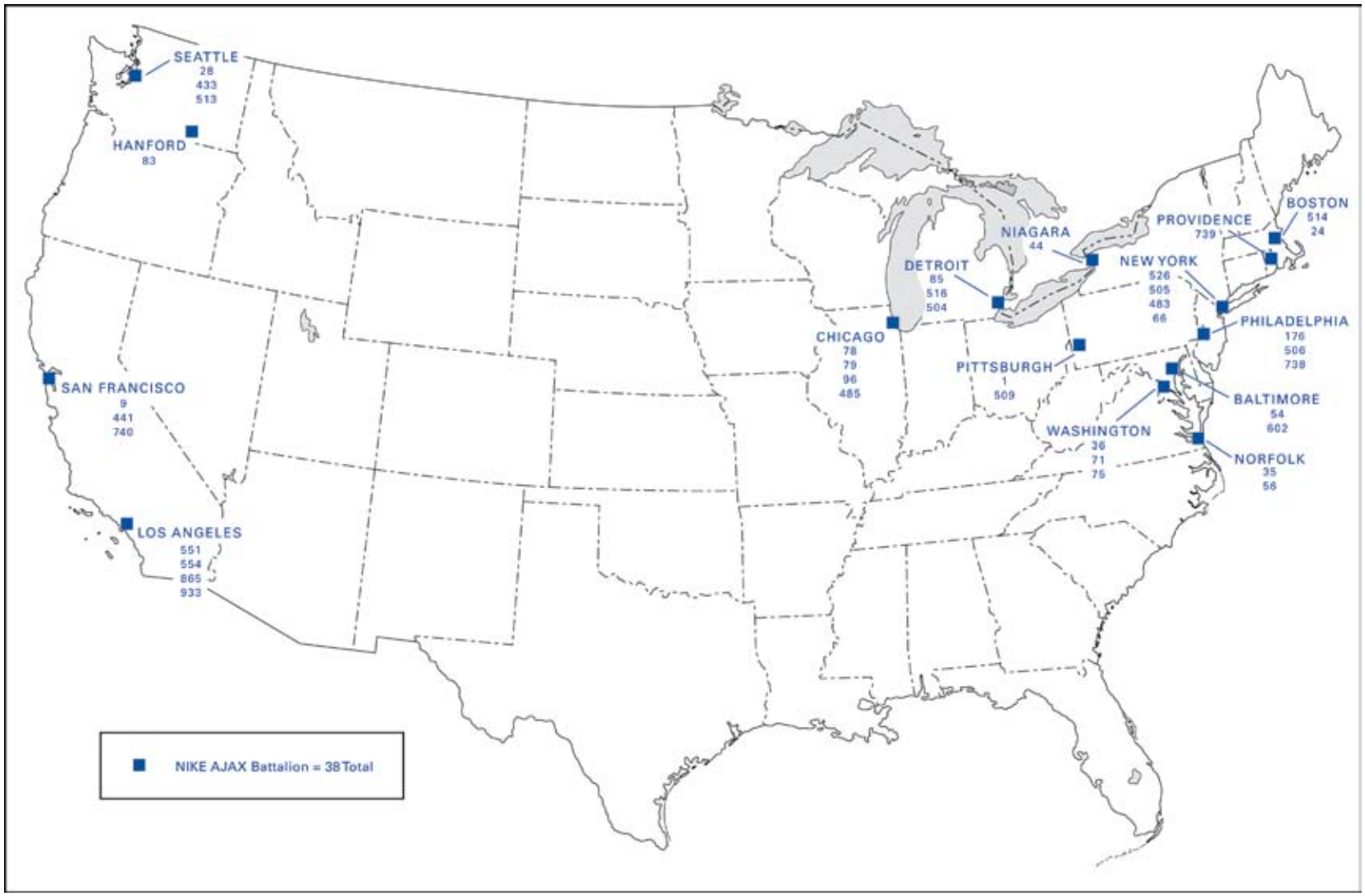
Taken from Map 24, "The History of ARADCOM, Volume 1, The Gun Era, 1950–1955," Historical Project Number ARAD 5M-1, Headquarters ARADCOM, 180.

Figure 20—ARADCOM 90-mm Deployment, 31 December 1955



Taken from Map 25, "The History of ARADCOM, Volume 1, The Gun Era, 1950–1955," Historical Project Number ARAD 5M-1, Headquarters ARADCOM, 181.

Figure 21—ARADCOM Nike-Ajax Deployment, 31 December 1955



Taken from Map 23, "The History of ARADCOM, Volume 1, The Gun Era, 1950–1955," Historical Project Number ARAD 5M-1, Headquarters ARADCOM, 179.

Since the early antiaircraft gun deployments provided a strategic antecedent, let's consider this aspect briefly. The initial defense and deployment directives from JCS in early 1950 specified antiaircraft protection for Washington, D.C.; AEC installation at Hanford, Washington, Sault Ste. Marie locks; and other areas to the extent units are available.[23]

Within that guidance, ARAACOM established the initial gun or automatic weapons defenses as follows[24]:

EASTARAACOM	WESTARAACOM
Washington, D.C.	AEC Plant, Hanford, Washington
Locks, Sault Ste. Marie	Sandia AEC Base-Kirtland AFB
Baltimore	Los Angeles
Boston	San Francisco
Chicago-Gary	Seattle
Detroit	Castle AFB (SAC)
New York City	Fairchild AFB (SAC)
Niagara Falls	March AFB (SAC)
Philadelphia	
Pittsburgh	

This listing, although changed occasionally as years passed,[25] clearly suggests the strategy for antiaircraft defense within the continental United States. The specific locations to be provided defense were the national capitol, Sault Ste. Marie locks, some atomic installations, some SAC bases, and some of the largest and most highly industrialized cities. Another feature of the strategy was an application of the principle of defense in depth. USAF interceptors also provided air defense for the areas in which the facilities provided antiaircraft defense were located.

Section II. Air Defense, 1956–1972

A. Approach

The previous section discusses in general terms the status at the end of 1955 of the United States strategic air defense in terms of systems, units, and deployments. Changes since that date are suggestive of modifications in the threat assessment and the associated national defense strategy, but they are also strongly influenced by budgetary, technological, and other constraints. Regardless of cause, frequently difficult to ascribe, characteristics of United States air defense strategy may be inferred from:

(1) Strategic decisions concerning the general means selected for defense, i.e., area defense or point defense? fighter interceptor or SAM? etc.?
(2) Research and development (R&D) decisions concerning desired or required individual system performance capabilities, as influenced by cost, technological, and tactical employment considerations.

[23] Ibid., p. 100.
[24] Ibid., pp. 98, 100, and 104.
[25] Ibid., p. 151. For example, four additional SAC bases (Carswell AFB, Texas; Ellsworth AFB, South Dakota; Limestone AFB, Maine; and Travis AFB, California) were designated for antiaircraft defense in 1953–1954.

(3) Decisions regarding procurement and production, i.e., how many units of a given system will be added to the defense inventory and when? what is the national defense budget?
(4) Decisions concerning the locations at which the units will be deployed, i.e., specifically what is to be defended and to what level of defense?
(5) Decisions to modernize or improve existing materiel to enable better performance against aspects of the threat not initially perceived or coincidentally made possible by technological advance.

The approach of this Section on United States air defense systems, 1956–1972, will be to emphasize deployments as implying or supporting the national air defense strategy, although there will be brief references to other significant events in system modernization and R&D objectives. As a means of highlighting the changes in air defense posture as defined by unit deployments, "snap-shot" years of 1960, 1964, 1968, and 1972 have been selected.[26]

B. 1956–1960

1. Organization, Command, and Control

There were several occurrences of major significance concerning organization for and command and control of air defense resources during this five-year period. One was an international development and was oriented towards continental rather than national defense. As early as January, 1956, the JCS approved in principle a USAF recommendation regarding "the need for peacetime integration of the operational control of Canadian-United States air defense forces."[27] This was followed by a similar recommendation by a joint Canada-United States study group in December of that year, and in August, 1957, by a joint governmental announcement concerning an international agreement for air defense of the two countries. From point of view of military organization, the international agreement was to be implemented by the establishment and functioning of Headquarters North American Air Defense Command (NORAD) at Colorado Springs, Colorado, effective September 12, 1957. Applicable Terms of Reference for NORAD were issued on June 10, 1958. Although the manner of military participation by Canada in continental air defense is beyond the scope of this study, the reader should be aware that such participation was present—both in terms of provision of joint-use facilities and provision of surveillance and early warning, fighter Interceptor, and SAM forces.

Several events of the period also had important consequences for CONAD. On July 3, 1956, JCS issued a revised unified command plan, the results of which were to give CONAD new Terms of Reference on September 4 and extra-CONUS air defense responsibilities for Alaska and the Northeast Area. Separation of CONAD, the joint command and USAF ADC, the component command, was also part of this action.

Presidential signature on August 6, 1958, of the Department of Defense Reorganization Act brought further changes to the CONAD concept. This act led to a new unified command plan from JCS on September 8, 1958, and the associated Terms of Reference on the 31st of December. CONAD was changed from a joint command to a unified command.

On March 18, 1959, a new, hardened survivable Combat Operations Center (COC) in Cheyenne Mountain, near Colorado Springs, was approved for NORAD/CONAD.

[26] These years also coincide with national presidential elections, times when air defense postures may be most affected by shifting foreign policy and national strategies.
[27] For this and other similar entries, see Appendix A, A Chronology of American Air Defense Systems.

Development and deployment of more sophisticated component weapons control means was extensive during this period. Preceded by extensive planning and testing of almost three years, the first SAGE air defense sector (New York) became operational on June 26, 1958.[28] Other SAGE sectors would be incorporated into the air defense system as they reached operational status. The first SAGE division (New York) became operational on January 1, 1959. At the end of 1958, the NORAD plan included eight SAGE divisions, seven of which were in CONUS.[29] A major divisional boundary reorganization was necessary to convert from the manual weapons control system to SAGE. This boundary reorganization was not completed until July 1, 1960.[30]

Two events complicated the SAGE picture before the system was fully in the field. First was the technological advance to solid state electronics; the other was an awareness that the SAGE system was not, in its current configuration, survivable in a nuclear attack environment. A solid state computer for SAGE (AN/FSQ-7A) in a hardened combat center came to be termed a Super Combat Center. Although nine of these facilities were planned in 1959, the project was cancelled by USAF on March 30, 1960.[31] SAGE in a six-division CONUS organizational plan was retained.

The Army's automated weapons control system, the Missile Master (AN/FSG-1), preceded the AF SAGE in operational use. The first Missile Master, a prototype, became operational in the Washington-Baltimore defense in December, 1957. The first production model was operational at Fort Lawton, Washington, (Seattle defense) in January, 1960. A total of 10 Missile Masters were programmed. The last one became operational on December 14, 1960. A need had been demonstrated for a smaller, less costly automated fire control system for the smaller Army defenses. The Battery Integration and Radar Display Equipment (BIRDIE) system was selected in December, 1959, with the initial set, of a total of 18, scheduled for completion in April, 1961.

A desire by CINCONAD to ensure an optimum of uniformity and cohesion in his exercise of operational control or operational command over component forces led in June, 1956, to an approved plan to collocate the Army Missile Master and the pre-SAGE AN/GPA-37, and eventually SAGE. This program was later extended to include collocation, to the maximum feasible extent, of Army Air Defense Command Posts (AADCP) and the USAF Air Defense Direction Centers (ADDC). The first collocation not involving Missile Master was at Geiger AFB, Washington, (Fairchild AFB defense) on May 15, 1958.[32]

2. Surveillance and Early Warning

The surveillance network remained relatively constant, except in the categories of radar stations of the Mobile Program and gap filler radars, both of which were increasing in numbers during the period. For example, by mid-period (June, 1958), Mobile Program radars had increased to 42 and the number of gap fillers had increased to 54,[33] whereas one year earlier only eight gap fillers had been operational. The gap filler radars were found to be deficient in range and altitude capabilities to cope with the high speed, very high altitude threats. These features, plus a vulnerability to ECM, necessitated plans for equipment

[28] "NORAD/CONAD Historical Summary, July–December, 1958," Headquarters NORAD/CONAD, p. 14.
[29] Ibid.
[30] "NORAD/CONAD Historical Summary, July–December, 1960," Headquarters NORAD/CONAD, p. 6.
[31] Ibid.
[32] "NORAD/CONAD Historical Summary, July–December, 1957," Headquarters NORAD/ CONAD, pp. 17–28; and "NORAD/CONAD Historical Summary, January–June, 1958," Headquarters NORAD/CONAD, pp. 11 and 21.
[33] "NORAD/CONAD Historical Summary, January–June, 1958," Headquarters. NORAD/CONAD, p. 28.

modification. Due to improved coverage from the AEW&C, the GOC contribution was reduced and then eliminated during the period. In January, 1958, the GOC was reduced from 24-hour to ready reserve status. One year later the GOC was inactivated.

Contiguous radar coverage from the Texas Towers was begun in August, 1956, when the first tower became fully operational. A second and a third Texas Tower reached operational status in October, 1958, and April, 1959, respectively. The remaining two Texas Towers programmed were eliminated from the program by mid-1957 due to budgetary problems.[34]

Construction of the land-based portion of the DEW Line was completed by June 30, 1957, and the system was deemed "technically ready for operations" on July 15th. The Mid-Canada Line became fully operational in January, 1958.

Early in the period, Navy participation was increased. As had been true earlier in the Atlantic, all five of the picket ship locations in the Pacific were manned since July 1, 1956.[35] The chapter on use of Navy blimps for airborne early warning was completed during the period. A squadron, ZW-l with two airships, was commissioned at Lakehurst NAS, New Jersey, in January, 1956, to man a station off the East Coast, by July, 1957. Manning of a station off the West Coast was programmed for July, 1959.[36] The Navy experienced budget cuts as early as 1957 which reduced the number of aircraft manning AEW&C stations on the sea barriers and reduced the number of squadrons for that duty by one on each coast.[37] By mid-1960 Navy participation was virtually eliminated because of cuts in the Navy budget. By April 1, 1960, the ships were withdrawn from both the Atlantic and Pacific DEW Line sea barriers. On July 1, ZW-1 terminated its air defense mission and manning the Atlantic station.

3. Fighter interceptors

The number of fighter interceptor squadrons available to ADC "peaked" at 72 in June, 1957,[38] and then declined to 41 squadrons at the end of 1960.

Major changes occurred in the aircraft inventory. Whereas in 1956 the F-86D, supported by the F-89D and F-94C, constituted the bulk of the fighter interceptor force, these aircraft were being modified or replaced by mid-1957. The F-86L provided electronic and aerodynamic improvements over the "D" model. The F-89H and J were model improvements to fire the Falcon missiles (infrared seeking) and MB-1 rockets (nuclear warhead), respectively. Although the F-89J had the advantage in its armament of a nuclear rocket, the aircraft had serious performance limitations. By 1960, all models of the F-86, F-89, and F-94 were gone from ADC; in their places were the F-101 (17 squadrons), F-102A (9 squadrons), and F-106 (14 squadrons).

4. Antiaircraft Gun and SAM Defenses

The five-year period, 1956–1960, saw the end of the "gun era" in strategic antiaircraft defense of the United States. On December 20, 1957, the final 90-mm and 120-mm gun battalions assigned to active air defense in CONUS were inactivated. The final 75-mm (Skysweeper) battalion in ARADCOM was

[34] "Continental Air Defense Command Historical Summary, July, 1956–June, 1957," Headquarters CONAD, p. 61.
[35] "Continental Air Defense Command and Air Defense Command History, January–June, 1956," Headquarters CONAD, p. 32.
[36] Ibid, p. 37.
[37] "CONAD/NORAD Historical Summary, July–December, 1957," Headquarters CONAD/NORAD, p. 44.
[38] "Continental Air Defense Command historical Summary, July, 1956–June, 1957," Headquarters CONAD, p. 38.

inactivated on June 15, 1960. In general, the inactivations of the gun battalions were accompanied by conversions on-site to Nike.

Further modifications to the Army's weapons system were underway to replace the Nike Ajax with the nuclear-capable Nike Hercules. The last Nike Ajax battalion to be deployed was on-site by June 30, 1957.[39] The initial Nike Hercules battery was operational in the Chicago defense on June 30, 1958. By December, 1958, the number of Hercules batteries (generally four firing batteries or fire units per battalion) had increased to eight; Ajax batteries numbered 236.[40] By the end of 1960 the number of Hercules fire units had increased to 88; the number of Ajax had been reduced to 174. The 1960 total of 262 Nike fire units was the greatest number employed under ARADCOM command.[41]

Two features concerning deployment deserve mention. First, by 1960 all ARADCOM fire units were located on-site. Second, primarily as a result of JCS approval in late 1957 of additional Nike defenses, at the end of 1960 CONUS Nike defenses were provided to[42] AEC Plant, Hanford, Washington; Washington–Baltimore; Seattle; San Francisco—Travis AFB; Los Angeles—March AFB; Dallas–Fort Worth; Kansas City; Minneapolis–St. Paul; Milwaukee; Chicago–Gary; St. Louis; Detroit; Niagara Buffalo; Cleveland; Pittsburgh; Boston–Providence; Hartford–Bridgeport; New York; Philadelphia; Norfolk; Fairchild AFB, Washington; Ellsworth AFB, South Dakota; and Loring AFB, Maine.

The initial strategy of a decade earlier in terms of locations to be provided dedicated air defense had not changed. Defense still was accorded to a critical AEC installation, the national capitol, some SAC bases, and an expanded number of the most populated and highly industrialized areas of the country.

The Army continued to rely heavily on air defense augmentation forces from the Army National Guard (NG). On June 30, 1957, 100 NG batteries were on-site.[43] On October 8 of that same year, however, the National Guard was relieved of its on-site gun battery tactical mission in anticipation of conversion to Nike and utilization in the on-site missile program. The first NG Nike Ajax battalion was deployed to on-site positions on September 14, 1958. By end 1960, 52 of the 174 Nike Ajax fire units on-site were National Guard.[44]

USAF deployed a surface-to-air missile system, Bomarc, in September, 1959. The Bomarc had a stormy history. The system was one of the issues of the AAF-AGF disagreements of the late 1940's and the later USAF-Army interservice rivalry of the 1950's. Funding for the Bomarc program was weakly and inconsistently supported by the Defense Department and challenged by a vacillating Congress repeatedly during the FY 1957 to FY 1961 budget hearings.[45] Initial ADC estimates of requirements for 53 Bomarc squadrons were successively scaled down until by 1960 the Bomarc program had to be reduced to 10 squadrons, eight of which were deployed in CONUS. The initial squadron became operational with one missile at McGuire AFB, New Jersey on September 1, 1959. By the end of 1960 all eight CONUS Bomarc squadrons had been activated, and four were operational. Bomarc squadrons were equipped with either "A" missiles (IM-99A)—an interim development, "B" missiles (IM-99B)—the ultimate Bomarc capability, or some combi-

[39] "Continental Air Defense Command Historical Summary, July, 1956–June, 1957," p. 46.
[40] "NORAD/CONAD Historical Summary, July–December, 1958," Headquarters NORAD/CONAD, p. 100.
[41] The *Argus*, U.S. Army Air Defense Command, June, 1974, p. 20.
[42] Ibid.
[43] "CONAD/NORAD Historical Summary, July–December, 1957," Headquarters CONAD/NORAD, p. 67.
[44] The *Argus*, U.S. Army Air Defense Command, June, 1974, p. 20.
[45] "An Overview of ADC Weapons, 1946–1972," Headquarters Aerospace Defense Command, April, 1973, pp. 104–29.

nation, of the two missiles. At the end of 1960, 210 "A" missiles and 252 "B" were programmed. Further problems for Bomarc were strongly suggested by the following quotation from an official 1956 command history: "As to the trend beyond 1960, ADC was convinced that USAF was putting too much dependence on ground-to-air missiles of the Bomarc type."[46]

5. Operational Problems

Of the many operational problems to confront air defense commanders during the period 1956–1960, one of the most complex was that of electronic countermeasures (ECM). The matter was aptly presented in 1956 by some developments in Strategic Air Command (SAC). ". . . a general ECM 'rearmament' on the part of SAC in recent months revealed to ADC how little was needed to improve SAC's ECM capability sufficiently to neutralize the air defense system."[47] Mutual interference from friendly electronic emissions was also troublesome. Solution to the latter problem lay in coordination with CAA and the Navy on dividing the frequency spectrum. Solution to the U.S.S.R. ECM threat, however, required system modifications to add antijamming circuits, frequency diversity, and rapid frequency tuning capabilities. The Army Nike system, in particular, underwent major system improvements to improve the capability against small, high-speed targets in an ECM environment.[48]

A second problem resulted from the equipping of fighter interceptors with the MB-1 nuclear rocket. As will be noted from Figure 18, several of the squadrons at the end of 1955 were located at civil or municipal airports. Because of the availability of atomic weapons, relocation of these squadrons to military bases became a matter of priority.[49]

A third problem illustrated the woes of a joint commander, CINCONAD. Until JCS had approved the CONAD force requirements and made such approval directive on the Services, little action resulted. Further, Service actions in response to budget cuts were often unilateral and occasionally impacted adversely on the CONAD mission. The CONAD frustration at the end of 1957 is stated as: "Lack of JCS approval made it impossible for CONAD to obtain many of the force levels it desired from the services. At year's end, CONAD had no recognized or approved program for the air defense of North America."[50]

C. 1961–1964

1. Organization, Command and Control

Since the initial SAGE direction center and the initial SAGE division became operational during the summer of 1958, progress toward completion of the SAGE program was steady. By December 15, 1961, when the final SAGE direction center became operational, the SAGE installation in CONUS was essentially completed. At the end of 1964 four of seven regional control centers and 16 of 18 sector direction centers were SAGE.[51] Those facilities not SAGE were either manual or remoted.

[46] "Continental Air Defense Command and Air Defense Command History, January–June, 1956," Headquarters CONAD, p. 43.
[47] Ibid., p. 21.
[48] Nike system modifications included new HIPAR and Range Only Radar (ROR), and Target Tracking Radar (TTR) improvements.
[49] "Continental Air Defense Command and Air Defense Command History, January–June, 1956," Headquarters CONAD, p. 50.
[50] "CONAD/NORAD Historical Summary, July–December, 1957," Headquarters CONAD/NORAD, p. 97.
[51] "NORAD/CONAD Historical Summary, July–December, 1964," Headquarters NORAD/CONAD, p. xiii.

However, a lack of survivability of SAGE against a missile attack was recognized. This led to a concept of the Super Combat Center, a hardened SAGE, a program cancelled by USAF in March of 1960. The Secretary of Defense in June, 1961, noting that a missile attack against SAGE and other vital NORAD command and control elements "could delay NORAD's ability to carry out its mission," terminated further SAGE funding. The need for a survivable, back-up system to SAGE was obvious. From this need came a back-up interceptor control (BUIC) system which was approved in March, 1962, for implementation in two phases.[52]

Phase I (BUIC-I). A manual back-up system, similar to pre-SAGE, to be completed by the end of CY 1962.

Phase II (BUIC-II). A system to provide semi-automatic control at 34 selected radar sites to be completed by the end of CY 1965.

BUIC-I, the first phase of the SAGE decentralization, was actually completed in May, 1963. The initial BUIC-II was installed in September, 1964; its projected operational date was one year later.

With the goal of "a saving in funds and manpower spaces," in late 1962 DoD directed major reductions in the programmed-to-be-replaced SAGE system.[53]

Plans for CONAD and ADC command and control changed again in December, 1964, when the Secretary of Defense approved a system wherein SAGE would remain primary, supplemented by an improved BUIC (BUIC-III) as back-up.[54] Completion of this program was projected for the period FY 1966 to FY 1969.

Army control systems were in a similar state of flux. For example, the end of 1963 saw Army defenses equipped with 10 Missile Masters (AN/FSG-1) and 18 BIRDIEs (AN/GSG-5 or 6). However, a December, 1963, decision involved the phase-out of both of the control systems and their replacement with 26 AN/TSQ-51s during the period FY 1966 to FY 1968.[55]

Excavation of the new NORAD/CONAD Combat Operations Center (COG), to be built in Cheyenne Mountain near Colorado Springs, was begun on May 18, 1961, and on October 30, 1964, it was ready for initial manning.

Strategic air defense was still a large commitment in terms of personnel at the end of 1964. Command strength figures show NORAD and its components at 154,971 and National Guard and Reserve Forces at 28,744.[56]

2. Surveillance and Early Warning

In August, 1961, the Greenland-Iceland-United Kingdom (G-I-UK) Line became operational to replace the former Atlantic barrier (Argentina, Newfoundland, to the Azores).[57] Radar coverage on this Line was achieved by two Iceland-based radars and two AEW&C stations. An additional favorable development was an ambitious program, conceived to begin in late 1962, to improve the gap filler capability by substitution of 182 of the new AN/FPS-74 radars.

[52] "NORAD/CONAD Historical Summary, January–June, 1963," Headquarters CONAD/NORAD, p. 41.
[53] Ibid., p. 1, and "NORAD/CONAD Historical Summary, July–December, 1964," Headquarters NORAD/CONAD, p. 1.
[54] Ibid., p. 23.
[55] Ibid., p. 26.
[56] Ibid., p. xiii.
[57] Ibid., p. 40.

However, the dominant characteristics of developments in the surveillance and early warning systems during the period 1961–1964 were *reduction* and *curtailment*. In March, 1963, the last Texas Tower radar was shut down. In May, 14 long-range radars and 10 gap fillers ceased operation. In June, the last of the USAF-manned Pinetree sites were turned over to the RCAF. In July, 28 DEW Line intermediate stations were closed. In January, 1964, five of eight Mid-Canada Line section control stations closed. Also, in that month, the AN/FPS-74 gap filler radar improvement program was cancelled. In July, the final AN/FPS-3 long-range radar was phased out of the ADC inventory.[58]

A 1964 year-end DOD decision programmed the deletion of an additional 16 CONUS prime radars, 32 height finder radars, and 9 gap fillers.[59]

Navy participation was still considerable at the end of 1964. USN was manning 10 picket ship stations in the contiguous radar system, five stations off each coast. Four Navy EC-121C aircraft were on patrol at all times on the Pacific barrier. Two Navy aircraft manned stations on the G-I-UK Line. However, funding restrictions brought efforts to reduce Navy activity. In April, 1960, early warning as a primary mission was withdrawn from the ships on the extension barrier stations—over CINCONAD objections. Later in 1960 the Navy proposed to discontinue the Pacific extension entirely because of fund limitations, but no action was taken on the proposal. In December, 1964, a Navy proposal to phase-out its forces both on the DEW Line extensions and on the contiguous radar picket ship stations were approved by the Secretary of Defense.[60] Termination of the Navy participation was again objected to by CINCONAD, but to no avail. The value of the DEW Line, about to be emasculated, in keeping U.S.S.R. bombers at stand-off position, and thus preclude a simultaneous missile and bomber attack was the principal argument.[61] The Navy phase-out was to start during FY 1965 and be completed during FY 1966.

The end of 1964 data shows the following status of the surveillance and early warning system[62]:

Prime Radars	183
Gap Filler Radars	96
Distant Early Warning Line (Land-Based)	
Main Stations	6
Auxiliary Stations	23
Aleutian Segment	
Main Stations	1
Auxiliary Stations	5
Greenland Segment	
Auxiliary Station	4
Mid-Canada Line	
Section Control Stations	3
Doppler CW Detection Stations	39
AEW&C Stations[63]	
Off East Coast	4
Off West Coast	5

[58] The date entries contained in this paragraph are extracted from Appendix A, A Chronology of American Air Defense Systems.
[59] "NORAD/CONAD Historical Summary, July–December, 1964," Headquarters NORAD/ CONAD, p. 45.
[60] Ibid., p. 40.
[61] "NORAD/CONAD Historical Summary, January–June, 1964," Headquarters NORAD/CONAD, p. 16.
[62] "NORAD/CONAD Historical Summary, July–December, 1964," Headquarters NORAD/CONAD, p. xii.
[63] 30 percent manning on a random rotating basis.

3. Fighter interceptors

Early in 1961 the fighter interceptor force had generally completed conversion to the "century-series" all-weather aircraft—the F-101, F-102, and F-106.

At the end of 1964, 42 squadrons, with 870 aircraft, were assigned to NORAD.[64]

Aircraft	Squadrons
F-101	18
F-102	9
F-104	2
F-106	13
	42

This was a decrease of three squadrons and approximately 100 aircraft over the previous 18 months.[65]

The augmentation forces were important to ADC. In July, 1961, 25 of the 29 AF National Guard squadrons with M-day missions to ADC began standing constant 24-hour, 5-minute alert requirements. Although somewhat reduced by the end of the period, a major augmentation force of 468 aircraft from 21 squadrons of the AF National Guard was identified.[66]

As a measure to improve the prospects, of the fighter interceptor force surviving a missile attack on the United States, in April, 1963, dispersal plans for 100 ADC fighter interceptors were formulated.

An ominous note for the future fighter interceptor air defense capability was sounded in December, 1964, when OSD set the FY 1970 USAF interceptor force level at 20 squadrons.

4. Surface-to-Air Missile (SAM) Defenses

At the end of 1964, the SAM missile inventory available to NORAD was as follows[67]:

Weapon System	Active Units	Augmentation Units
Bomarc "B" (IM-99B)	8 squadrons	
Nike Hercules	97 fire units	46 fire units
Hawk[68]	9 fire units	

The above status resulted from a combination of factors operating during the period 1961–1964. First, as pertains to Bomarc, the first squadron equipped with the more capable "B" missiles became operational on June 1, 1961. By December, 1962, the 10 squadron Bomarc program was completed. Two years later, in July, 1963, the "A" interim missiles were phased-out, as were two Bomarc squadrons equipped solely with those missiles.

The principal Army development involved the Nike Ajax—Nike Hercules conversion programs. The Ajax was phased-out of the ARADCOM inventory during this period. The final Ajax unit of the active

[64] Ibid., p. xi.
[65] "NORAD/CONAD Historical Summary, January–June, 1963," Headquarters NORAD/CONAD, p. 57
[66] "NORAD/CONAD Historical Summary, July–December, 1964," Headquarters NORAD/CONAD, p. xi.
[67] Ibid.
[68] Deployment of Hawk will be addressed in the following paragraph, *Operational Problems*.

Army was inactivated in December, 1961. The first National Guard Hercules battalion became operational in an ARADCOM defense in December, 1962, and by May, 1964, the final National Guard Ajax fine unit left the ARADCOM missile inventory.

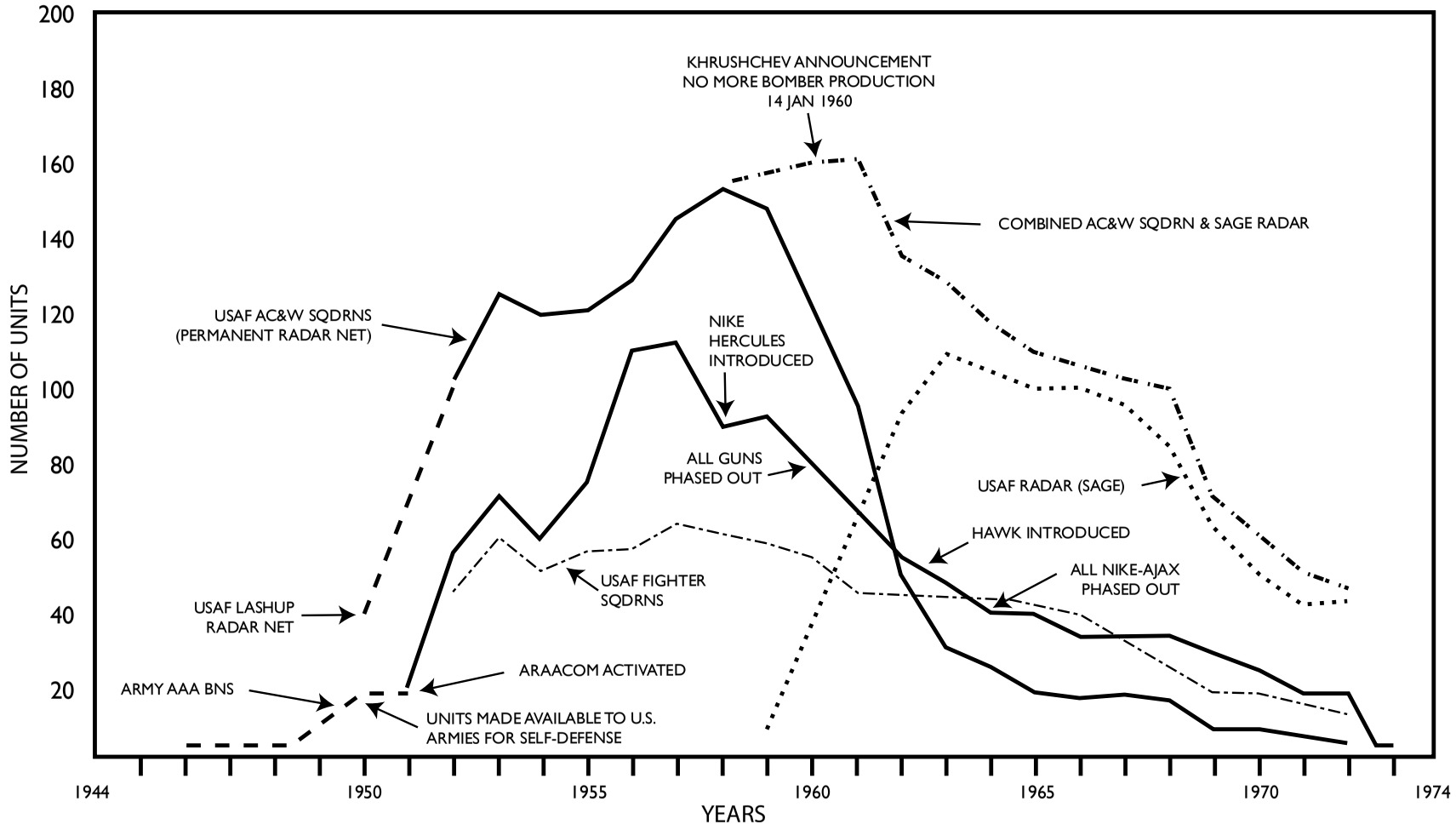
5. Operational Problems

The principal operational problem faced by air defense commanders during 1961–1964 was the reduction in means in terms of air defense units which were available to perform the air defense mission. These reductions have been described in previous paragraphs concerning command and control facilities, surveillance and early warning, fighter interceptors, and SAM units. The reduction will not be commented on further here. However, a pictorial summary of the years 1944 to 1974 is shown by Figure 22. Some reductions in total units by categories were possible due to changing defense criteria and substitution of units of improved capabilities (e.g., Nike Hercules for Nike Ajax). However, a major influence to the reductions was most certainly budgetary. Cuts in the national air defense budget were associated with an assessment of a much reduced U.S.S.R. bomber threat. On January 14, 1960, Khrushchev announced that the U.S.S.R. was ceasing the development of manned bombers and would, in the future, rely on ballistic missiles as strategic offensive weapons. The inevitable question concerning the wisdom of proceeding with expensive air defense weapons in light of a lessened manned bomber threat provided a military "explanation" for the budget cuts. However, CINCNORAD remained concerned about his undiluted mission of air defense of the United States and Canada and the significant U.S.S.R. inventory of heavy bombers. The military dilemma of enemy capabilities versus enemy intentions reared its head.

The presence of an unfriendly government in Cuba posed a thorny problem for air defense planners. With the traditional United States orientation generally to attack from the north, air defenses to the south were weak. As early as January 5, 1961, CONAD had prepared a Contingency Plan for Augmenting the Air Defenses of Southern Florida.[69] Implementation of the plan was tested occasionally. However, the "Cuban missile crisis" of late 1962 necessitated an operational reaction from the air defense system. CINCONAD declared DEFCON 3 on October 22 and continued that advanced readiness status until the 27th of November. Antiaircraft and SAM units were redeployed to Florida, the CONUS area closest to Cuba. One battery of 40-mm self-propelled, automatic weapons, was the first to deploy, followed shortly by a Nike Hercules battalion of three fire units, and two Hawk battalions.[70] AF Bases in Florida were alerted. Fighter interceptor and radar units also deployed to Southern Florida. Within 40 hours, two additional Fighter Interceptor squadrons had been deployed to Patrick AFB (F-106A) and two squadrons to Homestead AFB (F-102A), in addition to 22 aircraft at Tyndall.[71] Part of the CONUS fighter interceptor force was dispersed on October 22. In seven hours 167 fighter interceptors from 26 squadrons had been dispersed to 17 bases.[72] For the first time in United States history, the interceptors carried their nuclear armament. By the end of 1964 a full-time AEW&C station had been established off Key West.[73] In March, 1963, DOD directed the establishment of

[69] "The Fighter Interceptor Force, 1962–1964," ADC Historical Study No. 27, Headquarters Air Defense Command, November, 1964, p. 8.
[70] This constituted the sole use of Hawk in continental air defense during the period of this study.
[71] "The Fighter Interceptor Force, 1962–1964," ADC Historical Study No. 27, Headquarters Air Defense Command, November, 1964, p. 8.
[72] Ibid., p. 10.
[73] "NORAD/CONAD Historical Summary, July–December, 1964," Headquarters NORAD/CONAD, p. xii.

Figure 22—U.S. Air Defense Deployments by Year



This figure also appears in Volume 1, titled as Figure D-7

permanent defense on the Florida peninsula. A continuous all-weather interceptor alert capability at Key West was a common defense requirement.

Fighter interceptors from ADC were deployed outside of CONUS for air defense purposes on two occasions in 1963 and 1964.[74] In March, 1963, 10 F-106A's were deployed to Alaska because of Soviet incursions into United States airspace. The following January, 18 F-102A's were sent temporarily to the Panama Canal Zone because of the situation in Cuba and the Caribbean.

The presence of potentially hostile fighter aircraft in Cuba (MiG-21) generated a special requirement for CONAD. Whereas the ADC fighter interceptors were primarily to combat bomber-type aircraft, needed was "a high performance interceptor capable in (the) fighter-versus-fighter role."[75]

In early 1964 it appeared that a decision was imminent to discontinue the Nike defenses of SAC bases. The SAC base was itself inherently soft and difficult to defend to a sufficiently high level so as to insure survival of the aircraft and the continued operability of the base. SAC developed plans to flush their aircraft on receipt of early warning, or, as a contingency for any inadequacy of early warning, a portion of the SAC force was maintained on airborne alert. Area defense by the fighter interceptors was considered adequate for SAC bases. ARADCOM proposed using any Nike units gained by terminating SAC base defenses to defend hardened ICBM fields[76] and selected hardened command, control, and communications facilities. Both CONAD and SAC nonconcurred in the ARADCOM proposal.[77] To employ these same 18 fire units from the SAC bases, plus four more expected to accrue from closing the Thule AFB, Greenland, defense, CONAD preferred that air defenses of the following six additional CONUS metropolitan areas be planned: Charleston, South California; Houston; San Diego; Portland, Oregon; New Orleans; and Olympic peninsula area, Washington.[78]

Under the concept of either a joint or a unified command, CONAD was dependent upon the Service components for the provision of systems for the air defense mission in the appropriate numbers and possessing the required performance characteristics. This arrangement did not always produce optimum results. This problem was illustrated to some extent in October, 1963; when OSD directed creation of a means "for ensuring that unified . . . commanders could achieve adequate influence over the development, acquisition, and operation of their command and control systems."[79]

Except as reflected in the annual defense budget submissions and in testimony in support of the budget, there was a general paucity of comprehensive national plans indicating the goals and requirements for national air defense. And the budget process was suspect as the sole means of reflecting air defense requirements. In June, 1959, Congress, experiencing difficulty in making its decisions on the Bomarc program, had directed that DOD prepare a master Air Defense (MAD) plan to demonstrate what air defense resources were believed to be required and why. A second major effort in air defense planning, Continental Air Defense Study (CADS), 1966–1975, was required of USAF by the Secretary of Defense in early 1963.[80] The primary concern of this study, completed by ADC, was the evaluation

[74] "The Fighter Interceptor Force, 1962–1964," ADC Historical Study No. 27, Headquarters Air Defense Command, November, 1964, pp. 27–35.
[75] "NORAD/CONAD Historical Summary, January–June, 1963," Headquarters NORAD/CONAD, p. 57.
[76] It is interesting to note that this was the first definite proposal involving forces-in-being for air defense of ICBM.
[77] "NORAD/CONAD Historical Summary, January–June, 1964," Headquarters NORAD/CONAD, p. 70.
[78] Ibid., p. 67.
[79] Ibid., p. 8.
[80] "NORAD/CONAD Historical Summary, January–June, 1963," Headquarters NORAD/CONAD, p. 45.

of the effectiveness of several possible combinations of air defense system elements; its principal recommendation was the "tentative" support for 12 squadrons equipped with an improved manned interceptor (IMI).[81]

D. 1965–1968

1. Status of the Air Defense System, January, 1965

Because of the extensive adjustments to the various major elements of the continental air defense system which occurred during the period 1965–1968, or which were programmed during that period to be effective soon after the period's end, a pictorial presentation of the status at the beginning of 1965 is useful. Figures 23 through 25 show the NORAD/CONAD air defense warning system, the fighter interceptor squadron deployment, and the NORAD/CONAD SAM missile deployment and coverages. Figures 24 and 25 also show the geographical division of the NORAD area of responsibility into subordinate regional commands.

2. Organizations Command and Control

The BUIC system achieved several important milestones during this four-year period. On September 1, 1965, the first BUIC-II site at North Truro, Massachusetts, was accepted by ADC. On April 1 of the following year the last four BUIC-II sites became operational. In the area of future BUIC programming, 19 BUIC-III sites were approved by the Secretary of Defense in August, 1965. On December 1, 1968, the first BUIC-III site became operational.

The scheduled Army control system replacement also was progressing rapidly. At the end of November, 1966, the first of the AN/TSQ-51 fire distribution systems (Missile Mentor) became operational in the New York–Philadelphia defense. Three months later the last of the programmed Missile Mentors was operational in early February, the last of the older Missile Master systems was phased-out.

The NORAD/CONAD Combat Operations Center (COC), under construction in Cheyenne Mountain (Colorado Springs) since May, 1961, was completed in early 1966. On April 20, the NORAD COC moved from Ent AFB, Colorado Springs, to the new location in Cheyenne Mountain.

A Canada–United States agreement was reached to extend the NORAD agreement for five years, effective May 12, 1968.

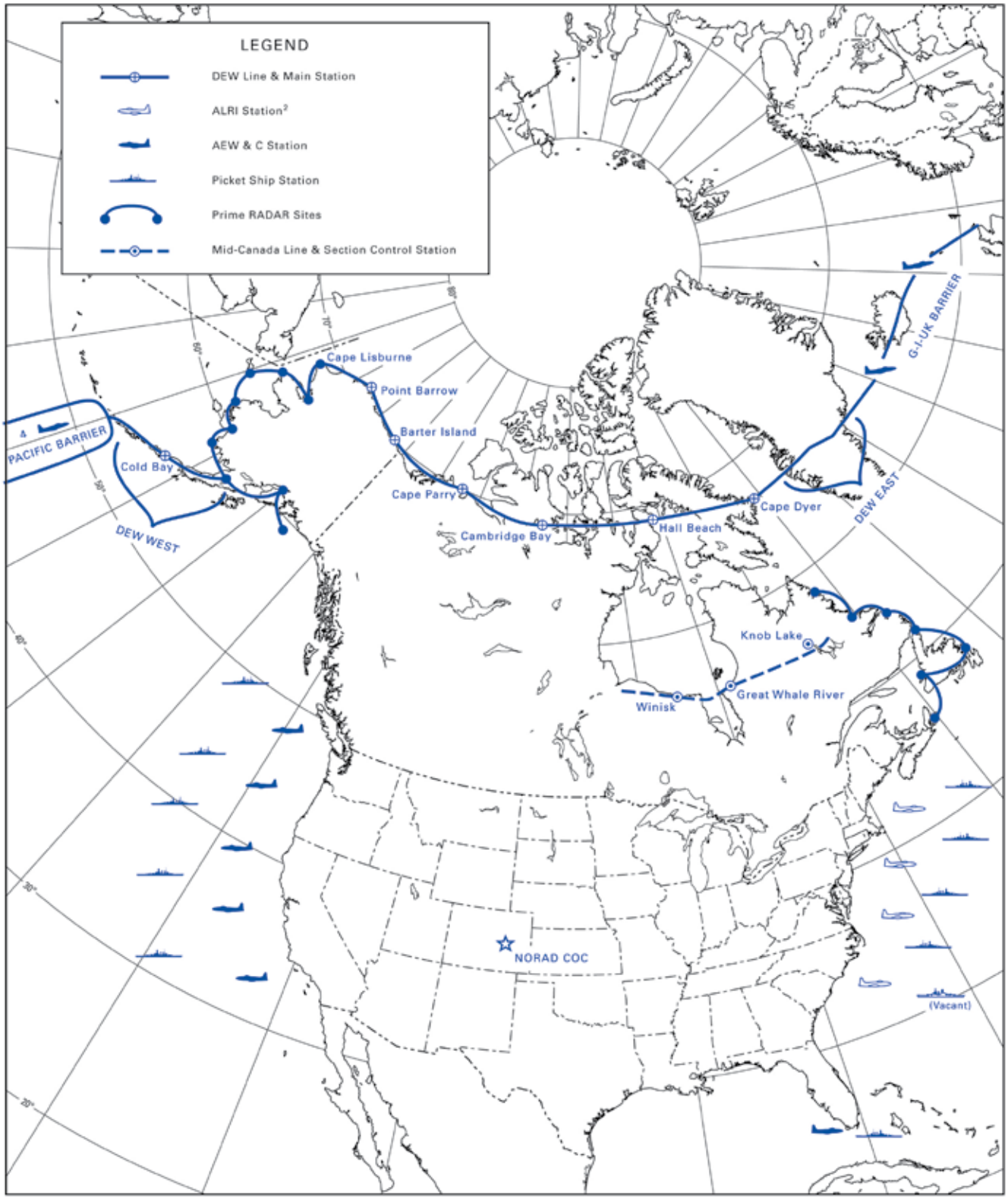
By the end of 1968, although down considerably from earlier periods, command personnel strengths were still significant: Regular forces were at 100,789; Augmentation forces (NG and Reserve) were at 25,153.[82]

3. Surveillance and Early Warning

Reductions and eliminations of surveillance and warning facilities became hallmarks of this period. During the first six months of 1965, the Navy first reduced and then ceased all operations by both ships and aircraft on the DEW Line extensions and in the contiguous radar system. With these reductions came the disestablishment of NAVFORCONAD on September l, 1965.

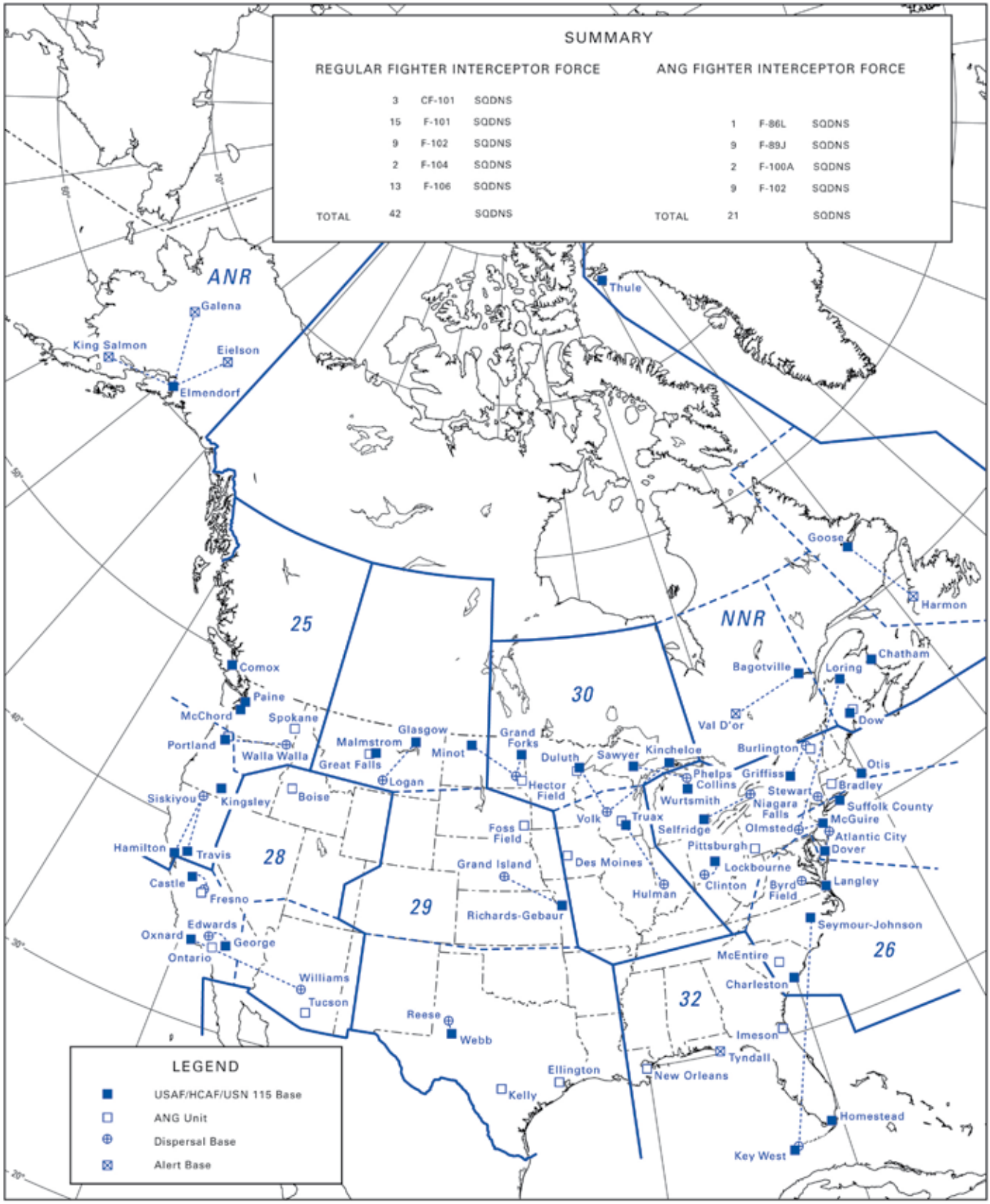
[81] "Air Defense and National Policy, 1958–1964," ADC Historical Study No. 26, Headquarters Air Defense Command, p. 69.
[82] "Continental Air Defense Command History, 1968," Headquarters CONAD, 1 May 1969, p. 1.

Figure 23—NORAD/CONAD Air-Defense Warning System, December 1964[1]



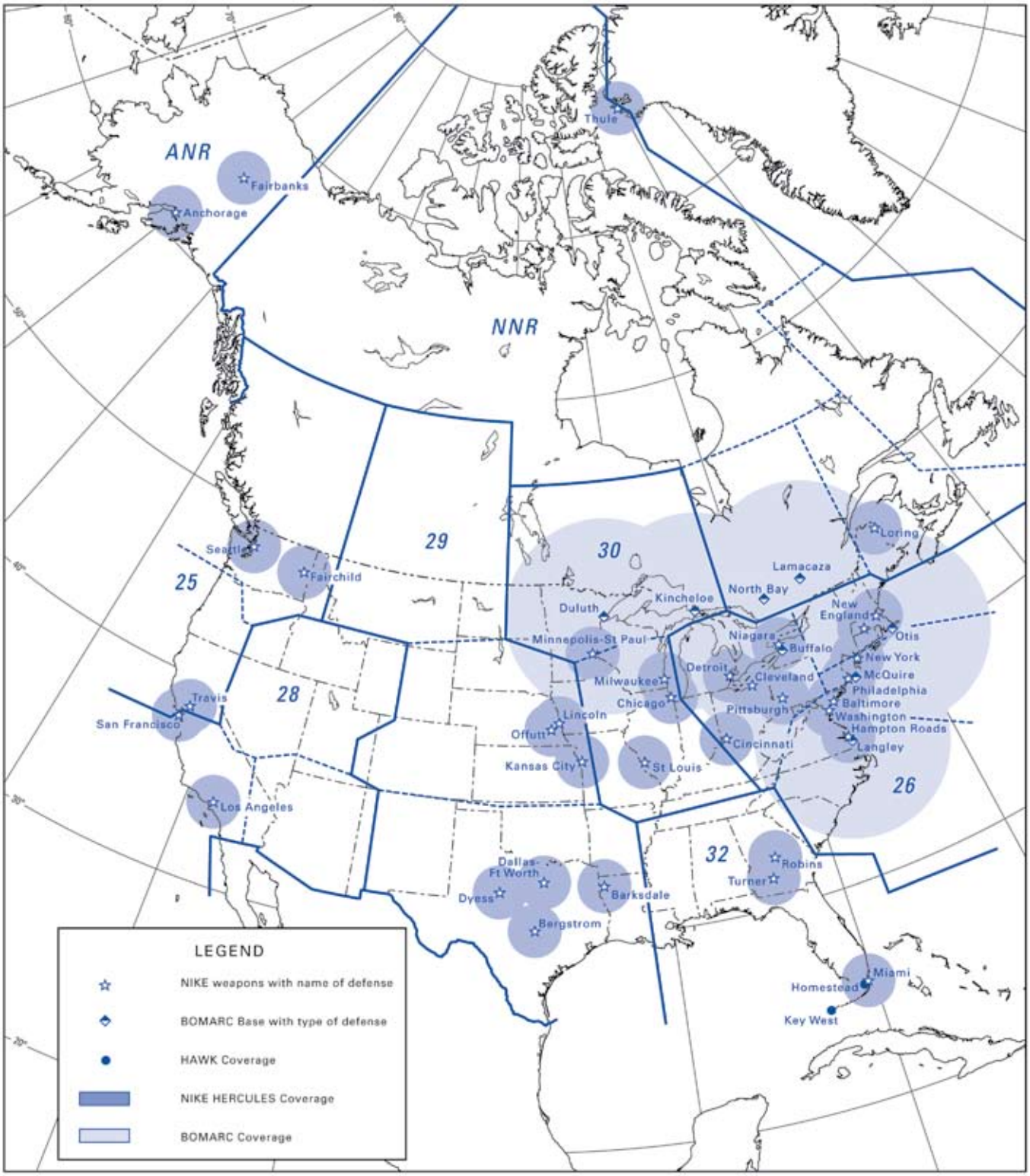
[1] This map is taken from "NORAD/CONAD Historical Summary, July–December, 1964," Headquarters CONAD, p. 43.
[2] Airborne Long-Range Input (ALRI)—a modification for AEWBC aircraft intended to extend SAGE operational area 250 miles to sea.

Figure 24—NORAD/CONAD Fighter Interceptor Deployment, 31 December 1964



This map is taken from "NORAD/CONAD Historical Summary, July–December, 1964," Headquarters CONAD, p. 70.

Figure 25—NORAD/CONAD SAM Missile Deployment, 31 December 1964



This map is taken from "NORAD/CONAD Historical Summary, July-December, 1964," Headquarters CONAD, p. 79.

In May, 1965, the Mid-Canada Line ceased operations. The land-based portions of the DEW Line remained intact.

The 1st of September, 1965, saw an ending of AEW&C aircraft flight operations on the Greenland–Iceland–United Kingdom barrier.

Reductions in surveillance means also occurred within CONUS. Starting in March, 1965; closures of long-range and gap filler radars commenced. Three years later 16 prime radars had been closed, and all gap fillers, except 17 in the southeast corner of CONUS, were gone.

4. Fighter Interceptors

Major reductions were also felt in the number of fighter interceptor squadrons, down almost 50 percent during the period 1965–1968. However, these figures, distressing to an air defense commander, did not present the whole bleak story. No fighter interceptor aircraft had been built since 1961; attrition was having its influence, and the number of aircraft per squadron was gradually being reduced[83]—as were the number of squadrons.

On December 1, 1968, NORAD possessed 20 regular forces fighter interceptor squadrons, comprised of 351 aircraft.[84] The ADC portion of this total, plus augmentation forces, is shown below:

	Regular Forces		ADC Air National Guard	
Aircraft Type	Squadrons	Aircraft	Squadrons	Aircraft
F-89	—	—	2	40
F-101	6	102	—	—
F-102	1	31	19	318
F-104	1	18	—	—
F-106	9	153	—	—

Progress in aircraft conversion continued. On November 6, 1967, the Air National Guard completed its programmed conversion to F-102. Only two squadrons of F-89 remained in the NG at the end of 1968; all other NG squadrons were equipped with the F-102.

5. Surface-to-Air Missile (SAM) Defenses

The status of the NORAD SAM missile force at the close of 1968 was[85]:

Weapon	Squadrons or Batteries/Missiles	
Bomarc	8/216 "B" missiles	
Hercules		
Regular Army	52/	}1,590
National Guard	44/	
Hawk	8/288	

[83] "The Fighter Interceptor Force, 1962–1964," ADC Historical Study, No. 27, Headquarters Air Defense Command, November, 1964, Foreword and p. 41.
[84] "Continental Air Defense Command History, 1968," Headquarters CONAD, p. xv.
[85] Ibid.

As had been true of the other air defense forces, the end-of-period status in 1968 of SAM units was down considerably from 1964. The Commanding General of ARADCOM noted that "since 1963 ARADCOM had been reduced 35 percent in its fire power."[86] The reductions had significant impact on the locations provided Hercules defense. On December 8, 1965, the Secretary of Defense directed the elimination of Nike defenses of SAC bases and of the Thule, Greenland, defense and the inactivation of the 22 Nike batteries concerned. On December 22nd the defenses at Barksdale, Texas; Robins and Turner, Georgia; and Fairchild, Washington AF Bases were declared non-operational. This group of four bases was followed in non-operational status on March 1, 1966, by Loring, Maine; Lincoln-Offutt, Nebraska; Dyess and Bergstrom, Texas AF Bases. The Nike batteries associated with all of these defenses were inactivated soon after the defenses became non-operational.

The budget axe fell again during 1967–1968. On August 3, 1967, OSD proposed the elimination of 15 additional Hercules sites. DA and ARADCOM were directed to consider this proposal and the earlier Nike HERA study[87] was used to assist in identifying the 15 Hercules sites to be eliminated. DA and ARADCOM proposed resisting of a major portion of the 15 batteries to improve their defense effectiveness in lieu of elimination. The discussion ended on August 10, 1968, when DOD announced what appeared to have been a predetermined decision for major inactivations. Discontinuance of three interior defenses was directed, along with the inactivation of the 12 associated Hercules batteries. The defenses affected, to be phased-out by March 31, 1969, were St. Louis, Kansas City, and Dallas-Fort Worth.

An additional reduction of five Hercules batteries, effective 1st Quarter, FY 1970, also emanated from OSD in December, 1968. These batteries, two RA and three NG, were identified by OSD as of "marginal effectiveness."[88]

6. Modernized Air Defense Concept

The major force reductions which have dominated the discussions of the preceding paragraphs resulted from adoption, announced by DOD on December 16, 1967, of a concept that visualized acquiring a modernized manned bomber defense system and the phasing-out of the current system. The principal elements of the modernized air defense force were identified as[89]:

A modernized F-106 (referred to as F-106X).

Airborne Warning and Control System (AWACS).

Over-the-Horizon Radar (OTH), backscatter.

NORAD COC in Cheyenne Mountain.

Limited number of current system long-range radars (LRR).

Joint military-FAA surveillance and control structure.

Some BUIC-III centers (15 by FY 1970).

Some Hercules and Hawk fire units.

Phase-out of the current force, beginning in July, 1968, would achieve an "intermediate force level" by mid-1970, but ultimately would eliminate[90]:

[86] Ibid., p. 48.
[87] The study, which came to be known as Nike HERA, was initiated in September, 1966, at the direction of the Secretary of Defense to reexamine the role of Nike Hercules in continental air defense, "particularly in light of the declining bomber threat."
[88] Ibid.
[89] "Continental Air Defense Command History, 1968," Headquarters CONAD, 1 May, 1969, p. 1.
[90] Ibid.

All interceptors, except F-106X.
All Bomarc
Much of the LRR force.
AEW&C force.
Gap filler radars
DEW radars
Most current region control centers and direction centers.

The planned status, shown in tabular form below[91] was applicable to achieve the "intermediate force level."

Squadrons/Fire Units/Installations

System	End FY 67	FY 68	FY 69
F-101	15	13	6
F-102	1	1	1
F-104	1	1	1
F-106	11	11	11
F-89 (Air NG)	2	2	2
F-102 (Air NG)	19	19	19
Bomarc[92]	8 (227 missiles)	8 (219)	8 (212)
Hercules			
RA	73	73	52
NG	48	48	44
LRR	170	155	126
Gap Filler Radars	88	17[93]	17
Combat Centers	6	6	5
Direction Centers	16	14	13

There were several problem related to adherence to the "modernized air defense force" concept. First, the decision regarding the F-106X resulted in cancellation of the USAF F-12 program[94] and USAF was denied a major aircraft development. Second, the phase-out of the current system seemed premature, in the absence of the capability to field the follow-on, modernized system. Although a need to conserve funds committed to the current system to be able to buy the future, modernized system was generally recognized,[95] CINCNORAD registered strong objection on April 2, 1968, to the carrot-at-the-end-of-the-stick approach by recommending "no further cuts until follow-on systems were operating."[96] History validates CINCNORAD's concern. State-of-the-art technology did not support an early operational capability of

[91] Ibid., p. 5.
[92] Reduction of generally eight missiles per year was programmed, rather than reduction in the number of squadrons.
[93] Gap filler radars would be retained for the Florida area only.
[94] Ibid., p. 10.
[95] Ibid., p. 7.
[96] Ibid., p. 8.

either the AWACS or the OTH, nor did Congress fund either program sufficiently to advance the technological capability dramatically.

As an additional problem, the time interval between the phase-down of the current system and the expected availability of the modernized elements required (or was based on?) a major shift in air defense strategy. Reductions in forces suggested the necessity of a strategy of thin perimeter defense. Specific USAF and Army units and facilities identified for elimination were located in central CONUS. With their elimination little remained in terms of surveillance, interceptor, or SAM forces. The response from the Secretary of Defense in February, 1968, to CINCNORAD's objection to this situation brought an incredible observation that the items/units identified for elimination "were located in the interior of the country and did not appear to contribute in any significant way to the reduction of damage to this nation in event of an attack."[97] The simultaneous reductions in fighter interceptors (area defense) and SAM (terminal defense) were particularly faulty from a military point of view. Weakening the area defenses permitted "leakage" of the system to enemy attackers, and the potential for such leakage made effective terminal defenses appear to be absolutely essential.[98]

The broad strategic impact of the overall reduction in air defense forces was to make the Soviet Long-Range Aviation relatively more and more effective. The U.S.S.R. was given attack options not available so long as an effective continental air defense system remained in being.

E. 1969–1972

1. Organization Command and Control

Activities in the category of organization, command, and control were relatively minor during the period 1969–1972. In November, 1969, NORAD again reorganized geographically; an eight-region, configuration (including Alaska) was adopted and NORAD divisions were eliminated.

The BUIC-III radar system became fully operational on January 5, 1970.

2. Surveillance and Early Warning

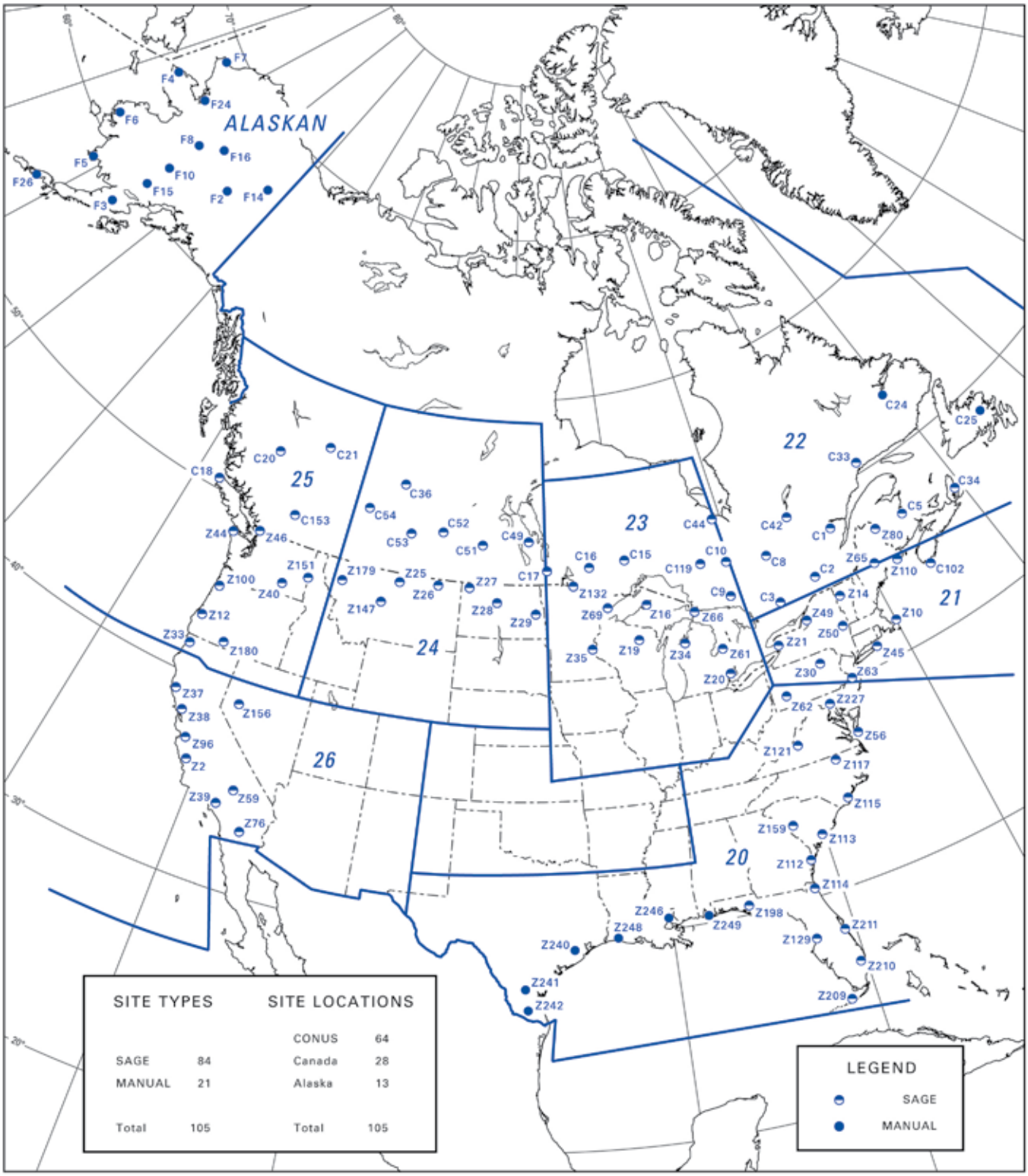
At the end of 1972, there were 105 long-range radar (LRR) sites an increase of six added in the southern United States over the past year. Sixty-four LRR were located in CONUS. Of those, 41 were ADC sites, five were FAA, and 18 were ADC/FAA joint use radars.[99] Locations of the NORAD LRR sites are shown by Figure 26.

The DEW Line remained in full operation with 31 ground-based radars.

Airborne surveillance and early warning was very meager by the end of the period. On November 14, 1969, the final AEW&C mission was flown off the East Coast. In December, 1972, the total AEW&C capability was represented by one EC-121 wing of two squadrons located at McClellan AFB, California. Detachments of this wing were also located at McCoy AFB, Florida, and overseas in Iceland and South Korea.[100] Additionally, an AEW&C reserve squadron, located at Homestead AFB, Florida, was identified for ADC upon federal mobilization.

[97] Ibid.
[98] Ibid., p. 9.
[99] "CONAD Command History, 1972," Headquarters CONAD, p. 44.
[100] Ibid., p. 59.

Figure 26—NORAD Long-Range Radar Sites, 31 December 1972



"CONAD Command History, 1972," Headquarters CONAD, p. 45.

3. Fighter Interceptors

The status of NORAD fighter interceptor squadrons at the end of 1972 was[101]:

	Regular Forces	Air National Guard
F-4	1	—
F-101	—	6
CF-101	3	—
F-102	—	9
F-106	9	2

During CY 1972 there had been a decrease of two squadrons of F-106's from the Regular Forces, but the two squadrons were transferred to the Air National Guard.

Deployment of the NORAD fighter interceptor squadrons on December 31, 1972, is shown by Figure 27.

4. Surface-to-Air Missile (SAM) Defenses

Adjustments of the NORAD SAM force levels, were extensive during the period 1969–1972. Whereas at the end of CY 1971 there were seven Bomarc squadrons (five in CONUS), one year later all had been phased-out of the NORAD inventory.[102] A Canadian decision in August, 1971, to eliminate Bomarc was followed four months later by a similar United States decision. Four United States Bomarc squadrons ceased operations in April, 1972; the final United States Bomarc squadron was inactivated on October 31st.

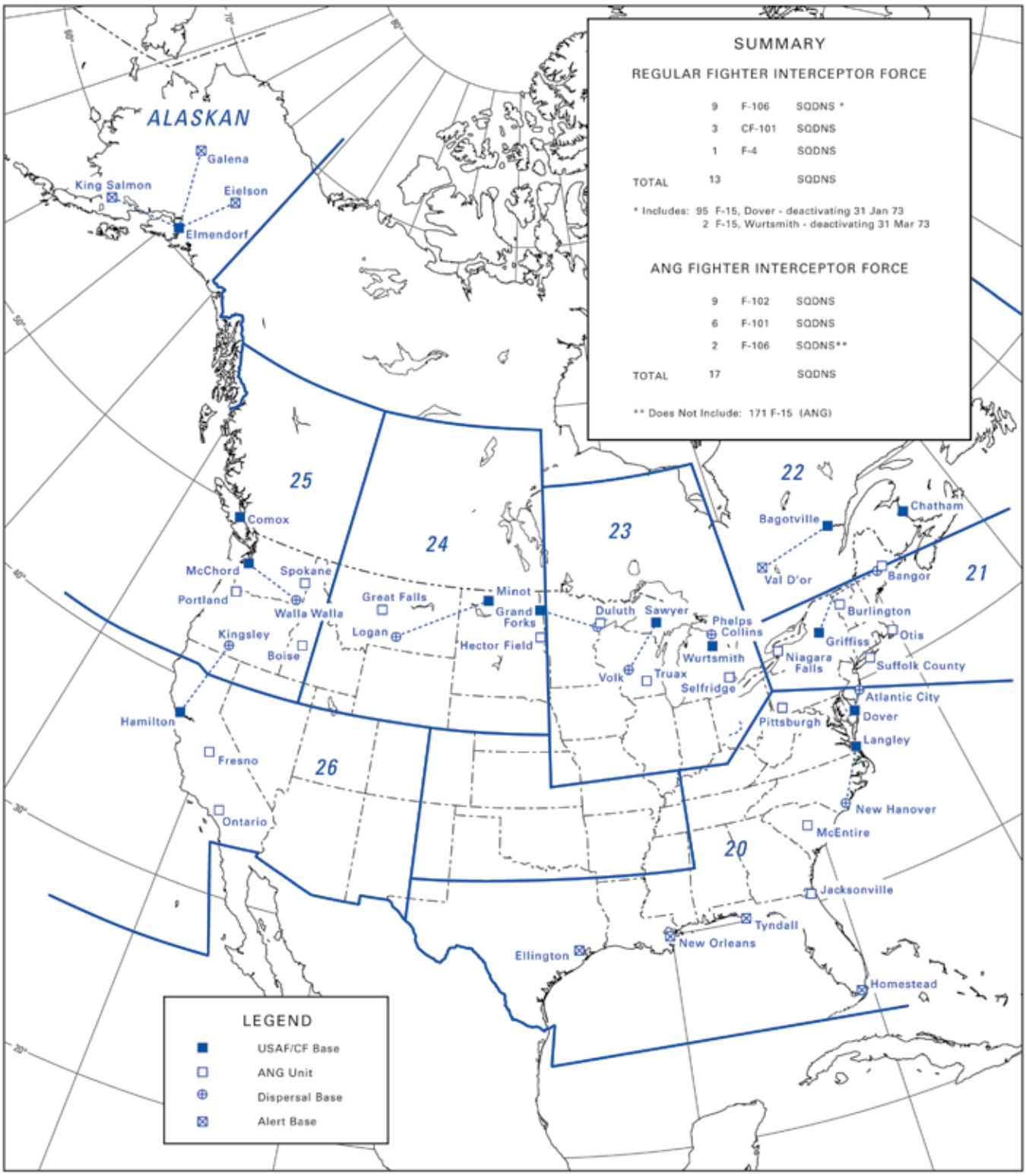
The Army's Nike Hercules deployment was greatly curtailed during these four years. In January and February, 1969, the St. Louis, Kansas City, and Dallas–Fort Worth defenses were discontinued in accordance with a decision of late 1968. On June 18 and August 1, 1969, five more Hercules batteries were inactivated, also in accordance with a December, 1968, directive. In October, 1969, additional reductions were programmed for ARADCOM batteries.

	FY 1970	FY 1971
Nike (RA)	43	40
Nike (NG)	41	39
Hawk	0[103]	

To implement the programmed reductions, ARADCOM was directed in December to discontinue the Niagara Falls–Buffalo and Cincinnati–Dayton defenses by March 31, 1970. Six Hercules batteries became non-operational on the 10th of December. In June 1971, 24 more Hercules batteries were phased out, and the Minneapolis–St. Paul, Cleveland, and Milwaukee defenses were closed. The Norfolk and Washington–Baltimore defenses were combined.

[101] Ibid., p. 64.
[102] Ibid., p. 98.
[103] Programmed Hawk reductions were not implemented because of a subsequent requirement for air defense of the southern United States.

Figure 27—NORAD Fighter Interceptor Deployment, 31 December 1972



"CONAD Command History, 1972," Headquarters CONAD, p. 65.

Some statistics will illustrate the rapidity of the Nike reductions. In March, 1970, there were 76 ARADCOM Hercules batteries. Compared to the peak year, 1963, the reduction was 44 percent. In June, 1971, 52 ARADCOM Hercules batteries remained. Using the previous comparison with 1963, the reduction was then 61 percent.

The status of the NORAD SAM squadrons/batteries at the end of 1972 was[104]:

Bomarc	2
Hercules	55
CONUS	52
RA	(25)
NG	(27)
Hawk	8

The NORAD SAM deployment at the end of 1971 (prior to elimination of Bomarc) is shown by Figure 28.

5. Air Defense of the Southern United States

Concern over Cuba and reaction measures of the air defense system in 1962 have been discussed earlier in this chapter. However, several events in late 1969 and early 1970 again forced the attention of the air defense planners to Cuba. On October 5, 1969, the inadequacies of radar and interceptor coverage to the south were dramatically illustrated when a Cuban pilot, flying a MiG-17 from Cuba, was undetected and unchallenged before landing at Homestead AFB, Florida. In May of the following year, a task force of Soviet TU-95 bomber aircraft arrived in Cuba after flying nonstop from bases in northern U.S.S.R. And in October, 1971, the weakness of air defense to the south was again demonstrated when an AN-24 transport from Havana, Cuba, arrived undetected and landed at New Orleans.[105]

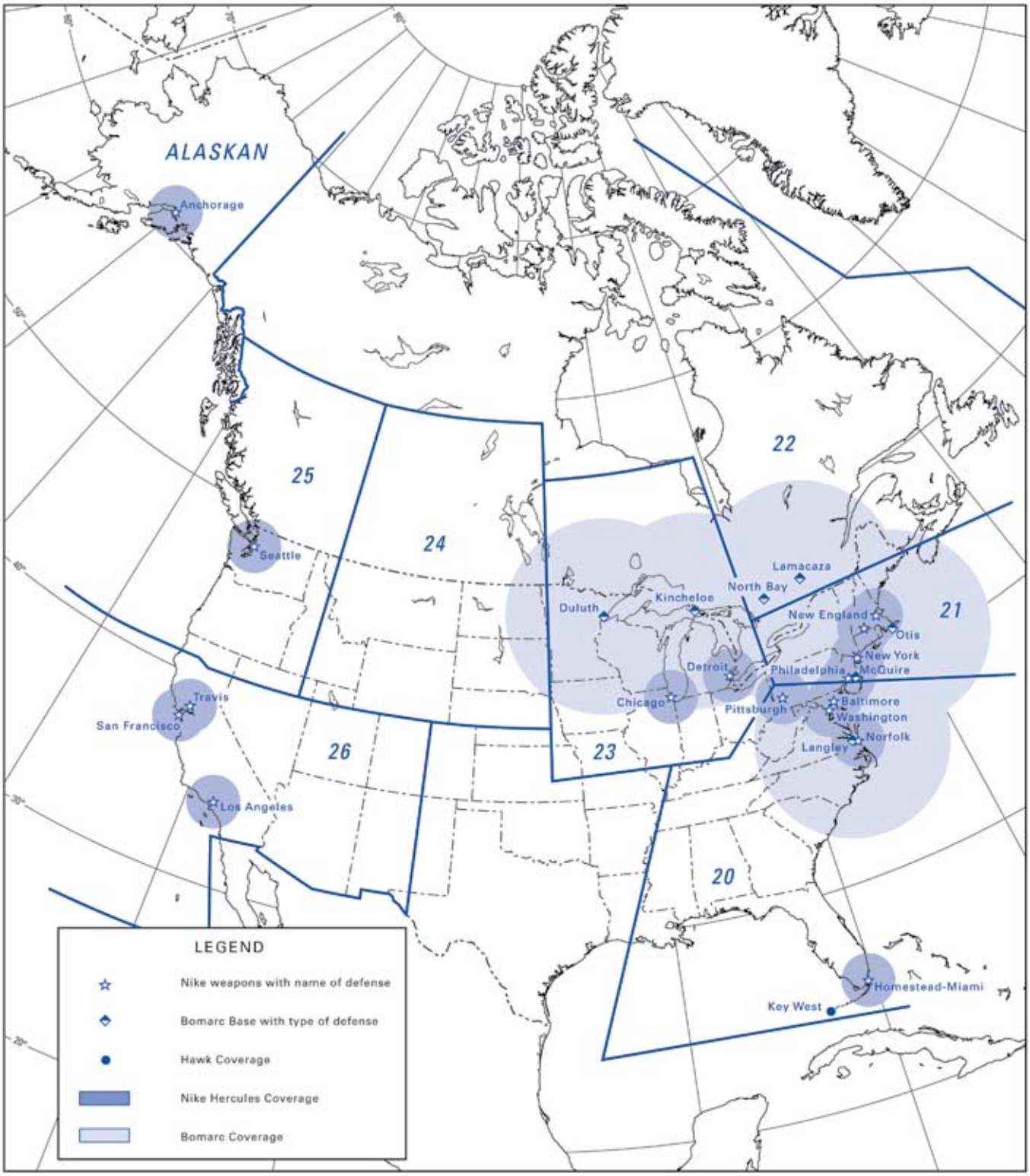
Enough was enough. On May 26, 1972, JCS directed that a detection, interception, and identification capability be provided by June, 1973, which was designed to restrict the unauthorized penetration of United States' airspace by unsophisticated type aircraft.[106] To carry out the directive, CONAD established a Manual Control Center, deployed additional military LRR and height finder radars on the Gulf Coast to supplement existing FAA coverage, and placed eight fighter interceptors on five-minute alert.[107] On October 6, 1972, the initial increment of the Southern Air Defense System became operational.

6. Air Defense With Reduced Forces

The air defense system which remained in being at the end of 1972 was obviously grossly ineffective against the type of bomber threat which had initially caused the deployment of the system. A new and greatly reduced threat was assessed by OSD. ". . . forces remaining after this cut would provide the capability to defend against a small attack (about 10 bombers) after one day of warning. . . ."[108] CINCNORAD's

[104] "CONAD Command History, 1972," Headquarters CONAD, p. 98.
[105] Landing at New Orleans was especially significant; the chairman of the House Armed Services Committee was from the state of Louisiana.
[106] "CONAD Command History, 1972," Headquarters CONAD, p. 53.
[107] Alert was provided by two ADC F-106's at Tyndall AFB and by two NG F-102's at each of three bases.
[108] "CONAD Command History, 1972," Headquarters CONAD, p. 39.

Figure 28—NORAD SAM Deployment, 31 December 1971



"CONAD Command History, 1972," Headquarters CONAD, p. 103.

utilization of the forces provided to him was to cover critical areas, plus the northern and coastal approaches to the CONUS. He believed that his forces "provide a credible though limited air defense that only partially satisfies the stated objectives."[109]

7. Planning Directives

A feature long missing from air defense planning was a national statement of air defense objectives. A bold effort to fill this void was advanced by Deputy Secretary of Defense Packard on April 20, 1971, in a Memorandum to the Secretaries of the Army and the Air Force and to the JCS.[110] In summary, Packard's directive was that there be no further reductions in the capabilities of the air defense system, and that for that system the following objectives of CONUS air defense were established:

(a) Contribute to maintaining realistic deterrence against Soviet attack by:
    (1) Defending strategic retaliatory forces.
    (2) Defending the National command authorities and key command and control centers.
    (3) Defending deployed ballistic missile defenses against air-supported threats.
(b) Restrict unauthorized overflight of U.S. airspace.
(c) Limit damage from deliberate or unauthorized small air attacks against any United States target.
(d) Deter Soviet air attacks by defending key military and urban/industrial targets.

Unfortunately for stability in air defense force structure, new CONUS air defense objectives were announced from OSD on March 9, 1972.[111] These objectives were specified for "force sizing." The threat was indicated to be "a small bomber attack with one or two days strategic warning." The "other" air defense objectives stated in 1971 (the Packard Memorandum) "should be given a secondary role in planning these forces."

The OSD statement of force sizing objectives of March, 1972, generated a requirement from JCS to CONAD for a study of the modernized CONUS air defense force. The study, based on wargaming and analysis, was completed on August 14, 1972. Of importance at this stage of our narrative was the conclusion. "Current systems are not capable of denying damages from a small sophisticated attack in the 1977–1985 time frame."[112] Compensating requirements in terms of future systems and deployments are discussed in Paragraph F, below.

8. Air Defense of ABM Facilities

It will be recalled that one of the Packard air defense objectives was that of defending deployed ballistic missile defenses against the air-supported threat. At the time when the Safeguard five-site deployment was planned, ARADCOM had planned to utilize 15 or 16 Nike Hercules air defense batteries. The exact number dependent on the specific Safeguard configuration selected.[113] These plans were, of course, never implemented because of curtailments in both the Safeguard and Nike programs.

[109] Ibid., p. 30.
[110] "CONAD Command History, 1971," Headquarters CONAD, pp. 29–30.
[111] "CONAD Command History, 1972," Headquarters CONAD, p. 31.
[112] Ibid., p. 32.
[113] Ibid., p. 30.

F. The 1972 View of Future System Requirements

1. Performance Characteristics Deficiencies in the 1972 Air Defense Force System

The mix of elements which constituted the air defense system in 1972—the radars, the fighter interceptors, the surface-to-air missiles, and the command and control facilities—provided less than desired effectiveness against an anticipated future, sophisticated threat, because of limitations of the individual systems.

Generalities in system performance characteristics will suffice to illustrate the problem. Fixed command and control facilities, however hardened, were considered highly vulnerable. Mobility and survivability appeared to go hand-in-hand. Operational radars of that date operated on line-of-sight principles, and were, therefore limited in range. The fighter interceptors needed more speed, more range, and an improved fire control system for target location and engagement. Further, any new fighter interceptor capabilities should complement gains in air defense effectiveness expected from development of a longer range, land-based radar. If, with improved radar and fighter interceptors, the air battle was expected to be conducted at greater ranges from the defended area, the new command and control means should be mobile and be in the vicinity of the air battle, i.e., the new command and control facility should be airborne and must carry radar for interceptor control and for warning from advanced patrol locations. Optimum improvement to the efficiency of the air defense air battle would be realized from the complementary contributions of an airborne warning and control system, an improved radar of vastly greater range capability, and an improved manned interceptor aircraft. In the weapons area of surface-to-air missiles (SAM), improvements were required in system detection and engagement ranges, in the capability to operate in an intense ECM environment, and in the target handling capacity of the system. This latter feature was of particular importance to minimize the possibilities of saturation of the defense by multiple attackers.

2. New System Development

Provision of types of systems for the strategic air defense mission is primarily the responsibility of the individual Services, although NORAD/CONAD attempted to influence the nature of new system developments by publication of Qualitative Materiel Requirement (QMR) documents.[114]

Four new system developments are of importance to this narrative—three USAF and one Army. As early as December, 1968, USAF had issued a request for proposal for an airborne warning and control system (AWACS). In July, 1970, the initial contract for AWACS was awarded to Boeing. By March, 1972, the development had proceeded to the point of airborne testing to determine the system capability under operational conditions.

In 1949, USAF initiated work on the detection of aircraft beyond the line-of-sight capability of current radars. The backscatter technique concerning over-the-horizon (OTH) radar propagation was endorsed by USAF in November, 1961.[115] A production release decision was projected for September, 1970. Two CONUS sites were initially planned to be operational in FY 1973. Each site—one east and one west—was visualized as being located approximately 500 miles in-land with a coverage arc of 160 degrees.

[114] These QMR documents related a specific threat to desired system performance characteristics against that threat. A separate QMR was, in general, published for each *type* of system visualized as being required.
[115] "History of the Air Defense Command, January–June, 1964," Volume 1, Headquarters ADC, p. 16.

The improved manned interceptor (IMI) had been one of the most urgent and long sought requirements of CONAD and ADC. In 1968, CINCONAD, General Reeves, is quoted in the command history as stating: "With regard to the interceptors for air defense, I consider it imperative that the Improved Manned Interceptors be developed."[116] The F-12 program, until cancelled, was considered potentially beneficial in meeting this requirement. In 1972 there was no developmental replacement for the F-12, although the F-14 (USN) and F-15 (USAF) were competing candidates, either capable of meeting the CONAD requirements.

SAM development (SAM-D), was contracted by the Army to Raytheon for "advanced development" in May, 1967. The SAM-D, ultimately to replace the aging Nike system and Improved Hawk in air defense, gave the promise of improved range, ECCM capability, an target handling capacity, in addition to other improvements.

Technological and manufacturing problems, and, above all, system costs combined to result in the non-availability of any of the improved systems—AWACS, OTH-B, IMI, or SAM-D—for deployment in operational quantities in 1972 and in the several years thereafter.

3. The Modernized Air Defense Concept

The CONAD modernized air defense force study of August 1972 concluded that the current systems were not capable of denying damage against the study threat directed. (See paragraph E7, above.) The need for modernized and survivable system components was asserted.[117] In addition, certain other more specific conclusions concerning air defense systems were reached[118]:

(1) Early tactical warning is essential to trigger the defense forces in order to defend effectively against the attack threat specified (i.e., small bomber attack).
(2) The most significant increase in total effectiveness is achieved with the introduction of AWACS.
(3) Current interceptors do not have the capability to exploit fully the introduction of AWACS. The IMI is needed.
(4) The SAM-D contribution is in direct proportion to attackers that "leak through" the area air defense.
(5) OTH-B, AWACS, IMI, and SAM-D provide essential complementary capabilities.
(6) A vigorous research and development program is supported for air defense components other than those under development, but no reorientation of programs currently under development is required.

4. Recommended Force Levels, Modernized Air Defense Force

A tabulation of the CONAD recommended and the JCS approved composition of the modernized air defense force follows[119]:

Force Element	Date Available	CONAD Recommendation	JCS Recommendation
OTH-B radars	by FY 1978	4	4
AWACS UE a/c	by FY 1978	35	25
IMI squadrons	by FY 1980	11	6–8
F-106 squadrons	by FY 1980	10	10
SAM-D fire units	by FY 1983	54	48
AABNCP [120]	by FY 1977	3	—

[116] "CONAD Command History, 1968," Headquarters CONAD, p. 11.
[117] This "modernized air defense force" was an evolutionary development of a similarly titled force first conceived in 1969.
[118] "CONAD Command History, 1972," Headquarters CONAD, pp. 32, 33.
[119] Ibid., p. 34.
[120] Advanced Airborne Command Post, a NORAD/CONAD concept comparable to the National and SAC airborne command posts.

Even with the JCS reductions to the CONAD recommendations, it was the JCS Judgment that the modernized forces proposed would be "able to counter a small, sophisticated attack during the 1977–1985 period *at a prudent level of risk*."[121] [Emphasis added.]

To anyone generally familiar with recent trends and developments in air defense, it is common knowledge that, in no case, have the force structure goals of the modernized air defense force been realized. Of concern to this study, however, was the fact that the promise of a modernized air defense force was the rationale for major force reductions in current systems starting as early as July, 1968. (See paragraphs E6 and E7, above.)

G. Characteristics and Strategic Implications Deduced from the Development, Deployment, Modification of the Air Defense System, 1945–1972

1. General

The intent of this paragraph is to summarize in the form of conclusions the salient points of preceding discussions around which the history of United States strategic air defense is structured.

2. The Significant Events

a. A series of international events (e.g., the Berlin blockade [1948], the attack on South Korea [1950], and the Soviet thermonuclear explosion [1953]) caused a defensive reaction in the United States to deploy a significant air defense, the system elements and command and control procedures of which were copies of those used in World War II.

b. The influence of a body of informed scientific opinion on air defense, emphasized by the new defense strategy inherent in NSC 162/2, October 30, 1953, brought the approval of a vastly improved air defense system.

c. Although a focus on system costs from 1956 to 1959 resulted in some curtailment of planned system developments and deployments, basically the concept of air defense of the early 1950's was the guiding force until approximately 1960.

d. Under this policy, the numbers of air defense units (surveillance and warning, interceptors, SAM) "peaked" during the period 1957–1961.

e. Following 1960–1961 a need to modernize or replace current air defense systems was constrained by: (1) a reevaluation downward of the U.S.S.R. bomber threat; (2) an increasing emphasis by defense planners on the increasing Soviet ICBM threat, against which air defense means had no capability; and (3) budgetary limitations.

f. By mid-1968 further curtailments in current air defense forces were directed toward a "graduated phase-out" of the current systems enroute to reequipping with costly new systems (AWACS, OTH-B, IMI, and SAM-D) of greatly increased capabilities.

g. Since the new systems were not, for a variety of reasons, ready by programmed dates, the 1968–1972 reductions in the current systems, in effect, constituted a virtual dismantling of the continental air defense capability.

3. Air Defense in a Continental Perspective

Several factors in combination—intelligence, materiel limitations, and tactical considerations—produced an important concept of continental, rather than national, air defense.

Canada–United States cooperation in continental air defense was achieved formally with the establishment of North American Air Defense Command in 1957. Additionally, CONAD exercised air defense responsibilities in Alaska and Greenland under terms of the United States unified command plan.

[121] "CONAD Command History, 1972," Headquarters CONAD, p. 34.

4. System Deployments

Strategic air defense is based on the complementary utilization of area defense (fighter interceptors) and terminal defense means (AAA guns and SAM).

Based on locations provided terminal defense during the period 1951–1972, CONUS air defense strategy may be inferred. From the beginning, the national capitol was protected. AEC installations, although of vital importance in the earlier years, became less vital to defend as their number increased. Twenty-four of the most populated and most highly industrialized cities were eventually provided defense, as were seven SAC bases. As necessitated by inactivation of Nike units, defenses were withdrawn first from the SAC bases (1965) and then from 12 cities located in the interior of the nation (1969–1971).

Coincident reductions in surveillance and early warning and fighter interceptor units and their withdrawal from the central CONUS forced CONAD into a thin perimeter air defense strategy.

When made necessary by international developments, CONUS air defense means were redeployed—temporarily or permanently—to meet the new threats (e.g., to Florida [1962], to Alaska [1963], to Panama [1964], and to the southern United States [1969–1972]).

5. Significance of the Threat

The initial period of build-up of United States strategic air defenses (1951–1960) was a direct response to the air attack threat perceived to exist from the U.S.S.R.

The first Soviet-launched satellite (1957) and the Soviet announcement of the primacy of ICBM as their strategic offensive weapons system (1960) resulted in progressive reassessments downward of the Soviet bomber threat.

Even though the Soviet bomber threat was being deemphasized, the continued presence of significant numbers of heavy bombers in the Soviet inventory was of concern to CINCNORAD. To ignore this element of the Soviet capability appeared to place an unwarranted reliance on an ability to interpret Soviet intentions.

The threat assessed during the period 1968–1972 as being one of "a small attack (about 10 bombers)" after a lengthy period (1–2 days) of strategic warning was for the purposes of force sizing and defense effectiveness studies; it was not correlated with Soviet heavy bomber *capability*.

Reductions in the CONUS air defense system starting in mid-1968 in expectation of achievement of a new, modernized air defense force were inconsistent with realities of the threat. A limited and decreasing bomber threat could not logically be used to justify reductions in air defense and simultaneously to justify a new, modernized air defense system. Budgetary and ABM strategic considerations appeared to have replaced the Soviet bomber threat in the minds of defense planners. Air defense and ballistic missile defense went hand-in-hand—and both were being deferred, except for token forces.

Section III. Ballistic Missile Defense

A. Approach

In preparing this section an attempt has been made to follow the guidelines established by the Historical Office, OSD, to treat the history of United States ballistic missile defense in a selective rather than exhaustive manner. There has been no attempt to provide an exhaustive description of BMD systems and their

characteristics. In fact, except for work conducted under the auspices of The Advanced Research Projects Agency, the United States, after 1957, pursued only one ballistic missile defense concept, and the story of the attempts to develop and deploy that system is only indirectly related to its characteristics. The fact is that the systems that evolved from that concept were able to intercept the missiles which they were designed to counter. As it turned out, their technical feasibility, which was an argument used against them, was fairly well demonstrated before the decisions to deploy or not deploy were made. Consequently, technical feasibility became more or less synonymous with system effectiveness which, in turn, was directly related to the threat, the deployment and the cost. The effectiveness was also well demonstrated—at least in the minds of the Soviets.

The history of ballistic missile defense in the strategic arms competition is a strange one and had a marked impact on United States goals, (if not on its strategy), and the arms competition itself. It was conceived when there was no threat and essentially abandoned at a time when the quantitative and qualitative threat was the greatest and was continuing to grow. It had a marked influence on bringing the Soviets to the Strategic Arms Limitation Talks and was the subject of the only treaty that evolved from SALT I.

The struggle against BMD was conducted on the basis of its technical feasibility, its effectiveness, its impact on the arms race, its cost and even its impact upon the environment—but mostly on its effectiveness and its impact on the arms race. The struggle was between the Administration and Congress with support on both sides from time-to-time from the scientific/academic community and almost all segments of the American society. There was divisiveness on both sides. Within the Administration there was a conflict between the Secretary of Defense and the Joint Chiefs and indeed between the Services themselves. In Congress there was conflict between the so-called hawks and the doves. The approach, in writing this history has been to highlight and analyze these events with the objective of determining why certain decisions were made. There has been no intent to make a judgment as to which side was right or wrong or to reflect on the integrity of any person or group. It has been accepted that each side and person was acting in good faith according to his own conscience and the good of the country.

Since the history of BMD encompassed such a wide spectrum of the American society, it has been necessary to go outside the Government files for reference material to present a reasonably well-balanced history. As a result, open literature has been used rather extensively. The extent to which balance has been achieved is left to the sense of the reader.

B. The New Dimension

The New Look strategy of the Eisenhower Administration hardly had time to experience the first blush of success before it was overtaken by events. The Administration, of course, had anticipated that the Soviet Union would eventually counterbalance the American strategic superiority but not before the end of the decade at the very minimum. Yet in 1955, the first year of the New Look budget, the Soviets demonstrated that they were far advanced in the production of long-range bombers and that they were qualitatively abreast of the United States in aircraft design and development. About the same time newly installed radar systems picked up evidence that the Soviets were testing large numbers of medium range ballistic missiles. The Killian Committee warned that unless the United States made additional efforts the Soviets would achieve a decisive lead in strategic missiles by 1960. Then, in August of 1957, the Soviets announced the successful firing of an intercontinental missile and followed the announcement a few months later with the Sputnik launchings to dramatize their capabilities. Thus, a new dimension was introduced.

Whereas the United States possessed the ability to destroy the war-making capability of the Soviet Union in 1954, with little likelihood of serious reprisal, by 1957 this was no longer the case. The new dimension, termed the "balance of terror" by one writer,[122] was considered the decisive military fact in the mid-1950's.

The "balance of terror" was the product of the development of a significant stockpile of thermonuclear weapons by both the United States and the U.S.S.R. and the development of a substantial delivery capability in both bombers and ballistic missiles by the Soviet Union. It undermined the New Look's two key assumptions i.e. that the 1953 ratio of Soviet to American power would not begin to change drastically, before the late 1950's and that American nuclear retaliatory forces could deter both large and small aggressions.

In addition to the growing number of thermonuclear weapons there was a growing awareness of their awesome destructiveness. The United States carried out its first thermonuclear explosion in November, 1952, the Soviets theirs in August 1953. The accumulation by both sides of substantial stockpiles of these weapons by 1956, marked a drastic change in the military situation. A general war in which hydrogen weapons were used would be disastrous for all participants. In 1950 and 1951 the Administration had prepared for what seemed like an imminent conflict with the Soviet Union. In 1953 and 1954 a different Administration not only placed reliance upon the ability of nuclear airpower to deter major and minor aggressions but also had indicated that it would not hesitate to use nuclear weapons where they would be militarily effective. Two years later, however, willingness to use nuclear weapons required also a willingness to face the possibility of thermonuclear devastation.

C. Nike Zeus Development

1. The Early Years

The impact of the new dimension, so aptly demonstrated by the Soviet Union with Sputnik I in 1957, was not lost upon the military. As early as 1955 the Army was contending that inadequate attention, as reflected by the amount of funds appropriated, was being given to the antimissile missile program. In December of that year the Army requested $7.7 million in supplemental FY 1956 funds for the ballistic missile defense program and expressed an opinion that early assignment of responsibility in the ballistic missile defense area would ensure a more coordinated effort.

Undoubtedly this request resulted from the fact that all three services, Army, Navy, and Air Force, were involved in some degree or another in ABM development. As early as 1944 the Army had contracted with the General Electric Company for research and development on a long-range surface-to-surface missile and a high altitude antiaircraft missile. The surface-to-surface program was Project Hermes while the antiaircraft program became Project Thumper.

Project Hermes began in November 1944 as technical intelligence teams, following the American advance in Germany, scoured the country collecting parts, documents, photographs, blueprints, notes, and scientists involved in the German rocket program. All this material was bundled together and shipped to the United States. About 130 scientists were also assembled and shipped to America under contract in a program known as Project Paperclip. In all 100 V-2 rockets were eventually assembled and fired under Project Hermes, the results of which provided a wealth of data for later use by U.S. ICBM and BMD development

[122] Huntington, *The Common Defense*, p. 88.

programs. An outgrowth of this program was the initiation of the high-altitude and upper-atmospheric research programs which were essential to missile defense and understanding the offensive warhead reentry phenomena.

In 1945, the Army also initiated Project Nike under a contract with the Bell Telephone Laboratories and the Western Electric Company. In the beginning the Army Air Force was a co-sponsor of this program with the Army Service Forces, but subsequently withdrew. This project led to the development of a whole family of antiaircraft missiles and subsequently a series of ABM systems.

The Navy's problem was the defense of carrier task forces from Kamikaze and high-speed aerial threats. To study this problem a contract was let with John Hopkins University Applied Physics Laboratory. The project was known as Bumblebee and from its research a whole family of surface-to-air missile systems—Talos, Terrier, and Tartar—was developed for shipboard use. In 1959, the Navy recommended Talos as a candidate for ABM defense.

The Army Air Forces, like the Army Service Forces, gained a great deal of knowledge from the Hermes project and the V-2 firings. In 1945, however, after withdrawing from the Nike project it initiated a contract with the Boeing Company for research on a ground-to-air pilotless aircraft in consonance with the McNarney directive of 1944 which assigned responsibility for guided missile development, for vehicles depending upon aerodynamic lift, to the Air Force. The project became known as the GAPA project. GAPA was a supersonic research vehicle using both rocket and ramjet propulsion. The program was later merged with G.E.'s Thumper program to develop the "collision intercept" method for destroying a ballistic missile. Due to budgetary constraints these programs were later merged with the University of Michigan's Aeronautical Research Center Wizard program to become the Air Forces Bomarc[123] system. The Wizard program, continued to be funded and like Talos was a candidate for the ballistic missile defense role in 1955 when the Army expressed the opinion that early assignment of responsibility in the ballistic missile defense area would ensure a more coordinated effort.

It has been reported[124] that antimissile design technology grew out of: (1) antiaircraft missile projects, (2) the high-altitude research carried out at White Sands, and (3) the upper-atmosphere nuclear tests carried out by the United States between August 1958 and September 1962. As early as February 1955 the Army had concluded, however, that the state of missile technology had advanced sufficiently to warrant a feasibility study for a system to combat ICBM. In March the Western Electric Company and Bell Telephone Laboratories undertook an 18-month feasibility study of "a new forward looking ground-to-air guided missile system capable of effectively engaging the target threats within the Continental United States during the period 1960–70."[125] Primary emphasis was to be placed on defense against long-range ballistic missiles.[126] In addition to the Bell Telephone and Douglas study, the Army was also looking into a ballistic missile defense system for the Field Army. In response to a query, the Chief of Ordnance informed the Chief of Research and Development on 16 November 1955 that the ongoing Ordnance Corps studies having reference to ICBM defense included the Nike II study being conducted by Bell Telephone and Douglas, and a

[123] Bomarc was an acronym for Boeing Michigan Aeronautical Research Center.
[124] Benson D. Adams, *Ballistic Missile Defense*, (New York: 1971) p. 18.
[125] "Nike ZEUS Guided Missile System," Volume I, System Study Report, prepared by BTL and Douglas Aircraft Company on behalf of Western Electric Company, Inc., 1 Mar 1957, p. vii, Foreword.
[126] Memo, Dir R&D, OSA, for Asst Sec Def, 1 April 1956, sub: Antiballistic Missile Program.

Plato study being conducted by Cornell Aeronautical Laboratories and the Sylvania Corporation.[127] Plato was to be a mobile system for defense of the Army in the Field, and was to use the Nike II (Zeus) missile. Effort on this project was subsequently discontinued in 1958.

The Bell-Douglas idea, the Chief of Ordnance reported, was to defend strategic points in depth so as to engage incoming missiles at several points. It would be a logical outgrowth of the Nike rings currently being installed. Fan-beam radars would be used to track the missiles, and computers would automatically command the launching of the missile or missiles closest to the incoming reentry vehicle (RV). Nuclear warheads would be used. Intercepts could be started at 300,000 feet altitude and continue down the line of descent until the "last resort" missile was fired from the area of the target.[128]

At about the same time that the Army was contracting with the BTL-Douglas team for a feasibility study, the Air Force contracted with the General Dynamics Corporation to study its proposed Wizard system to provide an area defense against ICBMs.[129]

As these studies got under way the Killian Committee (Technological Capabilities Panel) completed its deliberations finding that an ABM system was feasible but that accelerated research and development was required in certain areas, particularly radars. As a result of the recommendations of this committee, the Department of Defense approved release of $4 million of FY 1956 appropriated research and development funds for component development and experimental work on antimissile missiles. These funds were made available from a larger amount requested by the Army, which were temporarily withheld by the Bureau of Budget pending results of the Administration appointed Killian Committee reports.[130] Of these funds, $3.4 million would go to Ordnance for component design and system development. While it was realized that the money involved would not fund an ideal antimissile program, the Chief of Research and Development desired that "it be used to initiate studies and development for an aggressive program that would lead to the earliest practicable availability date of an Army antimissile missile capability."[131] The first contract for component hardware development for the Nike Zeus system was let in February of 1956.[132]

The increased Soviet activity in the development of ballistic missiles, as observed by the newly installed radar systems around the Soviet periphery, coupled with the lead time required to build and deploy a completely new system, caused the Chief of Research and Development in March of 1956 to direct the Chief of Ordnance to include in the Nike Zeus studies a study of the feasibility of obtaining an early anti-ICBM capability in 1960 or 1961 with a modified Nike-Hercules system.[133] Although pursued for some time this idea was subsequently dropped in order to concentrate all effort on the Zeus program.

The remainder of 1956 was a crucial one in the area of antimissile missile development. In June the final report of the Skifter Committee (Department of Defense Ad Hoc Group on Anti-ICBM) concluded that an anti-ICBM system was feasible of development. The committee recommended that research and development on acquisition radars should be conducted and that quick fixes should not be further considered. The Assistant Secretary of Defense (Research and Engineering), the following month, authorized the

[127] Memo, OCO or Chief of Ordnance to R&D, OCS, 16 November 1955, sub: ICBM Defense.
[128] Ibid.
[129] *ABM*, edited by Abram Chayes and Jerome B. Wiesner (New York Signet Books, 1969) p. 227, Chronology of U.S. ABM Deployment Decisions.
[130] CRD, *Chronological History of Army Surface-to-Air Missiles Through 1957*, Nike ZEUS, 10 January 1958.
[131] Memo, C of R&D for C of Ord, 31 January 1956, sub: Antimissile Missile Program.
[132] Memo, Dir R&D, OSA, for Dir GM, OSC, 24 April 1958, sub: (Incl 1) Report on Nike ZEUS.
[133] CRD, *Chronological History of Army Surface-to-Air Missiles Through 1957*, Nike ZEUS.

obligation of FY 1957Army research and development funds in the amount of $9 million for Project Nike Zeus. The program execution was to be in accordance with the recommendations of the Skifter Committee. In February 1957, the Army requested the apportionment of an additional $10.7 million from the FY 1957 Department of Defense emergency funds to raise the FY 1957 Nike Zeus effort to maximum rate. This level of funding was required to assure a 4th quarter 1962 operational availability date, provided maximum rate funding could be provided in the following years. This request for emergency funds was denied and in effect delayed the operational availability of Nike Zeus for one full year.[134]

2. Assignment of Responsibilities

In August of that same year the Special Assistant for Guided Missiles to the Secretary of Defense constituted a committee to review the overall anti-ICBM program. This was the first effort to coordinate the activities of the Services in the antimissile field. The first meeting was held on 17 September 1956, at which time the Army and the Air Force summarized their programs.[135] On 2 October the Special Assistant for Guided Missiles informed the Secretaries of the Army and the Air Force that in the antimissile field the Air Force would have responsibility for developing the early warning system and the Army would have responsibility for the active defense system. The assignment to the Army was justified on the grounds that major targets were already defended by Nike sites. In addition, the Nike II program appeared to be the only project beyond the study stage which was capable of accomplishing the mission. Further, there was a basic similarity between the anti-ICBM problem and the antimissile missile for field army use.[136]

This memorandum obviously did not resolve the controversy as to which service would have responsibility for antimissile missile development for the subject was addressed the following April by the Department of Defense Anti-ICBM Committee. That committee recommended on 25 April 1957, with Secretary of Defense approval, that the Army continue anti-ICBM missile system development at a level about as planned. In addition, the committee report confirmed the Special Assistant for Guided Missiles' assignment of responsibilities as issued in August the year before. The committee's report provided that the Air Force develop the anti-ICBM early warning system and carry out research and development on advanced acquisition radars required by the active anti-ICBM system and study the communications between these radars and the active portion of the system. The Army was to develop the local acquisition and target tracking radars required by the active portion of the anti-ICBM defense system and the defensive missile itself. The committee also recommended that an anti-ICBM Coordinating Agency be established to coordinate the Army and Air Force efforts in this field.[137] The Secretary of Defense approved the findings of the committee the same month. In January 1958, however, his successor Secretary McElroy issued the directive ordering the Air Force to discontinue all development work on Wizard.[138]

3. Early Plans

On 30 September 1956, the Nike Zeus feasibility study (originally termed the Nike II study) was completed. The results of the study were briefed to the Army General Staff on the first of October by representa-

[134] Ibid.
[135] Memo, Air Defense Branch, OCRD, 20 Dec 1956, sub: Antimissile Missile Statement of the Problem.
[136] Memo, Special Asst for GM, OSD, for Sec Army, Sec Air Force, 2 Oct 1956, sub: Anti-ICBM Systems.
[137] CRD, *Chronological History of Army Surface-to-Air Missile Through 1957*, Nike ZEUS.
[138] Chayes and Wiesner, *ABM*, p. 227.

tives of the Western Electric Company. The study defined the threat expected to confront the air defenses of the United States between 1960 and 1970 and described the proposed system for confronting it. The study included discussions of the guidance problem, the equipment that was recommended for its solution, a summary of the exploratory development work performed, and a proposed schedule for a development program.

The study concluded that it was feasible to provide an anti-ICBM defense with the Nike Zeus system. If development of the system was funded at the maximum rate, the first operational capability could be obtained in late calendar year 1962 under a normal production program.[139]

Later that same month the Army notified the Department of Defense Anti-ICBM Committee that following a phased program it would be possible to attain the operational capabilities with Nike Zeus as shown in Figure 29.

As a result of the successful completion of the feasibility studies and the successful component and experimental work conducted on Nike Zeus the decision was made in early November to initiate system development. Accordingly, the Army directed full system development in a phased program similar to the program outlined to the DOD Anti-ICBM Committee in October. At this same time the study on the feasibility of attaining an early anti-ICBM capability with Nike B (Nike Hercules) was terminated since the attainment of a Hercules capability would interfere with attainment of a much greater capability in nearly the same time frame with Nike Zeus.[140] On 1 December the existing contract with Western Electric Company was supplemented to include active development of the Nike Zeus system.

To meet this schedule the Army required $19.7 million in FY 1957. This was $10.7 million more than had been appropriated. Accordingly, the Army requested on 4 February 1957 the apportionment of $10.7 million from the Department of Defense emergency funds. This request was denied. However, in developing the FY 1958 budget the Army had planned a total of $26 million for Zeus ($12 million for R&D and $14 million for Production and Procurement). Unbeknownst to the Chief of Research and Development, the Deputy Chief of Staff for Logistics on 1 February 1957 had unilaterally programmed $25 million for Production and Procurement in support of R&D activities. This latter amount remained in the budget thus making a total of $37 million available for the Zeus program in FY 1958. This funding would permit an initial operational availability in the third quarter of CY 1963 instead of 1965 as had been the case with the reduced FY 1957 funds.

Shortly after the Soviet announcement of the successful launching of an ICBM in August of 1957, the Secretary of the Army recommended that the Secretary of Defense support a national priority for the anti-ICBM development program equivalent to the priority accorded the ICBM development. In keeping with this priority, he also recommended that additional funds be made available to the Army to accelerate research and development of Nike Zeus. Under an accelerated program, Army studies indicated, an early operational on-site defense of CONUS could be provided with 3 batteries[141] by the end of CY 1961 and

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[139] CRD, *Chronological History of Army Surface-to-Air Missiles Through 1957*, Nike ZEUS.
[140] Ibid.
[141] A Nike ZEUS battery comprised all the elements required for carrying out the engagement of an assigned target: radars for tracking and discrimination, defensive missiles, and related computer equipment. The organizational concept envisioned in 1957–1958 for deployment consisted of two major elements besides the weapons batteries: the Local Defense Center (LDC), consisting of the Local Acquisition Radar (LAR) and tactical control equipment for one to five batteries associated with the LDC, and; the Forward Acquisition Radar (FAR) which was to be deployed forward of the defended area, in the direction of possible ICBM attack. The FAR was to acquire target data and transmit it to the LDCs.

Figure 29—Nike Zeus Operational Availability Schedule as Furnished DoD Anti-ICBM Committee, 25 October 1956

Operational Capability	Date	
	Maximum Rate Funding	Budget Limited Funding
1. Early anti-ICBM capability (75 NM range, 130,000 feet altitude)	4th Qtr CY 62	3rd Qtr CY65
2. Full high altitude ICBM capability (75 NM range, 500,000 feet altitude)	4th Qtr CY 63	2nd Qtr CY67
3. Extended range antiaircraft (manned and unmanned) capability	4th Qtr CY 64	1st Qtr CY69

30 batteries by the end of CY 1962 at a cumulative cost of $2.0 billion. A full capability with 100 batteries could be provided by the end of CY 1965 at an estimated cost of $4.0 billion and an extended range capability with the 100 batteries could be achieved by mid-CY 1966 at an estimated cost of $6.0 billion.

In November the Chief of Research and Development notified Dr. H. R. Skifter, Chairman of the Department of Defense Anti-ICBM Coordinating Agency, the Assistant Secretary of Defense (Research and Engineering), and Dr. Killian, Special Assistant to the President for Science and Technology, of the Army FY 1959 funding requirements. Included was a statement of the FY 1958 and FY 1959 required research and development funding for the Nike Zeus accelerated program.

4. Conflicting Factors

As the Army struggled to attain the earliest operational availability with Nike Zeus several factors were to influence the program—not the least of which was the Eisenhower fetish for stability in military programs and stability in dollars. Under the New Look an annual goal of $34 billion in expenditures was established. During the same period, however, inflation was working against this goal. In July, 1956, the wholesale price index was 114.0. A year later it was 118.2. The costs of goods and services required by the Defense Department reportedly rose more rapidly than those in the economy in general; Secretary Wilson estimated that between January and August, 1957, the overall price tag on Defense Department programs had jumped 5 percent.[142] Obviously, it would be impossible to stabilize both programs and dollars under these circumstances. If the dollars remained the same, programs would have to be reduced. This led to a strategy of sufficiency. Whereas, under the New Look the United States had an overwhelming superiority in air and nuclear power, this virtual monopoly was no longer valid in the context of the new dimension. The question now became one of how much is enough? How large should the deterrent force be to achieve the national goals? And what should our defensive posture be should deterrence fall?

The Gaither Committee was one of several agencies assigned the task of addressing this problem.[143] As a result of this assignment the committee undertook an examination of active and passive defenses as they

[142] Huntington, *The Common Defense*, p. 94.
[143] This section is based upon a discussion in Benson D. Adams, *Ballistic Missile Defense*, p. 26.

contributed to deterrence and what protection they afforded the country in the event deterrence failed. One of the recommendations of this committee, to be given the highest priority, was ballistic missile defense protection of SAC bases against a possible future Russian missile attack.

Another factor was reorganizations within the Department of Defense and reassignments of responsibilities. Early in 1956 Defense Secretary Wilson reestablished the Office of the Director of Guided Missiles in DoD but gave it the new designation of Office of the Special Assistant for Guided Missiles. By 1957, the BMD program was a joint Army-Air Force effort monitored by the AntiBallistic Missile Committee of the Department of Defense. Each service was working its own solution to the problem. Despite several reorganizations and appointment of various advisory and coordinating committees, it was difficult to determine who had responsibility for various aspects of the developmental work and whether the military service or Department of Defense had overall coordinating responsibility for all R&D projects of a joint or interdepartmental level.

In November of 1957 the new Secretary of Defense Neil H. McElroy, redesignated the Office of the Special Assistant for Guided Missiles, the Office of the Director of Guided Missiles. The function of the new director was to guide all activities in the Department of Defense relating to research, development, engineering, production, and procurement of guided missiles. This office was Short-lived in that the Department of Defense Reorganization Act of 1958 created the Office of the Director of Defense Research and Engineering (DDR&E) with a subordinate facility, the Advanced Research Projects Agency (ARPA) with a charter to direct all ballistic missile defense and satellite development efforts. ARPA had a mandate to issue instructions to the military; to eliminate duplicate or unpromising programs; and to approve, modify, or disapprove programs and projects in the military.

Part of ARPA's charter included a program to investigate all possible defenses against space vehicles and ballistic missiles. It did this through its Project Defender. The Project's formal task called for research, experimentation, and systems feasibility studies to determine the technological possibilities of advanced defenses against exoatmospheric offensive vehicles. Its aim was to explore fundamental phenomena, develop new concepts, and apply new techniques. It was divided into five working parts: (1) general research and development (lasers, atomic and nuclear physics); (2) techniques and devices (radar, optical, infrared); (3) missile phenomenology (launch, mid-course, terminal); (4) systems and concepts (BAMBI, GLIPAR, ARPAT); and (5) penetration aids.

Another factor which tended to diffuse the Army's efforts to attain an early operational availability with Nike Zeus had to deal with service roles and missions. There is some evidence to indicate that the Air Force was concerned with the impact of a defense system on its strategic offensive posture. As early as June 1956, Lieutenant General James M. Gavin, the Chief of Army Research and Development had stated that missile defense would replace strategic air power as the nations chief deterrent factor.[144] The Air Force was opposed to the Army's ballistic missile defense concept arguing that the best defense was a strong offensive retaliation. Additional rationale included arguments that the Nike Zeus could be deceived, it was good only against unsophisticated RVs, it would cost as much as the whole ICBM program, it was technically infeasible, it would lead to the creation of a Maginot Line complex, and it could not be deployed before 1961, the period of the anticipated "missile gap." They also argued that a deterrent to war must be based

[144] *New York Times*, 13 June 1956.

upon an offensive capability and the Soviets would probably not remain idle in creating additional offensive capabilities if a defense against the ICBM was developed.[145] These same arguments were to appear over and over again during the next decade any time that a deployment decision seemed likely.

At the time that it was espousing these arguments the Air Force was still involved in developing its own BMD system, the Wizard, and while it exhibited a solid front to the other services and Congress, there was evidence of cleavage within its own ranks. The proponents for strategic offensive forces objected to any system that might reduce the magnitude of their effort while the strategic defenders were anxious to retain and exercise the air defense responsibilities so tenaciously pursued and won in the late 1940's and early 1950's.

To stop the interservice conflict on 16 January 1958 Secretary of Defense McElroy sent directives to the Army and the Air Force much similar to that issued in October 1956 by the then Special Assistant for Guided Missiles and the Department of Defense Anti-ICBM Committee in April the previous year. The directive limited the Air Force to a continuation of its current development effort in the Wizard program to that part which pertained to early warning radars, tracking and acquisition radars and the communications links between the early warning radars and the active defense systems as well as the data processing components required to form an integrated system. This work was to be conducted as a matter of urgency.[146]

The Army was to continue its development effort in the Nike Zeus program as a matter of urgency, concentrating on system development that would demonstrate the feasibility of achieving an effective active anti-ICBM system in an electric countermeasure and decoy environment.

Two months after the Secretary of Defense's January 1958 decision the Air Force appealed, claiming that the Army's Zeus did not have growth potential to handle possible enemy evasion, decoy, and countermeasure tactics. Agreeing with an earlier Senate Preparedness Committee resolution, the Air Force urged that more effort be put into developing antimissile missiles and that the Air Force be allowed to continue the Wizard program. Wizard it argued would be a complementary back-up system to Zeus.[147]

In the meantime, several events were taking place that would tend to both support the Nike Zeus program on the one hand and undermine it on the other. In March 1958, Dr. Richard C. Raymond[148] of General Electric TEMPO, speaking at the Annual Air Power Symposium in Salt Lake City predicted that both a long-range area defense antiballistic missile defense system and a short-range system would eventually be developed. The short-range system would be similar to the Army's Zeus, but, he argued, the Zeus in its then present configuration would become obsolete before it became operational because of foreseen ICBM improvements and the new detection methods. Undoubtedly he was speaking of penetration aids with respect to ICBM improvements. In 1958, Department of Defense had convened a committee to investigate the possible penaids that would be available to the offense in the 1960–1970 time frame. This committee reported on the feasibility of decoys, chaff, tank fragments, reduced radar reflectivity, nuclear blackout, and multiple warheads.[149]

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[145] U.S. House of Representatives, Committee on Armed Services, *Investigations of National Defense Missiles, Pursuant to House Resolution 67*, 85th Cong, 2nd Sess, 1958, p. 4196.
[146] Memo, Sec Def for Sec Air Force, 16 Jan 1958, sub: Program for Defense Against the Intercontinental Ballistic Missile.
[147] Adams, *Ballistic Missile Defense*, p. 29.
148 It is interesting to note that the new director of ARPA was Mr. Roy W. Johnson, a former vice-president of the General Electric Company.
[149] Herbert F. York, "ABM, MIRV, and The Arms Race," *Science* 3942 [1970] 257, 17 July 1970.

Dr. Raymond argued that for point defense, particularly for hard targets, the atmosphere could be used to filter warheads thus permitting identification of the warhead and engagement before the attacking warheads detonated. With soft targets, such as cities, an area defense was absolutely necessary. An area defense, he asserted, would require the ability to discriminate warheads from decoys beyond the atmosphere.[150]

Later in the year, Dr. Richard Holbrook, a scientist in ARPA's missile defense group, in a speech before the Atlantic Chapter of Sigma Delta Chi, said that the then currently envisioned Zeus would not provide an effective defense against multiple RVs, decoys, penaids, and radar jammers unless many interceptors were bought.[151] It is interesting to note that the United States at that time had its hands full trying to solve the problem of reentry and survivability of the warheads on its own IRBMs and ICBMs. There was no doubt of the feasibility of penaids in future years, but in 1958, there was no evidence that the Soviets were working on them, nor was the United States. In other words, they were, at that time, hypothetical. There were more immediate problems requiring concentrated effort in the development of both the ICBM and ABM systems.

While the scientists from ARPA were hypothesizing the future threat, the Argus series of high-altitude nuclear explosions was producing a generally shared opinion among scientists, in the fall of 1958, that an area ABM defense was technically impossible. Earlier, it had been suggested that high yield, high-altitude nuclear explosions would form patches of charged neutrons and electrons along the lines of flux of the Earth's magnetic field and that these charged particles would destroy the incoming warheads as they passed through. By mid-1959, however, the Defense Department had rejected this possibility on the ground that the patches would leak particles sufficiently fast to reduce the lethality to a level insufficient to produce a warhead kill since the earth's magnetic field was too weak to maintain the "Patches."[152]

5. Accelerated Deployment

Based upon the directive from the Secretary of Defense to pursue the development of Nike Zeus "as a matter of urgency," the Army had developed plans for an accelerated Zeus program. These plans included a statement of the necessary funds to achieve this capability. In late 1957 the funding requirements were incorporated into the FY 1959 Army budget. They included $136 million additional FY 1958 funds, and a total of $613 million in FY 1959 funds. It was the Army's opinion that the Zeus system should be deployed immediately because the risk of not doing so was becoming greater with each passing year. In November 1957 Army Chief of Staff, General Maxwell Taylor had urged an "all-out effort" at the earliest possible date to counter the threat represented by Sputnik type vehicles.[153]

About this same time the Chairman of the House Armed Services Committee, Carl Vinson became concerned about the matter of operational control of BMD. Perhaps he was remembering the earlier hassle over the Thor and Jupiter IRBM systems and wished to avoid a similar one over BMD. At earlier House hearings concerning this matter, Deputy Secretary of Defense Donald Quarles had indicated that no decision had been made. Apparently this answer had not satisfied Mr. Vinson for on 29 January 1958 he addressed a letter to the Secretary of Defense recommending that the Army be assigned operational responsibility for Nike

[150] "Dual Missile Defense Predicted," Aviation Week and Space Technology, 13 [1958] 27.
[151] "Nike ZEUS May Be Inadequate, Top Defense Scientist Warns," *Aviation Week and Space Technology*, 19 [1958] 33.
[152] *The New York Times*, 20 March 1959, p. 1.
[153] *The New York Times*, 21 November 1957, p. 1.

Zeus. In the same letter he also recommended that the Secretary make available to the Army $136 million in FY 1958 funds for the accelerated deployment of Nike Zeus.[154]

Subsequently, the Army briefed the Deputy Secretary of Defense on the need for the FY 1958 additional fund requirements and recommended that the requested $136 million be made available for the accelerated Zeus program. On 14 February 1958, the Secretary of Defense, the Director of Guided Missiles, OSD, the Secretary of the Army, and the Vice Chief of Staff of the Army met with Mr. Vinson regarding his recommendations for operational control of Nike Zeus and the accelerated deployment. No promises were made; however, the Secretary of Defense promised to respond to Mr. Vinson's recommendations by 15 April 1958.

Several months later at a Senate Defense Appropriations hearing Deputy Secretary Quarles said that the Army was in complete charge of ballistic missile defense development and operation.[155] Mr. McElroy, however, did not support the Army with its request for preproduction and development funds stating that such an act would "be premature at this time." He did, however, report that the system had been given top priority[156] and that the funds allocated would accelerate development of the systems readiness for production. The funds were to be devoted to research and engineering.

The remainder of 1958 was devoted to system research and development with a few possible exceptions. Early in the year the Chief of Research and Development noted that analysis of air defense systems in the Nike Zeus time era indicated that a companion surface-to-air missile might be required. As originally conceived, Zeus was to have a dual capability: the first, of course, an anti-ICBM capability; the second a long-range air defense capability. The latter capability had an impact on the design of the missile as well as other elements of the system. As conceived, however, it would also have a limited capability against low flying aircraft. The analysis had highlighted these deficiencies and detailed the specifications for the companion antiaircraft system. That system, the analysis indicated, should have a high rate of fire, a low altitude capability, improved homing-on-jamming techniques, and extended altitudes and ranges.[157] This analysis was the forerunner of a later recommendation to delete the antiaircraft requirement from the Nike Zeus specifications. This recommendation was accepted later that year.

The second significant action occurred in late January when the Director of Guided Missiles, OCRD, forwarded to the Director of Guided Missiles, Army, recommendations regarding the question of attaining an early defense against ballistic missiles with systems other than Nike Zeus. Essentially, the memorandum recommended that further consideration for accelerated development of all systems other than Nike Zeus and Talos be dropped. It also recommended that Nike Zeus be funded as a first priority and that Talos be funded as a second priority but be limited to a procurement program of 25 detachments.[158] These recommendations were subsequently briefed to an Ad Hoc Anti-ICBM Study Group appointed by the OSD, Director of Guided Missiles and chaired by Dr. H. R. Skifter, Special Assistant to the Assistant Secretary of

[154] CRD, *Chronological History of Army Surface-to-Air Missiles Through 1957*, Nike ZEUS.
[155] Adams, *Ballistic Missile Defense*, p. 28; CRD, *Chronological History of Surface-to-Air Missiles Through 1957*, Nike ZEUS. On l2 February 1958 the Director of Guided Missiles had dissolved the anti-ICBM Coordinating Agency since the Army, by the 16 January 1959, Sec/Def memorandum, had been given development responsibility for the active portion of the ABM system. This may have been the basis of Quarles statement.
[156] On 22 Jan 1958, the National Security Council had assigned a national priority to the anti-ICBM effort equivalent to the priority assigned to the ICBM and IRBM effort.
[157] Memo for Record, OCRD, 9 January 1958.
[158] Memo, C of R&D FOR CoS, 27 March 1958, sub: Antimissile Missile.

Defense for Research and Engineering. The Study Group had been formed to consider means for attaining an early defense against ballistic missiles.

In spite of these recommendations it became necessary for the Army to reverse its position regarding Talos. In a memorandum dated 23 April 1958, the Director of Research and Development, Department of the Army informed the Director of Guided Missiles, OSD that the Army would no longer be able to support the Talos program beyond a minimum industrial effort and a limited evaluation at White Sands Proving Ground. The Army had been trying to develop a program for establishing approximately 25 operational units of the missile since assuming responsibility for development, procurement, and manning of land-based Talos on 26 November 1956 but had been unable to do so because of funding limitations.[159] Presently available funds were being expended at a rate which would require termination of the industrial effort on 1 May 1958.

Development work on Nike Zeus continued through 1959. Following Deputy Secretary Quarles statement that the Army was responsible for the development and operation of the Nike Zeus, the Army assigned responsibility for preliminary Nike Zeus site selection to the Army Air Defense Command (ARADCOM) in January. This was consistent with the responsibilities of that command and would better insure close coordination with the Commander-in-Chief Continental Air Defense Command since ARADCOM was the Army component command of CONAD. In July a new missile configuration was approved, simplifying and strengthening the missile airframe by removing the large wings from the sustainer section. This design increased the range of the missile as well as its maneuverability and greatly simplified handling, maintenance and launching. The first three Nike Zeus missiles were fired in August, October, and December.

While the Army was proceeding with the development of Zeus, other events were working that were to affect its deployment. The Eisenhower Administration was still striving for a balanced budget, stability, and reduced taxes. The goal was to limit the defense budget to $40 billion which meant that the introduction of any new major system as expensive as Zeus would either have to be accomplished at the expense of other forces or the defense budget ceiling would have to be raised, something the Administration was reluctant to do.

Under this arrangement the Army was competing with the other services for defense funds. The Air Force was engaged in developing the Ballistic Missile Early Warning System (BMEWS) and doing additional ballistic missile defense work under Project Defender[160] for ARPA. In its FY 1960 budget request the Army recommended $1.3 billion for the Zeus program. This program included $300 million for research and development and $700 million for tooling, production facilities and some Zeus facilities. This figure was eventually reduced by the Administration to $300 million before it was submitted to Congress.[161] This reduction constituted a decision by the Administration not to deploy Nike Zeus. The stated reason for this reduction was the same as that given the year before but undoubtedly was influenced by budgetary considerations. As 1960 was an election year and, although it was possible that ballistic missile defense along with

[159] When the Air Force was directed to transfer responsibility for the land-based Talos to the Army, it initially refused to transfer the supporting funds. Eventually, a part of the funds were transferred but never the full amount.
[160] Under Project Defender the Air Force examined unorthodox means of missile defense such as antimatter, antigravity, radiation weapons, "death ray guns," and other exotic means to supplant the ground-to-air antimissile missile. BMEWS and the MIDAS and SAMOS intelligence satellites were the only successful ones.
[161] Adams, *Ballistic Missile Defense*, p. 34.

the "missile gap" might be a political issue, the Administration felt that a balanced budget and, perhaps, reduced taxes would get more votes.

The Army continued to press for deployment and requested additional production funds to speed the program toward a 1962 operational date. General Taylor, Army Chief of Staff, in a statement before a Congressional Joint Preparedness Committee stated the Army's position this way: "My reservation in this area arises from the unopposed ICBM threat and my conviction that the importance of obtaining this unique antimissile weapon at the earliest possible date out-weighs the possible financial risks inherent in initiating selective production."[162]

In the end Congress approved the $300 million requested by the Administration and voted an additional $137 million to begin production of Zeus. The Administration, however, refused to allow the Army to spend the $137 million, feeling that the system was not ready for deployment and questioning whether a workable defense was feasible.[163]

The "premature" judgment was probably influenced by opposition the Army was getting from certain parts of ARPA, DoD, the Air Force, and the Navy. The Air force and the Navy agreed with the administration contending that additional funds for production would be premature, claiming that some of the new approaches being investigated for ballistic missile defense would make Zeus obsolete. During the FY 1960 budget hearings the Air Force position on ballistic missile defense was clarified. Richard Horner, the Air Force Assistant Secretary for R&D told the House Appropriations Committee that a careful analysis of the Wizard system had indicated that it would not be cost effective. The Air Force, he said, felt the same way about Zeus, arguing that it could easily be overwhelmed by attacking missiles. It was the opinion of the Air Force that money being spent on missile defense might better be spent on increased offensive capability.[164]

In presenting ARPA's program to the same committee, Roy W. Johnson said that any BMD system should be technically feasible, capable of reacting to all missile threats in all types of environments, economical, and operational at the earliest possible date. Since all of these terms are relative, and since maintenance of a modern military establishment is not inexpensive, it could be expected that he would relate these criteria to Zeus. This he did not do. Instead, he said that ARPA's advanced efforts were designed to "leapfrog" the weaknesses of Zeus which were the inability to discriminate the warhead from other objects and decoys and the lack of a satisfactory positive mechanism for destroying the reentry vehicles.[165]

The Army felt compelled to counter these attacks on Zeus. It argued that Zeus could provide adequate point defense to vital installations and prevent the United States retaliatory forces from being destroyed on the ground. The deployed system would increase the costs to the Soviets by making them invest more and more funds in additional missiles and sophisticated penaids while at the same time complicating their targeting problem. Whereas the assured damage from a specified number of missiles could be readily computed for undefended targets, computation of the number required to produce the same damage of a defended tar-

[162] U.S. Senate, Joint Hearings Before the Preparedness Investigating Sub-committee of the Committee on Armed Services and the Committee on Aeronautical and Space Sciences, *Missile and Space Activities*, 86th Cong, 1st Sess, 1959, p. 23, as quoted in Adams, *Ballistic Missile Defense*, p. 32.
[163] Adams, *Ballistic Missile Defense*, p. 34.
[164] U.S. House of Representatives, Committee on Appropriations, *Department of Defense Appropriations for Fiscal Year 1960*, Part 6, 86th Cong, 1st Sess, 1959, pp. 164–174.
[165] Ibid., pp. 108–110.

get was not as straightforward and indeed was fraught with doubt since the full capability of the defensive system was unknown. This might cause the Soviets to overtarget some areas and undertarget others or even raise sufficient doubt in the minds of Soviets to question whether any attack would succeed.

Zeus as it was presently configured, the Army contended, had the capability to counter Soviet decoys albeit in limited numbers. A Zeus Acquisition Radar (ZAR) was being added to the system to replace the Forward Acquisition Radar (FAR) and Local Acquisition Radar (LAR). The ZAR would have increased power and an effective acquisition range of 1,000 nautical miles. Also planned was a Decoy Discrimination Radar (DDR). Besides these improvements Zeus had additional growth potential.

It was true, the Army agreed, that Zeus was less than perfect. It could be saturated and it was possible that the blast from the Zeus warhead at low altitudes could destroy the target, or parts of the target being defended. However, improvements in these areas could also be made in time. In the meantime, it was necessary to consider the entire target array. If the Soviets elected to saturate one point defense, the number of missiles available to attack other points would be fewer. As far as low altitude intercepts were concerned, the damage caused by the Zeus warhead would have to be compared to that which would be caused by the much larger warhead on the RV.

By the end of 1959 the deployment of Zeus was no nearer than it had ever been. The reasons given, in official testimony, were the technical uncertainties of the program; yet, the economic and political factors could not be denied. Zeus was expensive. If it could have been deployed at a third of the estimated cost, Army's chances of success would have been much greater. As it turned out, the question evolved: could more deterrence be bought by a dollar spent to destroy Soviets than one spent to defend Americans? As 1960 began, the controversy over the missile defense program focused on whether to produce and deploy the system before the results of the research and development tests were known.

During 1960 research and development were continued on Nike Zeus. It was a campaign year and the candidate of the Democratic Party made the "missile gap" a major campaign issue. In June he outlined his approach to foreign policy in a 12-point agenda in a speech to the United States Senate.[166] The first point of his 12-point agenda concerned the strengthening of our nuclear retaliatory power by increased production, hardening bases, and improving continental defenses.[167]

During the year the Army-appointed, Nike Zeus Ad Hoc Advisory Committee, chaired by Mr. Richard S. Morse, considered the problem of early production and deployment of the Nike Zeus system. On 21 November the committee submitted its recommendations to the Chief of Staff. In essence the committee recommended that a production rate of four batteries of Nike Zeus equipment be initiated immediately and that the units produced be deployed in consonance with the antimissile defense plans of the North American Defense Command (NORAD). As far as present Nike Zeus research and development was concerned, the committee recommended that the program be continued with the primary objectives of determining the system effectiveness against various types of threats and for improving its effectiveness consistent with the state-of-the-art.[168]

In December the Secretary of the Army recommended an interim production and development program to the Secretary of Defense. This program called for the production of four batteries, two defense centers,

[166] John F. Kennedy, *The Strategy of Peace*, (New York: Popular Library Edition, 1961) p. v.
[167] Ibid., p. ix.
[168] Chronology of the Development of Ballistic Missile Defense (1955 to Present), Safeguard System Command, Huntsville, Alabama.

and 200 missiles a year. The Secretary recommended that the production program be initiated immediately and that $73.3 million in FY 1961 funds be provided to permit letting the production contract by 31 March 1961. Deployment of units would be as recommended by CINCNORAD. At the time this request was made the fiscal 1961 budget year was half over so the Secretary of the Army was really asking for additional or supplemental funds.[169]

Earlier in the year both the Secretary of Defense and the Director of DDR&E in appearing before the House Appropriations Committee had indicated that a careful and painstaking review had been made of the Nike Zeus program and that it was decided to press forward as rapidly as possible with the research, development, test, and evaluation of the system but not to place it into production. As Dr. York, Director of DDR&E stated, "It is expected that these tests will provide the basis for a final decision. . . ."[170] The request for additional funds by the Secretary of the Army in December for a March contract was also denied.

In August of 1960 the Army had indicated that with the new improvements (increased radar range, greater power, and increased ability to discriminate) the Zeus program was ahead of schedule.

In October a report in *The New York Times* indicated that the Soviets were deploying a ballistic missile defense system similar to Zeus around Leningrad.[171]

In October ARPA announced that a series of contracts had been let with TRW, Convair, Boeing and others to investigate the feasibility of a satellite-born anti-ICBM defense system. The concept was to have orbiting armed satellites detect ICBM launches and destroy the missile during its boost phase before booster burn-out. Several orbits for the satellites were considered. TRW recommended numerous satellites with random orbits, Convair proposed a polar orbit system, but they all had basically the same drawbacks, long development times (approximately 15 years), tremendous costs in building and maintaining large numbers of satellites in orbit, and international political problems associated with having armed satellites orbiting over foreign countries.

The Army request for additional funds from the FY 1961 budget in December of 1960 may have been a trial balloon. After the November elections, the Army began a major campaign to sell the Zeus program and prepare for the upcoming legislative battles. Large ads began appearing in popular magazines throughout the country promoting Zeus. Special emphasis was placed on the prime and subcontractors showing where they were located and the distribution of the funds already expended among them.[172] In all some 37 states had firms involved in the program with California and New Jersey being the front runners. These ads were run by the contractors, prime and sub, and, in general, depicted the part that each was playing in the program.

That the ads had effect was attested by Jerome B. Wiesner, Kennedy's science advisor: "In 1961, when President Kennedy first began to survey his military problems, his attention was drawn forcefully to an anti-missile system, the Nike Zeus. He began to get a flood of mail from friends, from Congress, from people in industry. The press pointedly questioned him about his plans to deploy the Nike Zeus system. . . ."[173]

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[169] Ibid.
[170] U.S. Congress, House, Hearing Before the Subcommittee of the Committee on Appropriations, *Department of Defense Appropriations for 1961*, Part 1, 86th Cong, 2nd Sess, 1960, pp. 30–31, Part 6, p. 14.
[171] Jack Raymond, "U.S. Says Russians Plan Antimissile," *The New York Times*, October 15, 1960, p. 3.
[172] Adams, *Ballistic Missile Defense*, p. 39 and Jerome B. Wiesner, "Against," a Center Occasional Paper 2 (February 1969): 177 as quoted in Clark A. Murdock, *Defense Policy Formation*, (Albany State University of New York Press, 1974) p. 118.
[173] Ibid., p. 118.

All was not in favor of the Zeus program, however. Zeus had its opponents both inside and outside the Administration. By 1960 it was becoming increasingly clear to some individuals, particularly in the scientific community, that technical and economic resources were being expended by both the United States and the Soviet Union on weapons but that no additional security was being achieved. Technology was not capable of developing a defense against the ICBM. The most important task was to slow down the arms race, allow both sides to acquire equalized invulnerable deterrents and then eliminate the danger of nuclear war by deemphasizing advanced technology which might upset the stable situation.[174] A ballistic missile defense system came under the heading of "advanced technology." This was made quite clear by Weisner, soon to become President Kennedy's science advisor, in December of 1960, when he delivered a paper to the Sixth Pugwash Conference in Moscow: "It is important to note that a missile deterrent system would be unbalanced by the development of a highly effective antimissile defense system and if it appears possible to develop one, the agreements should explicitly prohibit the development and deployment of such a system."[175]

Inauguration of President Kennedy in January 1961 was followed by an extensive evaluation of ongoing United States defense policies. Zeus was among the items evaluated. It appeared that the Kennedy Administration was interested in answering two questions about Zeus: (1) was it technologically feasible? and (2) would it be cost effective?

The Army had prepared well for the FY 62 budget hearings. The Nike Zeus Ad Hoc Advisory Committee, chaired by Dr. Richard S. Morse, Assistant Secretary of the Army for Research and Development, in 1960 had members from both the Department of Defense and the White House. It had recommended immediate initiation of production. The Joint Chiefs of Staff agreed that Nike Zeus should be committed to immediate production if the United States was to avoid losing the ballistic missile defense race—Soviet efforts had been going on for along time. Nevertheless, the Eisenhower Administration had not included production funds in the FY 1962 budget.

It was the Army's hope that this decision could be overturned. The BMD system was necessary, the Army argued, for enforcing a disarmament agreement—it would provide security against cheating—and security against inadvertent accidental launches. In January 1961 the Army developed and forwarded the "Nike Zeus Defense Production Plan" to the Secretary of Defense for approval. The plan provided for the production and deployment, over a period of eight years, of 29 defense centers, 70 batteries and supporting equipment, and 3,610 missiles.[176]

The Army's hopes were dashed in April when the new Administration decided to go along with the old. The opposition, both within the new Administration and without, was too great. The Air Force in conjunction with the Aerospace Corporation (using ARPA furnished funds) were actively pursuing the boost intercept (BAMBI) program and several other concepts for intercepting ICBMs using satellites while at the same time advocating the superiority of their concepts over Zeus. Resistance was also building in DDR&E which was against any production decision before questions regarding the systems technical feasibility were answered.

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[174] From the Foreword by Jerome B. Wiesner in the Special Arms Control Issue of *Daedalus*, 4 [1960] 678 as quoted in Adams, *Ballistic Missile Defense*.

[175] Jerome Wiesner, *Comprehensive Arms Limitations Systems*, text of paper prepared for and delivered at the Sixth Pugwash Conference, Moscow, November 29, 1960; p. 247 of the *Conference Proceedings*.

[176] Safeguard Command, *Ballistic Missile Defense Chronology*.

On 4 April 1961, the new Secretary of Defense, Robert S. McNamara appeared before the Senate Armed Services Committee to announce the decision. In that appearance and others before Congress, he reviewed the Zeus progress and outlined the advantages that would accrue to the nation by successful development of Zeus. These included many of the arguments previously advanced by the Army—it would "force an aggressor to expend additional resources to increase his ICBM force. It would also make accurate estimates of our defense capabilities more difficult . . . and complicate the achievement of a successful attack. Furthermore, the protection that it would provide, even if for only a portion of the population, *would* be better than none at all."[177] He also reviewed the uncertainties to include the technical feasibility of developing the system, the vulnerability of the system to ballistic missile attack, system degradation by sophisticated ICBMs screened with decoys, and saturation of the defense. He also stated that the system was expensive in relation to the defense it could provide.[178] As a result, he concluded, he and the President were recommending: ". . . that we not undertake Zeus production at this time, but that we proceed do develop Zeus as rapidly as money will permit it to be developed and we are recommending, as you have seen, $270 million for that purpose in fiscal year 1962."[179]

Several members of Congress were active in promoting Nike Zeus in 1961. Senator Strom Thurmond (R-S.C.) was the leading spokesman in the Senate while Representative Daniel Flood (D-Va.) was the leader in the House. Their efforts along with the Secretary of the Army, the Chairman of the Joint Chiefs of Staff and the Chief of Staff of the Army were of no avail in getting the release of production money. Neither were arguments that the Soviets were producing a ballistic missile defense system effective. When asked whether evidence of a Soviet deployment would affect his decision, Mr. McNamara replied, "I do not believe it would affect my decision in anyway because I have assumed that we must take account of the possibility that they will have such a system."[180] In arriving at the decision not to deploy Zeus, Mr. McNamara said that he had discussed the matter with the JCS, the Service Secretaries, and the scientific community. The latter he pointed out were sharply divided. He had also spent two or three hours discussing the matter with the five senior Bell Laboratory executives working on the problem and had gone into the Zeus system in some detail.[181]

In the meantime development of Zeus continued. In June the prime contract was extended to cover work on the Zeus Multifunctional Array Radar (ZMAR). This was an advanced radar study for determining the feasibility of having an electronically scanned radar perform the multiple functions of acquisition, discrimination, and tracking in an ICBM defense system. The proposed system would feature a phased array arrangement with no moving parts and no necessity for a rotating antenna. Four faces at 90 degree intervals would be required to cover 360 degrees in azimuth. A feasibility model was to be installed at WSMR at a later date.

In December Zeus made its first successful intercept of a live missile.

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[177] U.S. House of Representatives, Hearings before a Subcommittee of the Committee on Appropriations, *Department of Defense Appropriations for 1962*, Part 3, 87th Cong, 1st Sess, 1961, pp. l6–17.
[178] Ibid.
[179] U.S. Senate, Hearings Before the Committee on Armed Services, *Military Procurement Authorization, Fiscal Year 1962*, 87th Cong, 1st Sess, 1961, p. 14.
[180] Op. cit., p. 112.
[181] Ibid., Part 3, p. 31.

The most startling thing of the year occurred on 1 September when the Soviets broke the unofficial nuclear test moratorium by testing a nuclear weapon in the atmosphere. These tests continued through October. There was conflicting opinion over the purpose of these tests, some contending that part of the test series was for the express purpose of developing a kill mechanism for a missile defense system. Others believed that the Soviets were developing a warhead for a smaller missile which indicated that the Soviets were building an invulnerable deterrent similar to the United States Minuteman which when complete, and in conjunction with the United States invulnerable deterrent, would lead to stability.[182]

Whatever the purpose[183] the Administration was concerned. President Kennedy announced resumption of atmospheric tests and on 22 September the Secretary of Defense approved the first two phases of a three phase Nike Zeus deployment.[184] Twelve metropolitan areas were included: Washington/Baltimore, New York, Detroit, Ottawa/Montreal, Boston, San Francisco, Los Angeles, Pittsburgh, St. Louis, and Toronto/ Buffalo. (This decision was to be reversed in presenting the FY 1963 budget to Congress.) In December, however, unofficial reports were being circulated in the press that President Kennedy and Secretary of Defense McNamara had asked for production funds for Zeus in the new military budget. Army hopes were soaring.

With an approved deployment plan the Army requested $401 million for Zeus in fiscal year 1963. The Department of Defense reduced this to $235 million.[185] In his House budget testimony in 1962 McNamara reiterated his previous position. There were significant and serious questions as to the practicality of Zeus. Therefore, ". . . we are not recommending funds for its procurement and deployment at this time, but we are requesting the maximum amount of funds which can be effectively used in 1963 in the research and development program to continue development and testing on a top priority basis."[186]

From a system standpoint, 1962 was a year of tests for Nike Zeus. In late January the Zeus Acquisition Radar on Kwajalein received its first signal returns from an ICBM. In February this same ZAR successfully acquired an Atlas missile fired from Vandenberg Air Force Base and transferred it to the TTR. In April this ZAR acquired and tracked a Soviet satellite and transferred the target to the TTR. As a result of this latter success, the Secretary of Defense placed a requirement on the Zeus program to demonstrate by May 1963 the capability to intercept a satellite at Kwajalein. The project was assigned the code name MUDFLAP.

On 19 June Nike Zeus successfully intercepted an Atlas nose cone over Kwajalein. Subsequently a series of intercepts was attempted in which 10 out of 14 missiles achieved successful intercept. Out of the series at least three shots were attempts at salvo firings with two missiles per salvo. In all three cases the first missile successfully intercepted the target while the second aborted for one reason or another. On 22 December Zeus successfully intercepted an Atlas RV carrying two decoys.

In all, the tests of 1962 could be considered highly successful. The Army in the meantime continued to achieve a greater capability with the system. In March a feasibility study was completed on a fast reaction missile which because of its fast reaction time and speed would maximize the time available to a defense

[182] Adams, *Ballistic Missile Defense*, p. 50.
[183] In later years it was generally accepted that at least one of the purposes of these tests was the development and test of an antimissile missile warhead. In an article in the *New York Times*, 5 February 1967, Hanson Baldwin reported that during one of the Soviet atmospheric nuclear tests, two Soviet ICBMs were simultaneously destroyed.
[184] ARADCOM, *Ballistic Missile Defense Chronology*.
[185] U.S. House of Representatives, Hearings Before a Subcommittee of the Committee on Appropriations, *Department of Defense Appropriations for FY 1963*, 87th Cong, 2nd Sess, 1962, Part 2, p. 348.
[186] Ibid., p. 46.

for atmospheric discrimination between warheads and decoys. This system would later be designated the Sprint and would become a subsystem of Nike X. Later in the year the Martin Company was awarded a contract for the missile development.

Although the tests of 1962 had been very successful, and the Army would continue to push for the early deployment of Nike Zeus, by mid-1962 it had become quite apparent that Nike Zeus was dead. In his testimony before the Senate Armed Services Committee that year McNamara had sounded the death note when he said, "A 100 percent effective system of military defense against ICBMs and submarine launched missiles is technically impossible. At least during the period 1963 through 1967 we will rely for our survival on a combination of military and civil defense measures."[187] Later he was to tell the Congress that he would never recommend an anti-ICBM program unless a fallout program accompanied it.[188] He was sure that the public and Congress would not approve the fallout shelter program—after all, several previous attempts had died in Congress.

D. Nike-X Is Born

The successful intercepts by Nike Zeus did little to convert the skeptical and unconvinced opponents of the system, particularly those in the Administration. Too much was still unknown about reentry phenomena and the environment in which a ballistic missile intercept would occur. The problems of saturation and decoy discrimination were still very real. In the opinions of these people the Zeus system could not cope with the advanced ICBM threats expected in the late 1960's. By mid-1962 these officials had concluded that four major improvements were needed in the system: (1) a new radar capable of detecting, acquiring, evaluating, and tracking a large number of targets simultaneously; (2) a capability to intercept targets at greater altitudes; (3) a new fast-reaction, high-acceleration missile, and (4) use the discrimination radar as a target track radar.[189]

Several alternatives were examined including one to continue development of Nike Zeus with a separate development of an advanced radar. A second alternative considered was development of the four improvements listed and the deployment of a system which would initially incorporate part of these improvements. The third alternative was to turn to the development of a more advanced system with more advanced missiles and radars and to defer a deployment decision.

The Army appears to have favored the second approach. In 1963 it recommended an initial deployment of Zeus and the phase-in of new equipment (i.e., Sprint) and phased array radars, as they became available. Eventually the new equipment would dominate the system. The advantages would be an early deployment and the provision of a defense to meet the current threat with the ability to grow and stay abreast as the threat became more sophisticated. Even at a cost of $2.8 billion, Army chief of Staff Earle Wheeler told the Senate Armed Services Committee, it is worth something to protect a large number of people and a large segment of the economy.[190] By so doing we would also have a technological triumph over the Soviets—by being the first to deploy an operational antimissile missile system.

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[187] U.S. Senate, Hearings Before the Committee on Armed Services, *Military Procurement Authorization FY 1963*, 87th Cong, 2nd Sess, 1962, p. 206.
[188] Benson D. Adams, "McNamara's ABM Policy, 1961–7," *Orbis* 12 (Spring 1968), p. 206.
[189] Adams, *Ballistic Missile Defense*, p. 55.
[190] U.S. Senate, Hearings Before the Committee on Armed Services, *Military Procurement Authorizations Fiscal Year 1964*, 88th Cong, 1st Sess, 1963, p. 131.

The Army was strongly supported by Senator Strom Thurmond who, on 11 April 1963 requested and received permission to hold a closed session of the Senate, the first since World War II. His purpose was to try and retain $196 million in the military procurement bill to begin production of Nike Zeus. This bill had been favorably reported out of the Armed Services Committee. The closed session was necessary to permit discussion of classified material which Senator Thurmond wished to introduce in his argument against an amendment to eliminate the Zeus funds for production. His attempt, as did the Army's, failed. The Senate vote 58 to 16 passed the amendment and eliminated the funds.

The decision to not deploy Nike Zeus had in fact been made by DOD in late 1962. In a memorandum to the Secretary of the Army, dated 5 January 1963, the Secretary of Defense stated emphatically that there would be no deployment, current or future, of the Nike Zeus system. Further, it stated that no decision had been made as to whether the Nike-X system would eventually be deployed. The memorandum then went on to direct the Army to reorient the Nike Zeus effort toward a new system approach, to be called Nike-X. The Nike-X system consisted of the following components: the Multifunctional Array Radar (MAR), the Missile Site Radar (MSR), the Sprint missile, the Zeus missile, and the necessary data processing equipment. The Nike Zeus testing program at Kwajalein and Ascension Islands, and at WSMR, were to be continued but reoriented to support the Nike-X system. Thus with one breath one system was buried and another born.

It is interesting to note that in all the debates that went on there was little mention of the threat that Nike Zeus would have faced had it been deployed as originally planned. Nor was there much discussion of the ability of Zeus to handle that threat. Instead, technological feasibility was always directed at a hypothetical threat some 10 to 15 years in the future. Perhaps this was a natural reaction having been so thoroughly deceived in estimating the Soviets ability to produce the atomic bomb, the hydrogen bomb and the ICBMs. In the words of one analyst that participated in the review of the Army's proposal to deploy the combined system in late 1962 and early 1963, "The Army didn't handle the proposal very well . . . But the timing was good. They sent it in right after a series of successful Nike Zeus shootings. Also, the Soviets did not have much of a missile force at this time—the missiles they did have were big and crude, cruder than those that Nike Zeus had intercepted."[191]

There was considerable talk about the destabilizing influence of a United States ballistic missile system but little about the destabilizing influence of a Soviet ballistic missile defense system. Mr. McNamara had indicated that news of a Soviet deployment would in no way affect his decision not to deploy Zeus. He did admit that steps were under way to improve the United States ICBM force, however, and that these steps were directly related to the Soviet ABM deployment. Still, there was a strong argument by both the Army and members of Congress to be the first to deploy. On the surface these arguments could be related to personal pride, to be number one, to demonstrate our scientific and technological superiority. But they in fact had a much deeper meaning that was designed to enhance our deterrent posture. The proponents of early deployment could not see how any defensive system could be considered to threaten the other side. To them the capability of causing mutual destruction was not an acceptable basis of deterrence. Since the United States, on record, was committed to a no first strike policy, we would have to accept the first strike and then retaliate. A defensive system would enhance our retaliatory capability.

[191] Quoted by Clark A Murdock, *Defense Policy Formation*, p. 121.

As the deployment debates continued in 1963 the Army reoriented the Nike Zeus program to Nike-X as directed by the 5 January memorandum. In March the Martin Company began a full development of the Sprint missile. That same month construction was begun on the MAR I radar at WSMR. In December design and development of the Missile Site Radar (MSR) was initiated. This radar, as the MAR, was to be a phased array radar with the capability to track several missiles and targets simultaneously.

Several live firing tests were also conducted, the most significant of which were conducted on 30 March and 23 May. In the 30 March test a Nike Zeus missile was fired against an ICBM target launched from Vandenberg Air Force Base. Intercept occurred at an altitude of 261,000 feet, the highest ever achieved until that date. This was the first successful intercept in which reaction controlled steering was employed. There were no equipment malfunctions during the test.

On 23 May 1963 a satellite intercept was successfully accomplished at Kwajalein by a Nike Zeus launched against an Agena D satellite. This successfully demonstrated the Mudflap capability as directed by the Secretary of Defense in April 1962.

Perhaps one of the most significant events of 1963 was the signing of the Partial Nuclear Test Ban Treaty in August. This was the culmination of 17 years effort in arms control beginning in 1946 with the Baruch Plan. The treaty banned nuclear testing in the atmosphere, underwater and in space. Two Senate committees held hearings on the treaty; the Foreign Relations Committee and the Preparedness Investigating Subcommittee of the Senate Armed Services Committee. Many of the same witnesses appeared before both committees. Whereas the Preparedness Committee called witnesses only from the military, the Atomic Energy Commission, and the Arms Control and Disarmament Agency, the Foreign Relations Committee called high-ranking government civilian and military personnel, scientists, private citizens, union officials, peace and disarmament advocates, and political scientists. The Preparedness Committee concluded that the disadvantages to the United States, military and technical, were not outweighed or counterbalanced by the claimed military advantages.[192] The Foreign Relations Committee concluded that "the treaty represents a net advantage to the United States; that the risks it contains are acceptable. . . ."[193]

The most significant aspect of the treaty with respect to ballistic missile defense was that the system could never be fully tested short of an actual war. The consensus of the witnesses was, however, that the United States had the capability to develop the necessary warheads and design around the remaining uncertainties without further testing.

E. Assured Destruction and Damage Limitation

1. McNamara's Inconsistency

Failure to support the Army's composite deployment proposal in 1963 meant the effective death of Nike Zeus. As one analyst with the Systems Analysis Office said, "It was ready to deploy and it wasn't deployed."[194] By this time it had become apparent to many that Secretary McNamara was really not interested in deploying a ballistic missile defense system. The main reasons advanced were technical yet, according to one analyst in the Systems Analysis Office:

[192] U.S. Senate, Interim Report by Preparedness Investigating Subcommittee of the Committee on Armed Services, *Military Implications of the Proposed Limited Nuclear Test Ban Treaty*, 88th Cong, lst Sess, 1963, p. 11.
[193] U.S. Senate, Report of the Committee on Foreign Relations, *The Nuclear Test Ban Treaty*, 88th Cong, 1st Sess, 1963, p. 9.
[194] Murdock, *Defense Policy Formation*, p. 124.

> McNamara didn't feel confident of himself on technical matters. He relied heavily on Brown [Dr. Harold Brown, DDR&E] and Perrini [Brown's assistant] and did not draw on any other sources for technical information. Brown was making the technical argument that Zeus would be easily overcome by simple penetration aids and it wouldn't make any sense to go ahead on a composite system because the Soviets could easily overcome it. But there was no evidence that the Soviets would actually buy offsets.[195]

Perhaps Mr. McNamara was only playing the part of a "good soldier" and implementing the guidance of his Commander-in-Chief. At any rate there is no doubt of the influence of Dr. Jerome B. Wiesner, Science Advisor to the President, in this area. His opinion of the effect of an ABM deployment on international stability and arms control has already been mentioned. The quality of his input into the policy debate was not always popular and was bitterly resented by at least one analyst:

> Only Wiesner could write memos to JFK without staffing them, without exposing them to anyone else. He sent a couple of memos to JFK that were wildly wrong on technical and arms-race questions. These arguments have set the tone of debate ever since: the same arguments persist now—cost-exchange ratios, arms-race implications, inherent advantage of defense and the idea that technology has reached a plateau.[196]

Whatever his motive, by 1963 Mr. McNamara was hard pressed for reasons not to deploy Zeus. In 1962 the Systems Analysis Office conducted a study of the trade-offs between active and passive defense which had concluded that from a cost-effective point of view, initial spending for missile defense should be solely for the construction of blast and fallout shelters—fallout shelters were a necessary complement to a terminal defense system. In the words of one of the authors of the study:

> . . . when he [McNamara] saw the study on the trade off with civil defense, he saw a way to put off the military. My feeling was that he never did want to deploy ABM but this had little to do with the study. It was for many other reasons: for example the arms race. . . . The analysis did not affect decisions, but supported his position and provided ammunition. Since he knew that Congress did not want to build fallout shelters and he did not want to either, this provided a good way to put off ABM. . . .[197]

McNamara used this argument before Congress in 1963 when he said that he would "never recommend an anti-ICBM program unless a fallout shelter program does accompany it." He reiterated this statement before the House Appropriations Subcommittee in 1966 and continued by saying: "The Congress, and in a very real sense I think the people, have turned down the program on a number of occasions. We have recommended it in at least three of the past five years. In every year, it was turned down."[198]

Although he was to continue to use the civil defense argument, it became apparent in early 1964 that he was merely using it as an excuse to prevent a ballistic missile deployment. When the 1963 shelter program was under consideration by the Senate Armed Services Committee in February 1964 an attempt was made to obtain assurances from McNamara as to whether he would procure and deploy an ABM system if the civil-defense bill was passed. The assurance never came and the shelter program died in committee.

The facts are that McNamara was willing to use analysis and data that supported his position, whether the purpose of the analysis were related to that position or not. Conversely, he was unwilling to acknowledge analysis that was contrary to that position. He was also willing to use technological arguments to support his position not to deploy the ABM while at the same time, he was willing to state that the technological

[195] Quoted in Murdock, *Defense Policy Formation*, p. 120.
[196] As quoted in Murdock, *Defense Policy Formation*, p. 121.
[197] Ibid., p. 122.
[198] Ibid.

problems were solved if it suited another purpose. This inconsistency was noted by Benson D. Adams in McNamara's treatment of the ABM issue in 1963:

> During the previous six months, before the House Appropriations Committee and the Senate Armed Services Committee, McNamara had stated that a great deal of knowledge was still needed about the effect of nuclear detonations in the atmosphere; that indeed this knowledge could only be obtained by high attitude testing. But, testifying on behalf of the Test Ban Treaty, McNamara said that we had gained sufficient knowledge and data from prior atmospheric nuclear tests to allow us to design an ABM.[199]

2. Back to the Drawing Board

It appeared that the decision not to deploy Zeus in 1963 would give Mr. McNamara at least four to six years before the deployment stage would be reached again. This respite, however, was relatively short-lived. By the end of 1964 interpretations of the United States 1962–1963 atmospheric nuclear test series began to raise the possibility of high yield explosions in space releasing a tremendous surge of thermal X-rays that would flash over thousands of miles in the near-vacuum. The lethal radius of these X-rays increased by a factor of 100 according to one scientist and gave a new lift to the Nike Zeus concept. It appeared that the discarded Nike Zeus system was better than anyone had thought. These interpretations were widely accepted by mid-1965 and McNamara's breathing spell which he had envisioned lasting until at least 1967, had suddenly disappeared.

The Army in 1964 requested no funds for deployment in the FY 1965 budget. For the first time there was no disagreement between the Army and the Secretary of Defense. As General William Dick, Chief of Army Research and Development said in testifying before Congress, there could be no real production decision made until at least 1966. This decision would have to wait on the MAR test results, since the MAR was the most critical component of the proposed Nike-X system, and these results would not be available until late 1964. Barring any unforeseen developments, a deployment decision was at least one or two years away.[200] He of course was not aware of the hot X-ray kill mechanism at that time. Mr. McNamara indicated that several problems still had to be solved before sufficient information would be available to make a judgment about the systems feasibility. These problems included technical, strategic and economic considerations. If these and the discriminations problem were surmounted, the system could be deployed starting in late 1964.[201] "The continued testing of Nike Zeus and preliminary studies of the Nike-X system's characteristics and effectiveness," Mr. McNamara told the House Armed Services Committee, "provide grounds for believing that the technical problems of at least a partial defense against a ballistic missile attack may be solved within the next several years."[202]

The tests of which Mr. McNamara spoke included those being conducted on the MAR I at WSMR and those being conducted using Zeus equipment on Kwajalein. Power was turned on at the MAR I radar on 15 June. Thereafter a series of tests were initiated to demonstrate its multifunction capability. By the end of the year the radar had tracked a variety of targets to include a Pershing missile. Successfully demonstrated were the radar's automatic search, verification track, and precision track features. In the meantime, the Zeus

[199] Adams, "McNamara's ABM Policy," p. 206.
[200] U.S. House, Committee on Armed Services, Hearings on Military Posture and H. R. 9637, No. 36, 88th Cong, 2nd Sess, 1964, p. 7698.
[201] Ibid., p. 7016.
[202] Ibid.

radars on Kwajalein participated in the advanced ballistic reentry system, low observable, reentry vehicle test, a part of the Air Force penetration aids program. On 18 June the discrimination radar accepted ZAR designation, identified the reentry vehicle and successfully transferred the target to the TTRs. Good radar and optical data were obtained.[203]

The preliminary studies, of which McNamara spoke, presumably included the Threat Analysis Study ordered by the Department of Defense in July 1963. The object of the study was to provide the broadest possible base upon which to make a decision to produce and deploy the Nike-X system. The study was headed by the then Major General Austin W. Betts and was completed in October 1964. It covered every conceivable aspect of the ballistic missile defense problem and was contained in 23 volumes when completed. It addressed the strategic implications of a ballistic missile defense deployment, the Soviet ICBM threat, and Soviet BMD progress. It also considered whether Nike-X would be destabilizing, if deployed. Also considered was the value of a ballistic missile defense for arms control and as a hedge against the Nth-country threat. In an arms limitation agreement, the report concluded that Nike-X could provide protection against cheating and provide a defensive nuclear umbrella while the number of ICBMs was being reduced. The report considered NATO and even suggested deploying a ballistic missile defense of Western Europe.

In general, the study was as comprehensive as possible and presented a strong argument for a ballistic missile deployment. It was presented to the Secretary of Defense in December but had little impact on a decision to deploy Nike-X. In 1963 the Army had been told to plan for an initial operational capability in 1969. After the briefing, it was later learned from a document signed by Secretary McNamara that the deployment decision was to be postponed for another year and the Initial Operating Capability date would be extended to October 1970. The FY 1966 RDT&E program was recommended at $390 million which included $20 million for the follow-on reentry measurement program and $10 million for production planning/engineering.

The Nike-X deployment that was proposed to McNamara in the fall of 1964 was designed to defend urban-industrial complexes against a potential Soviet attack. The Systems Analysis Office, however, proposed to McNamara a small defense concept—one being able to defend against several mixes of moderate attacks with various combinations of civil defense, air defense, and ballistic missile defense. Whether this was an original idea or one derived from the threat Analysis Study is not known; but there was a strong similarity. In addition to countering a prospective Chinese threat, it was suggested, a "light" or "thin" defense could be classified as an arms-control move because it would ensure against premature offensive responses to an accidental firing or an attempt by a third power to "trigger" wars between the super powers. As reported by Clark A. Murdock, the Systems Analysis proposal upset McNamara. The day after the report was submitted, the Chinese exploded their first nuclear weapon. Whereas he had hoped to avoid making a deployment decision for at least two years, "here was his own Systems Analysis Office forcing him to look at it now."[204] Nevertheless, McNamara discarded the idea at that time. The small defense idea achieved greater prominence in the immediate future and provided the basis for the Sentinel deployment decision in 1967. The focus on small attacks reduced some of the objections to a deployment such as saturation which required a large attack and the arms limitation objection. It was hypothesized that a small deployment would not be destabilizing because the Soviets would not need to respond to it since it represented no threat to them.

[203] *Ballistic Missile Defense Chronology (1957 to Present)*, Safeguard System Command.
[204] Murdock, *Defense Policy Formation*, p. 127.

In his Posture Statement of 1965, McNamara presented for the first time his strategic concepts of assured destruction and damage limitation which were to provide the framework for future decisions on ballistic missile defense:

> The strategic objectives of our general nuclear war forces are: to deter a deliberate nuclear attack upon the United States and its allies by maintaining a clear and convincing capability to inflict unacceptable damage on an attacker, even were that attacker to strike first; in the event such a war should nevertheless occur, to limit damage to our populations and industrial capabilities.
>
> The first of these capabilities (required to deter potential aggressors) we call "Assured Destruction," i.e., the capability to destroy the aggressor as a viable society, even after a well-planned and executed surprise attack on our forces. The second capability we call "Damage Limitation," i.e., the capability to reduce the weight of the enemy attack by both offensive and defensive measures and to provide a degree of protection for the population against the effects of nuclear detonations.[205]

In light of this strategy any future weapon system would have to be evaluated in terms of both its assured-destruction and damage-limiting capability.

Discovery and acceptance of the thermal X-ray phenomenon in late 1964 and early 1965 made considerable impact on the Nike-X system configuration. With the Sprint missile and an improved Zeus missile, both a terminal and area defense could be provided. To provide this capability a long-range acquisition radar would be required. This would necessitate some modification in the MAR capabilities and would also require some augmentation of the MSR. A meeting with Dr. Harold Brown, DDR&E, on 23 April 1965 resulted in the necessary redirection. As a result of that meeting, the Army was directed to:

(1) Install a tactical MAR (TACMAR), the modified MAR, on Kwajalein.
(2) Proceed with the development of an augmented MSR.
(3) Conduct cost and schedule studies on installing the originally planned MSR and then the augmented MSR, or only the augmented MSR on Kwajalein.s
(4) Proceed with the development of the new long-range interceptor missile.
(5) Continue design studies of a Very High frequency radar—to provide early acquisition of the targets and permit utilization of the maximum range and altitude capability of the new long-range missile. The radar would eventually become known as the Perimeter Acquisition Radar (PAR).

While reorienting the Nike-X program in 1965, the Army continued with component development and the Nike Zeus test program. This latter program, along with the ARPA advanced research in ballistic missile defense, had provided much of the technology for the new Nike-X system. As Mr. McNamara had told the Democratic Platform Committee in August 1964: "The new Nike-X, which will give us the option to deploy—if the national security requires it—is the most advanced antiballistic missile yet conceived by any nation."[206]

Several "firsts" were also achieved in the program during 1965. In January two Nike Zeus missiles were launched from Kwajalein in salvo against a simulated submarine-launched ballistic missile. The test was the first completely successful salvo firing, with miss-distances of both missiles well within the lethal blast radius. In November the first guided Sprint launching was successful at WSMR.

In October the Army completed the DEPEX II study and presented the results to the Secretary of Defense. This was the first of several annual studies directed by the Secretary of Defense to address many of the complex problems associated with a ballistic missile defense deployment. The study considered the

[205] Robert S. McNamara, "Excerpts from 1965 Posture Statement, Smith and Johns, *American Defense Policy*, p. 98, as quoted in Murdock, *Defense Policy Formation*, p. 128.
[206] *The New York Times*, August 18, 1964, p. 18.

threats that the United States ABM would face—both Soviet and Nth country, the deployment configurations required to meet these threats to include the number of Sprint and Zeus missiles, and the number of shelters necessary to complement each deployment. An attempt was also made to assess the impact of an American ABM deployment upon Soviet strategy. In all several deployments were considered and each evaluated from a standpoint of cost and effectiveness. In the final analysis a 25-city defense deployment against a Soviet threat was recommended.

F. *Limited Nike-X: The Chinese Threat*

Based upon the DEPEX study, the Army in preparing the FY 1967 budget had included $188 million for preproduction funds for long lead-time items for Nike-X. The Joint Chiefs of Staff supported the Army in this request. The Army did not believe that the ballistic missile defense modular concept, fall-out shelters and air defense were so irrevocably linked together as McNamara[207] and the Joint Chiefs. The Army argued that a start on defense had to be made at some point and this was the time to do it.

McNamara deleted the Army request for preproduction funds. His reasons were essentially the same as those used in the past: the necessity for a shelter program, an improved air defense program, the expense, and the inability to provide 100 percent protection against a Soviet attack. His argument for the shelter program was based upon the damage that would result from low altitude Sprint intercepts. This argument was already undermined by the stress, with the new Zeus missile, on an exoatmospheric intercept and by the fact that the Sprint warhead was a low-yield enhanced radiation device that would cause little damage to the defended area (he dropped this argument in 1967). He acknowledged the effectiveness of Nike-X against a small uncomplicated attack such as might be launched by the Chinese but postponed any decision on a deployment to counter such an attack based upon the then present knowledge of Chinese Communist nuclear progress which didn't warrant such a deployment.[208]

He again reiterated that he would never sanction a deployment against the Soviet threat because the Soviets could offset the defenses at lower costs than the U.S. deployment; a defense against the Soviets would cost between $25 billion and $30 billion to deploy and between $1 billion and $2 billion per year to maintain; and the United States would still suffer upwards of 50 million fatalities. On the basis of this rationale he recommended $447 million for research, development, and testing programs for Nike-X. In addition he recommended $119 million for ARPA to continue its missile defense studies which included the Hibex missile, the hard-point defense radar (HAPDAR), reentry measurements, penetration aids, and satellite defense.

The Congress did not agree with the Secretary's position. In 1963 the Soviets had announced that they had designed an effective antimissile missile and a year later had displayed the GALOSH antimissile missile in a Moscow parade. By 1966 there was considerable evidence that the Soviets were accelerating their

[207] In his statement to the House Armed Services Committee in 1965 McNamara had stated that the Soviet Union with its bombers, submarine-launched missiles, and ICBMs could inflict severe damage against the United States. Therefore, he, went on to say, a very good defense against only one form of attack would have limited value. "A meaningful capability to limit the damage of a determined enemy attack, therefore, requires an integrated, balanced combination of strategic defensive forces, area defense forces, terminal defense forces and passive defenses." He thus tied to the ballistic missile defense costs, the cost of both a shelter program and an air defense system. See U.S. Department of Defense, *Statement of Secretary of Defense Robert S. McNamara Before the House Armed Services Committee on the Fiscal Year 1966–70 Defense Program and 1966 Defense Budget*, 1965.

[208] U.S. Department of Defense, *Statement of Secretary of Defense Robert S. McNamara Before the House Armed Services Committee on the Fiscal Year 1967–71 Defense Programs and 1967 Defense Budget*.

ABM deployments. In addition to the GALOSH system around Moscow, there was evidence of another system, the Tallinn system, being deployed in, an arc several hundred miles long along the northwest border. Evidence indicated that this was an area defense weapon with characteristics resembling Nike Zeus. McNamara believed that it was an advanced air defense system, perhaps procured to counter the advanced man bomber which he had refused to sanction. The Joint Chiefs were unanimous in their conviction that it was an ABM system. Regardless of McNamara's belief there was sufficient uncertainty to cause the Secretary to take countermeasures. In announcing the new system in November, he said that the United States would procure and deploy a new submarine-launched ballistic missile, the Poseidon, to counter this capability. By his actions it would appear that Mr. McNamara might have believed that this system was more likely designed as an SLBM system than either an anti-bomber or anti-ICBM system.

In April the Senate Armed Services Committee recommended the appropriation of $167.9 million to buy long lead-time items for Nike-X, to shorten the time to initial operational capability and to spur the Administration into deploying Nike-X. Early in May the House Armed Services Committee announced unanimous support of the Senate committee's Nike-X appropriation recommendation. Eventually the House Armed Services Committee authorized $153.3 million for long lead-time item procurement.[209] This figure was approved by the Senate but not without some opposition. In fact, during this debate it became apparent that opposition to the deployment of Nike-X system was not confined to the Administration, its advisors, and certain civilian scientists. By 1966 a very vocal minority had developed in the Congress against BMD. By 1968 this group had enlarged considerably in both Houses.

The announcements of new Soviet offensive and defensive missile deployments and China's explosion in May and December of two hydrogen devices (at least a year before expected) did not provoke a deployment decision. It did, however, spark a renewed congressional effort to achieve a deployment. Opposition grew because of a fear of an accelerated Arms race. Late in the year Congress was startled to learn that the Administration was considering asking the Soviet Union for a moratorium on ballistic missile deployments. This recommendation had been suggested in 1965 by the Arms Control and Disarmament Committee of the National Citizens Commission of the White House Conference on International Cooperation, chaired by Wiesner and Gilpatric. Believing that the Soviet BMD effort was a limited one and that a costly upward spiral of the arms race would be started if either side deployed an extensive system, the Administration sought to prevent such a race by seeking a moratorium. An answer to this proposal was not expected until after the first of the year. A decision to deploy a BMD system would be contrary to this request. Therefore the Administration decided to withhold any decision until the Soviet answer was received. It was expected that this action would forestall increasing Congressional pressure to deploy Nike-X.[210]

While 1966 did not produce a decision to deploy Nike-X, optimism mounted during the year. Within the Army several reorganizations and responsibility assignments were made in preparation for the anticipated favorable decision. On 28 January an Army Chief of Staff memorandum established the Nike-X System Office as a Class II Activity. Lieutenant General A. W. Betts, Chief of Research and Development was appointed Nike-X System Manager (acting). The Nike-X Project Office was designated an Army Materiel Command Class II Activity under the operational control of the Nike-X System Manager. The Army Air Defense Command as the ultimate user of the system was assigned the normal combat develop-

[209] Adams, *Ballistic Missile Defense*, p. 131.
[210] Adams, *Ballistic Missile Defense*, p. 138.

ment activities for the system. These activities included development of firing doctrine and system operating logic, communications doctrine, logistics doctrine, and operational security doctrine. Also, ARADCOM was assigned responsibility for site selection, on-site training, development of Tables of Organization and Equipment, Tables of Allowance, and Tables of Distribution, as well as the conduct of Operational Acceptance Testing.

In May the Joint Chiefs of Staff directed the Commander-in-Chief, Continental Air Defense Command to conduct a study to determine the operational impact of a Nike-X deployment on other offensive and defensive systems within CONUS. Authority was granted to utilize personnel from other commands to the extent considered necessary. As a result a team was assembled which included members from CONAD, ARADCOM, ADC, SAC, Nike-X Project Office and other commands and agencies operating forces within CONUS. The final report was submitted to the Joint Chiefs in February 1967 with the general conclusion that the Nike-X system could be deployed and operated within the CONUS without serious impact on the operation of other DoD systems.

In June 1966, the Continental Air Defense Command published its concept for the operational employment of Nike-X within the CONAD command and control structure. Operational command of the system would be vested in CINCONAD. He would exercise this command through CG ARADCOM who would command Nike-X through his Ballistic Missile Defense Center and his subordinate Region Commanders and their supporting Fire Direction Centers. Interfaces would be provided for the exchange of information between the CONAD Region Commanders and the Nike-X Commanders at the Region Control Center and Fire Direction Center level.[211]

By December the Army was prepared to present the results of its 1966 "Nike-X Deployment Model Study 1-67 (DEMOD 1-67)" to the Secretary of Defense. This was one of the studies directed by the Secretary earlier that year. Other studies were being conducted by DDR&E and a special group of the Defense Department's Defense Science Board. These studies were designed to ensure continued advances in ballistic missile defense technology, pending an Executive decision to deploy.[212]

The defense objectives of DEMOD 1-67 were specified by the Secretary of Defense and were directed against the potential threat from both the Chinese People's Republic and the U.S.S.R. through the 1970's. Defenses were specifically designed and evaluated to defend United States industrial and urban centers against a deliberate Chinese Communist attack (called a counter value attack) and a deliberate U.S.S.R. attack against United States offensive forces—a counter-force attack. Additional analysis was conducted with respect to the ability of the deployments to protect the Continental United States against inadvertent or unauthorized ICBM launchings by an Nth country. The problem of providing a defense to our Allies was also addressed in this study. Deployments for the defense of Europe and Japan were designed and analyzed. The light defense of urban-industrial centers against a deliberate Chinese attack was approved by the Secretary of Defense on 20 December for planning purposes. With minor modifications this deployment would become the Sentinel deployment in 1967.

In the meantime, on 5 December the Assistant Secretary of the Army for Research and Development was briefed on the work that the Army was conducting on a low-frequency radar and relating the applicability of that work to the DDR&E requirement to develop a VHF/UHF radar for Nike-X. The Project Manager requested

[211] "CONAD Operational Employment Concept for the Nike-X Terminal BMD System," 20 June 1966.
[212] Adams, *Ballistic Missile Defense*, p. 136.

authority to proceed with the program. Dr. O'Neal verbally gave that authority at the briefing. Subsequently the Nike-X System contractor was directed to proceed using the General Electric Company as a subcontractor for design and development of the radar. This was the beginning of the Perimeter Acquisition Radar program.

By the middle of 1966 it appeared that a trend was developing favoring a limited Nike-X deployment against the Chinese. The system then being discussed would cost between $5 billion and $8 billion. The deployment would encompass about 12 MSR sites each with a complement of both the improved Zeus (DM15X2) missile and Sprint, and about six Perimeter Acquisition Radars. The system would provide a thin area defense tailored to the Chinese threat. It would have limited growth potential so as not to influence or provoke a Soviet reaction.

G. Sentinel Decision

Based upon the Secretary of Defense's approval of the DEMOD 1-67 deployment for planning purposes in December 1966, General A. W. Betts, the Nike-X System Manager, requested ARADCOM in early January to conduct preliminary site selection for the DEMOD 1-67 deployment. He also requested ARADCOM to prepare the Command and Control Supplement to the Nike-X Qualitative Materiel Requirement (QMR) and document the firing doctrine and communications requirements for the system.[213]

Later the same month in his State of the Union Message, President Johnson announced his decision to seek an agreement with the Soviet Union to halt BMD employment. "We have the solemn duty," he said, "to slow down the arms race between us, if that is at all possible, in both conventional and nuclear weapons and defenses . . . any additional race would impose on our peoples, and all mankind, for that matter, additional waste of resources with no gain in security on either side."[214] In his Budget Message, still later that same month, he stated that the United States would initiate discussions with the Soviet Union on the limitation of antiballistic missile (ABM) deployments (indications had been received that the Soviets might be interested in talks). Pending the outcome of those talks, the United States would continue intensive development of Nike-X but take no action to deploy an antiballistic missile defense. Should the discussions prove unsuccessful, he would reconsider the deployment decision. To provide for actions that might be required at that time, approximately $375 million were included in the FY 1968 budget for the production of Nike-X for such purposes as defense of our offensive weapons systems.[215] This latter statement would indicate that the rationale for the deployment had shifted from the previously considered Chinese threat to the Soviet threat.

Secretary of Defense McNamara went into much greater detail about ballistic missile defense in his Annual Posture Statement. In response to the Soviet strategic buildup, particularly the deployment of ballistic missile defenses, the United States would produce and deploy Poseidon SLBMs, increase the number of Minuteman III missiles and provide them with an improved third stage, provide improved penaids, and initiate development of new RVs specifically designed to penetrate BMD-defended targets. He expressed concern that the Soviets might be developing a first-strike (counterforce) capability to attack hardened targets and indicated that Nike-X might provide a partial solution to that problem.

[213] Personal letter LTG Betts, Nike-X System Manager, to LTG Hackett, CG ARADCOM, dated 6 Jan 1967.
[214] Text of President Johnson's State of the Union Message, *The New York Times*, January 11, 1967, p. 6.
[215] Adams, *Ballistic Missile Defense*, p. 146.

With respect to the prospect of defending cities he spoke of two possible deployments (similar to two contained in the Army's DEPEX II study of 1965). The first deployment, he called Posture A. It would provide a light area defense and a terminal defense of the top 25 United States cities at a cost of $9.9 billion. The second deployment, Posture B provided for the defense of the top 50 United States cities at a cost of $19.4 billion. He then illustrated the savings in lives that each deployment would provide under various conditions. With no United States ABM, the Soviets would kill 120 million people. If the Soviets struck first against a Posture A deployment 40 million lives would be lost; with Posture B, 30 million. If the United States struck first: 100 million lives would be lost with no ABM defense, 30 million with a Posture A deployment, and 20 million with a Posture B deployment. However, if the Soviets responded to our ABM deployment with improvements to their strike force to maintain their assured destruction capability—which he was sure they would do—the Soviets would inflict 120 million fatalities, if they struck first, whether the United States had either a Posture A or Posture B defense.[216] His argument was designed to prove that no defense regardless of its cost would buy anything as far as saving. American lives was concerned. The argument was fatalistic.

He then went on to point out that there would be a number of other problems associated with an ABM deployment. The first was the need for proper integration of the system and the associated computer programming problem. (The Army Air Defense Command had recognized this problem as early as 1964 and had been working on a solution since that time. A preferential defense firing doctrine had been derived along with a command and control structure and associated computer programs.) The second problem concerned the ability to manufacture the equipment without extensive reengineering. The third problem concerned the reaction of the taxpayers. Unprotected taxpayers would demand protection to the same degree as those in large cities. He then went on to point out that an initial small deployment would eventually expand to a $40 billion or $50 billion 10-year cost system. Further, a decision to deploy a ballistic missile defense system would require a new bomber defense to prevent the Soviets from end-running the Nike-X deployments using improved aircraft. Associated with the deployment would also be the cost of a shelter program. Adding the cost of the bomber defense and shelter programs to the Posture A and B deployments would increase their costs to $12.2 billion and $21.7 billion respectively.[217]

Based upon these arguments Mr. McNamara proposed $440 million for RDT&E and $375 million for preproduction of Nike-X to be used if the negotiations with the Soviets regarding ABM deployments were unsuccessful. As far as a deployment against the Chinese threat was concerned, he felt that there was plenty of time to make that decision before the Chinese developed a significant offensive force. In this regard, as it turned out, he was probably correct.

The Joint Chiefs disagreed with Secretary McNamara's deployment decision. General Wheeler, speaking for the Chiefs stated: ". . . we believe we should go ahead now and start to deploy a light defense as a first step in moving toward a possible Posture A, which the Secretary outlined in his statement."[218]

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[216] U.S. Department of Defense, *Statement of Secretary of Defense Robert S. McNamara Before a Joint Session of the Senate Armed Services Committee and Senate Subcommittee on Department of Defense Appropriations on the Fiscal Year 1968–72 Defense Program and 1968 Defense Budget*.
[217] Ibid.
[218] U.S. Senate, Committee on Armed Services and the Subcommittee on Department of Defense of the Committee of Appropriations, *Military Procurement Authorization for Fiscal Year 1968*, 90th Cong, 1st Sess, 1967, p. 249.

General Wheeler then went on to present a lucid argument for an ABM deployment. In summarizing, he said, "the basis of the recommendation of the Joint Chiefs . . . is based fundamentally on the requirement to maintain the total strategic nuclear capability or balance clearly in favor of the United States. Specifically, we believe that deployed Nike-X would do one or more of the following:

> First, provide a damage limitation capability by attrition of a Soviet attack.
>
> Second, introduce uncertainties which would inhibit Soviet leaders from concluding that the United States could not survive a Soviet first strike or that the United States would not pre-empt under any circumstances.
>
> Third, stabilize the nuclear balance.
>
> Fourth, demonstrate to the Soviets and our allies that the United States is not first-strike minded; in other words, that we don't put all of our eggs in the offensive basket.
>
> Fifth, continue to deny to the Soviets an exploitable capability. And by this I mean to continue the Cuba power environment in the world.
>
> I think that in regard to this last point, and to explain it a bit, I should point out that by this we mean that at the time of Cuba, the strategic nuclear balance was such that the Soviets did not have an exploitable capability, because of our vastly superior nuclear strength. And to bring this forward into the present context, it's also the view of the Joint Chiefs that regardless of anyone's feelings about the situation in Vietnam, we think it quite clear that we would have had even more hesitation in deploying our forces there, had the strategic nuclear balance not been in our favor.[219]

While not agreeing with the Defense Secretary, the JCS did agree with the President to postpone an ABM deployment temporarily "while exploring with the Soviet Union the possibilities of arms control implementation of one kind or another."[220]

A survey of the Secretaries of the Army, Navy, and Air Force during this same period found unanimous agreement for deploying a light ABM if the proposed negotiations were unsuccessful.

The apparent nearness of a deployment decision kicked off a series of debates in the Senate and House of Representatives during the late spring and summer of 1967. True to Secretary McNamara's prophecy, one of the issues was the question of why some cities were provided defenses while others were not. Other debates got into the area of international politics, while others concerned the issue of the Arms Race. Opposition was voiced to including the $375 million for Nike-X preproduction but both houses overwhelmingly passed the bill.

While these debates were underway several events occurred that indicated that the Soviets were not as anxious to discuss a moratorium on ABM defenses as first thought. While visiting London, on 9 February 1967, Premier Kosygin was asked the question, "Do you consider it possible to agree on a moratorium on the development of antimissile defense systems and, if so, on what conditions?" His answer:

> This is an important question in the military sphere. I should not like to answer it directly, but want in turn to ask the person who submitted this question—I understand that he represents the British Institute of Strategic Research Studies—the following: Which weapons should be regarded as a tension factor—offensive or defensive weapons? I think that a defensive system, which prevents attack, is not a cause of the arms race but represents a factor preventing the death of people. Some persons reason thus: Which is cheaper, to have offensive weapons that destroy cities and entire states or to have defensive weapons that can prevent this destruction? At present the theory is current in some places that one should develop whichever system is cheaper. Such "theoreticians" argue also about how much it costs to kill a person—$500,000 or $100,000? An antimissile system may cost more than an offensive one, but it is intended not for killing people but for

[219] Ibid., pp. 251–252.
[220] U.S. Senate, *Armament and Disarmament Problems*, pp. 86–87.

> saving human lives. I understand that I am not answering the question that was put to me, but you can draw appropriate conclusions yourselves.
>
> There are other, far more dependable, ways of solving the security problem, ways that really could suit mankind. You know that we advocate discontinuing nuclear arming altogether and destroying reserves of nuclear weapons. We are ready for this, and not because we have few such weapons, but precisely because we have many, and mankind does not need nuclear weapons. And if the representatives of the press, those who influence the minds of people, treated this question along such lines, it seems to me that there would be far greater results than from talk about which weaponry is cheaper, offensive or defensive. The best thing is to seek renunciation of nuclear armament and the destruction of nuclear weapons.[221]

It would appear that the Premier was interested in talking of more than just an ABM moratorium.

On 26 June 1967 it was reported in the *Washington Post* that the Soviets had ruled out any negotiation on ABM limitations, for the present. As reported in the article, this position had apparently been communicated to the President by Mr. Kosygin during the Glassboro Conference. It was also reported in this article that Soviet Foreign Minister Gromyko had privately told other diplomats that the Soviets rejected the kinds of talks proposed by the United States on the grounds that the United States wanted to negotiate on the technical level, while the Soviets wanted broad political talks on the implication of nuclear weaponry.[222] In a television interview at the United Nations after the Glassboro talks, Kosygin was asked essentially the same question as he was asked in London and gave essentially the same reply.

By late summer 1967 the pressure for an ABM deployment, from all sides, was increasing. The upcoming year was a presidential election year and evidence indicated that the Republicans were going to make ABM a campaign issue. Nixon and Reagan had both discussed the ABM issue in political speeches. The Republican Party had issued a pamphlet entitled, *The Missile Defense Question, Is LBJ Right?* The JCS evidenced more and more concern over the growing Soviet strategic capabilities and the lack of a decision to deploy Nike-X. The Soviets adopted a harder line than had been evidenced at Glassboro. In addition, it was reported that the Soviets were developing multiple warheads for their large ICBMs. On 8 September Secretary of State Rusk warned the Soviets that time was running out, if they did not agree to start talks soon the United States would be compelled to begin an ABM deployment. The mounting pressure on the President made it imperative that the policy of non-deployment be reexamined.[223]

On 18 September 1967, Secretary of Defense McNamara made the announcement that the United States would begin deployment of a missile defense against China, in a speech to the United Press International in San Francisco.[224] The speech was originally intended to be a policy statement on ballistic missile defense and the first 22 of 25 pages are devoted to that subject. The last three pages deal with the deployment decision. This had led many to believe that McNamara was forced to change his speech from an argument against deployment to announce the President's decision. Whatever the case, the United States was committed.

Early in the year the Army was directed to develop plans for deployments to counter several different threats. On 5 July Mr. McNamara was briefed on these deployment concepts. Topics covered included the DEMOD 1-67 deployments, expanded deployments for Hardsite Defense, modifications to the DEMOD

[221] As quoted in Adams, *Ballistic Missile Defense*, p. 154.
[222] Ibid.
[223] Adams, *Ballistic Missile Defense*, pp. 158–161.
[224] Speech by Secretary of Defense Robert S. McNamara, on 18 September 1967, San Francisco, California, before United Press International Editors and Publishers.

1-67 deployment to counter the Fractional Orbital Bombardment System (FOBS) threat, and an anti-Soviet defense deployment DEMOD 2-67. At the conclusion of the briefing Mr. McNamara directed that a 30-day study be performed of the evolving Chinese threat and the necessary modular growth to the 1-67 deployment to counter that threat. It seems apparent that, while still opposing deployment, Mr. McNamara was correctly assessing the pressure being applied. Murdock reports that Phil G. Goulding, Assistant Secretary of Defense (Public Affairs) recalls the pressure being so intense in the summer and fall of 1967 that the "choice in the Pentagon . . . was not a small ABM versus none at all, but rather a small ABM versus a big one."[225] The summer deployment study was probably used to help him resist a thick anti-Soviet deployment and force acceptance of a "thin" system against the Chinese "which would not provoke Soviet reaction."[226]

In the middle of the deployment debates in the summer of 1967 a new concept for missile defense was announced by the Navy. The system, called SABMIS (Sea Based AntiBallistic Missile Intercept System) was to be composed of elements similar to those of the Nike-X system mounted on large ships. With the ability to move these ships forward to positions around the periphery of the Soviet Union, it would be possible to detect the launch of enemy missiles and intercept them during the boost or mid-course phase of their flight trajectory. While receiving some attention, the studies were eventually discontinued due to the vulnerability of the ships in the forward basing areas.

Immediately after the announcement of the intent to deploy a ballistic missile defense system, the Department of Defense appointed a Design Review Committee headed by Dr. Daniel Fink, Deputy Director of Research and Engineering, to review the DEMOD 1-67 deployment. In October the Committee had completed its review. Basically, the deployment as originally designed was accepted. The only exceptions were the deletion of the site at Minot AFB and addition of the defense of Washington, D.C., and movement of the site from Anchorage to Fairbanks, Alaska.

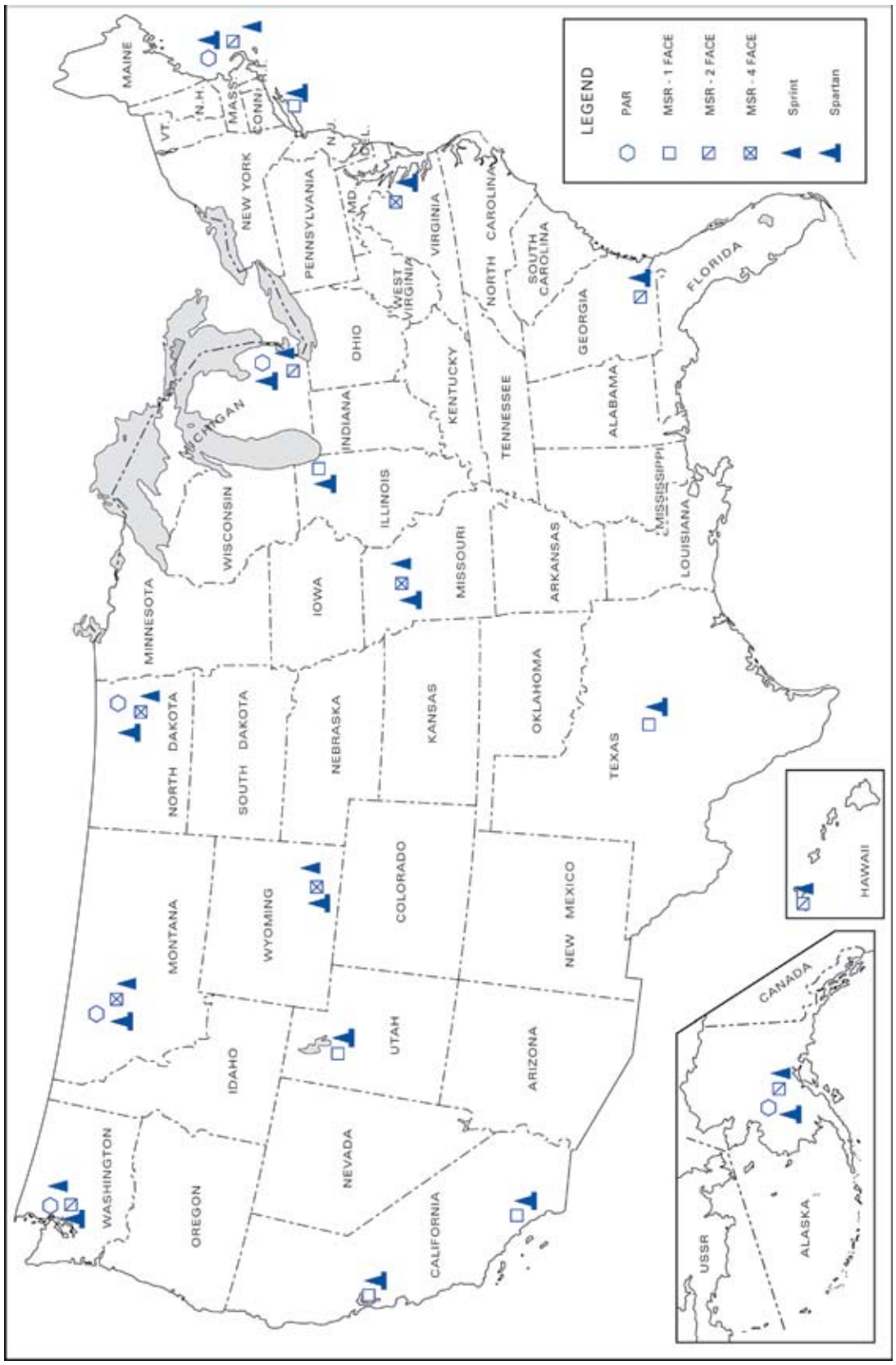
On 3 November the deployment was officially named Sentinel and the Department of Defense announced the location of the first ten sites. The Corps of Engineers obtained entry rights to the first five sites and began core drilling and radio frequency testing by the end of November. Plans were also developed for briefing the communities nearby the selected sites on the effect of the sites on their communities. These briefings were accomplished under the direction of the Commanding General ARADCOM during the period 20–24 November. By the end of the year much had been accomplished but much remained to be done.

H. Sentinel Deployment

The Sentinel deployment (Figure 30) would consist of 17 sites: 15 in the Continental United States (CONUS) and one each in Alaska and Hawaii. All sites would have an MSR and Spartan missiles except the site in Hawaii which would have only Sprint. There were six PARs, five of which were deployed along the northern border of CONUS. The sixth was to be located at Fairbanks, Alaska. Each PAR was to be deployed in the vicinity of an MSR and would be protected with Sprint missiles. All MSRs were to be one faced (have 90 degrees coverage in azimuth) except those located in the vicinity of PARs which would have two faces, and those in Minuteman fields which would have four faces. The MSR programmed for Washington, D.C. would also have four faces. In addition to the sites defending PARs, the sites in the Minuteman fields and

[225] Murdock, *Defense Policy Formation*, p. 137.
[226] Ibid.

Figure 30—Sentinel Deployment



the one in Hawaii would have Sprint missiles. The deployment would provide a light area coverage over the entire CONUS. Terminal defense was also provided to a portion of four Minuteman Wings. An option was included to add additional Sprint missile farms at the Minuteman Wings at a later date should this be considered necessary. Table 24 lists the location of the Sentinel sites and the equipment planned for each.

In November 1967 the Secretary of Defense announced the location of ten sites as a first increment of the Sentinel deployment. These sites were Albany, Georgia, Chicago, Dallas, Grand Forks, New York City, Oahu, Salt Lake City, Seattle, Boston, and Detroit. By the end of the month briefings were conducted and meetings held with the civic leaders and residents of the communities nearby these sites. The reaction was almost immediate. Protests were staged in Boston, Chicago, and New York and by the end of 1968 had increased in such magnitude that they, along with other objections, forced the newly elected President to review the entire Sentinel deployment as one of his first acts after taking office.

The fact that 12 of the 17 sites were located at or near major population centers led many of the opponents of an ABM deployment to the conclusion that Sentinel was merely the first step towards a heavy defense against the Soviet threat. The Joint Committee on Atomic Energy, headed by Senators Jackson and Pastore, decided to refocus the hearings from the need to deploy a ballistic missile defense against the Chinese threat to the need for a defense against the Soviets.

Table 24—Sentinel Equipment[227]

Location (Vicinity)	Equipment			
	PAR	MSR	Spartan	Sprint
Fairbanks, AK	1	1-2 Faces	Yes	Yes
Seattle, WA	1	1-2 Faces	Yes	Yes
San Francisco, CA	No	1-1 Face	Yes	No
Los Angeles, CA	No	1-1 Face	Yes	No
Salt Lake City, UT	No	1-1 Face	Yes	No
Malmstrom AFB, MT	1	1-4 Faces	Yes	Yes
Warren AFB, WY	No	1-4 Faces	Yes	Yes
Grand Forks AFB, ND	1	1-4 Faces	Yes	Yes
Whitman AFB, MO	No	1-4 Faces	Yes	Yes
Dallas, TX	No	1-1 Face	Yes	No
Chicago, IL	No	1-1 Face	Yes	No
Detroit, MI	1	1-2 Faces	Yes	Yes
Albany, GA	No	1-2 Faces	Yes	No
Boston, MA	1	1-2 Faces	Yes	Yes
New York, NY	No	1-1 Face	Yes	No
Washington, D.C.	No	1-4 Faces	Yes	No
Honolulu, HI	No	1-2 Faces	No	Yes

[227] "CONAD Command History, 1968," Headquarters CONAD.

The reaction to the announced decision throughout the world was generally negative. The British were irritated at not being consulted and warned that the deployment would set off a new round in the arms race. The United States, they implied, would have to break the Nuclear Test Ban Treaty to perfect the system. The Chinese asserted that the system was not designed for defense but to provide a nuclear threat to them. The Canadian Government declined any participation, although the Prime Minister said that he regretted the decision. The Soviets blamed pressure from Pentagon Hawks and munitions makers for the decision.[228]

In Congress the reaction was mixed. Representative Craig Hosmer of California and Senators Stennis, Tower, Hichenlooper (La.), and Anderson (NM) supported the decision unequivocally. Senators Church and Fulbright did not like it. Senator Jackson was unwilling to accept the Chinese rationale. Senator Clark called it an "expensive toy."

By 1968 Sentinel was beginning to encounter concerted opposition in Congress, in the academic and scientific community, and from the public, particularly in those areas where Sentinel sites were to be located. The opposition had not reached sufficient magnitude at the beginning of the year, however, to warrant any change to the Administration's plans. In his final Posture Statement McNamara recommended: $651 million of FY 1969 funds plus $229 million FY 1968 funds for Sentinel deployment; $313 million for Sentinel development; $165 million for Nike-X; and $103 million for Project Defender. The Army continued site selection and survey activities. In May, the Defense Department announced three new areas, San Francisco, Los Angeles, and Whiteman Air Force Base, for Sentinel deployment. Briefings for the adjacent communities were scheduled for 4 June 1968 at Sedalia, Missouri, 5–6 June at Los Angeles, and 21 June at San Francisco. The 5–6 June briefing at Los Angeles was cancelled due to Senator Kennedy's assassination and rescheduled for 17 June. A second briefing was held in San Francisco on 2 August because of non-attendance of high-level officials at the first briefing. In September the Real Estate Subcommittee of the House Armed Services Committee approved acquisition of land at Camp Curtis Guild and Sharpner's Pond near Boston for the first MSR and PAR sites respectively. In November, Department of Defense announced the last two sites at Warren AFB in Wyoming and Malmstrom AFB in Montana (the planned locations at Washington, D.C. and Fairbanks, Alaska never were publicly announced).

In May the prime contractor authorized the General Electric Company to proceed with Phase II of the PAR development. Phase II was the design and manufacture of a prototype PAR to be installed and tested on the first tactical PAR site (Boston). This same month, while the new sites at San Francisco, Los Angeles, and Whitman AFB were being announced, the contractors (Boeing, Martin-Marietta, and McDonald-Douglas) were selected by the Advanced Ballistic Missile Defense Agency (ABMDA) to conduct analytical studies to establish promising methods for upgrading the Sentinel system performance by modification or new design of the Spartan missile third stage to meet evolving threats. Earlier in April an ad hoc committee under the chairmanship of Dr. H. W. Augustadt of Bell Telephone Laboratories had been appointed to make similar studies of Sprint and make recommendations for improving its performance. In late May the committee's recommendations were accepted and the contractor was directed to implement the improvements immediately.

[228] This paragraph is a summary of actions as reported in Adams, *Ballistic Missile Defense*, pp. 178–179.

In the meantime opposition to Sentinel continued to mount. From a timing standpoint a more turbulent environment could not have been selected to announce the decision and initiate the deployment. The United States had announced the development of the Multiple Independent Reentry Vehicle (MIRV) as a means of overcoming the Soviet ballistic missile defense. There was evidence that the Soviets were developing multiple RVs for their ICBM force. The United States was at the height of its involvement in Vietnam: the draft lottery was unpopular; the Tet Offensive was in progress. There was unrest on the campus and attacks on the military-industrial complex and on military research activities. Former President Eisenhower, who had warned against the military-industrial coalition in an interview reported in *The New York Times*, said that he doubted the success of a thin ABM, saying the best defense was a good offense, and we had that.[229] In addition, the Administration had announced a $6 billion cut in the Federal Budget which would affect many domestic programs. All of these factors reflected a growing disillusionment and disenchantment with the Government, its Foreign Policy, the military, defense spending, and, above all, Vietnam. To add to the disillusionment, the Chinese threat was rather tenuous in the first place and the Secretary of Defense had just recently announced that there had been a slippage in the Chinese threat of at least a year. On 1 July 1968, at the signing ceremonies of the Non-Proliferation Treaty, President Johnson announced that agreement had been reached with the Soviets to begin talks in the near future to limit both offensive and defensive nuclear weapons.[230]

As the year progressed opposition grew. By the middle of the year the United States Defense Policy and budget were being attacked vigorously in the House and in the Senate and Sentinel was in the middle of the controversy. Several amendments were made to delete Sentinel deployment funds from the FY 1969 budget in both Houses—all of which were defeated. Several members of the scientific/academic community led by Dr. Jerome Weisner and Dr. Hans Bethe published articles opposing Sentinel. During the debate on the Cooper-Hart Amendment to delete $387.4.million from the Appropriations Bill for Sentinel deployment, they sent a telegram which was read into the record by Senator Hart, supporting the Amendment. Their main argument was that important domestic priorities were being sacrificed for the deployment of a ballistic missile defense which would not add to United States security.[231] The amendment was defeated 25 to 45 and concluded the attempts to defeat Sentinel in the Congress in 1968.

I. Demise of Sentinel[232]

While urging the Congress to stop the deployment of Sentinel in 1968, the opponents were organizing a grass roots movement with the public. In November, five scientists including Dr. David Inglis, former chairman of the Federation of American Scientists formed the "West Suburban Concerned Scientists Group" dedicated to stopping Sentinel site construction in Chicago and its suburbs. The thrust of the approach adopted by these scientists was to acquaint the community with the configuration of the site and to emphasize its impact on the local ecology and safety of the community. Points stressed included the size of the buildings and indeed the size of the installation, the harmful aspects of the high powered radar, nuclear weapons in their backyards, and the undesirability of having soldiers in their neighborhoods. To this they added tactical implications—suggesting that deploying a ballistic missile defense in Chicago would make

[229] "Eisenhower Doubts 'Thin' Missile Plan Can Be Successful," *The New York Times*, January 16, 1968, p. 13.
[230] Carroll Kilpatrick, "U.S., Russia Plan Talks on Restricting Missile," *Washington Post*, July 2, 1968, p. Al as reported in Adams, *Ballistic Missile Defense*, pp. 183–184.
[231] U.S. Congressional Record, November 1, 1968, p. E9645.
[232] Much of this section is based upon personal experience and observation of the author during the period.

the City a target for ICBMs while at the same time introducing the possibility of a nuclear explosion at the site or, in an attack, the possibility of a low altitude intercept wherein the Sentinel missile would destroy the city it was defending. In no way did they address the fact that in an assured destruction strategy the population centers were the targets of the attack, whether they had ballistic missile defense or not. Neither did they address the fact that Nike Hercules units had been deployed within and around their city with nuclear weapons for over ten years. Nor did they mention that soldiers had been their neighbor's for over 15 years. The five scientists were asking the Army to hold hearings before acquiring any more land for test drilling so that concerned individuals could state their reservations on the proposed sites. In the meantime, these scientists were being joined and supported by the Federation of American Scientists to alert congressmen, other scientists and the public to Army ballistic missile activities in and around urban areas.[233]

The effect of these scientists was remarkable. Shortly, a whole series of debates were touched off throughout the country. Articles calling for open hearings and public debate began appearing in periodicals and newspapers throughout the country. The "New England Citizens Committee on ABM," formed by Abram Chayes, a former State Department legal advisor, indicated that it would sponsor a national conference on ballistic missile defense.[234] At a town meet in Reading, Massachusetts the Army was strongly opposed by a group organized by Dr. Jerome Wiesner and Dr. George Rathjens who immediately implored Senator Edward M. Kennedy to oppose the deployment. This request resulted in a letter to Defense Secretary Laird urging a freeze on the deployment of Sentinel pending a thorough investigation and review of the whole program. Such a review he said would be conducted by the Congress in fiscal 1970. He cited five reasons against the deployment: (1) technical questions on its effectiveness, capability and feasibility; (2) its impact on the Soviet strategic force structure by heightening the arms race and making arms limitation talks more difficult; (3) site locations near urban areas, chances of accidents, and the possibility of the site itself becoming an attractive target; (4) costs, inflation, and overruns as well as the compulsion to expand to a thick defense; and (5) distortion of federal funding priorities.[235]

Rumors and conflicting reports were also circulating during this period as to whether the new Administration would go ahead with the deployment on the basis of the Chinese threat. By reorientation to the Soviet threat it might become a bargaining point in the upcoming SALT in Vienna.

On 4 February 1969, Senator Kennedy was joined by other Senators opposed to Sentinel when they requested a delay, fearing it would start a new arms race.

On 6 February Secretary of Defense Laird ordered a halt to all land acquisition, and construction pending a month-long review of the Sentinel system. At a news conference that same day, the President indicated that Sentinel was more than a defense against the Chinese threat, it had considerable damage-limiting capability.

J. Safeguard

The Department of Defense immediately undertook an extensive review of the ballistic missile defense problem. On 14 March 1969, Mr. Nixon announced his new BMD plan. In explaining his decision he said that it appeared that three alternatives were open to him: (1) a deployment that would attempt to defend United States cities against an attack by the Soviet Union; (2) a continuation of the Sentinel program

[233] Adams, *Ballistic Missile Defense*, p. 187.
[234] Ibid., p. 191.
[235] Ibid., p. 191.

approved by the previous administration; or (3) an indefinite postponement of deployment while continuing research and development.[236]

The President rejected all three alternatives on the basis of the growing Soviet threat. It was still not feasible or practical from a political, military or economic standpoint, to defend cities from a heavy Soviet attack but, there were too many risks in halting all work. Only operational experience could provide answers to certain problems which research and development could not. As a result he thought the Sentinel program had to be modified. The security of the country demanded a deployment but that deployment would be phased and reviewed annually from the viewpoint of the threat, technical aspects, and arms control considerations.

The purposes of the new system would be: (1) protection of land-based retaliatory forces against a direct attack by the Soviet Union; (2) defense of the American people against the kind of nuclear attack which Communist China is likely to be able to mount within the decade; and (3) protection against the possibility of accidental attacks from any source.[237]

The Department of Defense noted that the plan also: (1) protects the National Command Authority, (2) preserves options to curtail or reorient if arms control agreements are reached, (3) rejects a thick defense system, (4) moves sites away from major cities, and (5) strengthens our R&D efforts.[238]

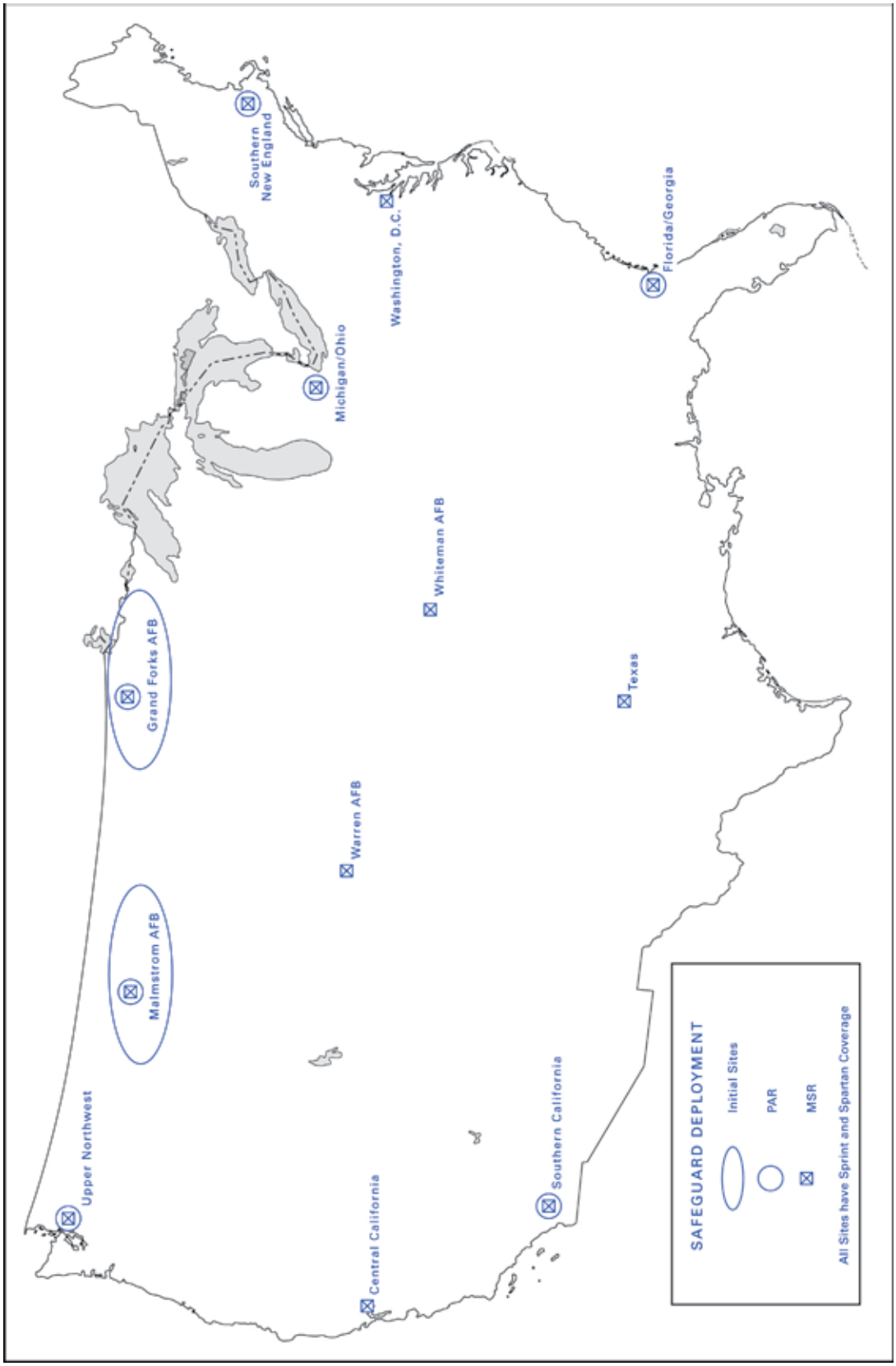
The new deployment, Safeguard (taken from the President's speech) was to consist of 12 sites (Figure 31). There were to be seven PARs located around the perimeter of the Continental United States to provide greater detection against the SLBM threat. All sites would have both Sprint and Spartan missiles. Two sites could be added to provide area coverage of Alaska and Hawaii. Table 25 indicates the location and equipment to be at each site.

Table 25—*Safeguard* Locations and Equipment

Location	Equipment			
	PAR	MSR	Spartan	Sprint
Northwest	Yes	Yes	Yes	Yes
Central California	No	Yes	Yes	Yes
Southern California	Yes	Yes	Yes	Yes
Malmstrom AFB	Yes	Yes	Yes	Yes
Warren AFB	No	Yes	Yes	Yes
Grand Forks AFB	Yes	Yes	Yes	Yes
Whiteman AFB	No	Yes	Yes	Yes
Texas	No	Yes	Yes	Yes
Michigan/Ohio	Yes	Yes	Yes	Yes
Southern New England	Yes	Yes	Yes	Yes
Washington, D.C.	No	Yes	Yes	Yes
Florida/Georgia	Yes	Yes	Yes	Yes

[236] "Text of President Nixon's Announcement of Revised Proposals for Sentinel Antiballistic Missile Program," *The New York Times*, March 15, 1969, p. 17.
[237] Ibid.
[238] Safeguard System Manager's Office, Fact Sheet, 1969.

Figure 31—Safeguard Deployment



The deployment was to be accomplished in phases. Phase I would be a deployment of two PARs and two MSRs with associated missiles at Grand Forks AFB, North Dakota and Malmstrom AFB, Montana. These two sites would have a Sprint and Spartan missile farm collocated with the MSR and remote Sprint missile farms located through and around the Minuteman silos. At least one Sprint farm was to be so located as to provide protection of the PAR. Phase I would provide a limited protection to Minuteman and would provide operational experience to the crews. It would require an investment of approximately $2.1 billion.

Phase II would have three options which could be selected in response to a number of threats. Phase IIA was designed to respond to an increased Soviet ICBM threat to Minuteman. Two more sites would be added to defend Minuteman at Warren and Whiteman Air Force Bases and a third site would be added to defend Washington, D.C. This option would not increase the number of PARs deployed. Increased Minuteman survival would be afforded by this deployment plus, additional time would be provided the National Command Authority in which to make an assessment of an attack and a calculated decision.

Phase IIB was designed to respond to an increased Soviet SLBM threat to SAC bomber bases. The response would be the full 12-site deployment. Phase IIC was designed to respond to an increased Chinese ICBM threat, in which case a full 12-site deployment would be initiated to provide an area defense of heavily populated areas. The costs of Phase IIB and IIC would be $6.3 billion and $6.0 billion respectively. The threat and the objective of the deployment would determine the exact location of the sites as well as their composition. For instance, a Soviet SLBM threat would require radar coverage in all directions whereas a Chinese ICBM threat could be oriented toward China. This could reduce the number of radar faces required as well as the number and type of missiles. Table 26 illustrates the Safeguard phases and options.

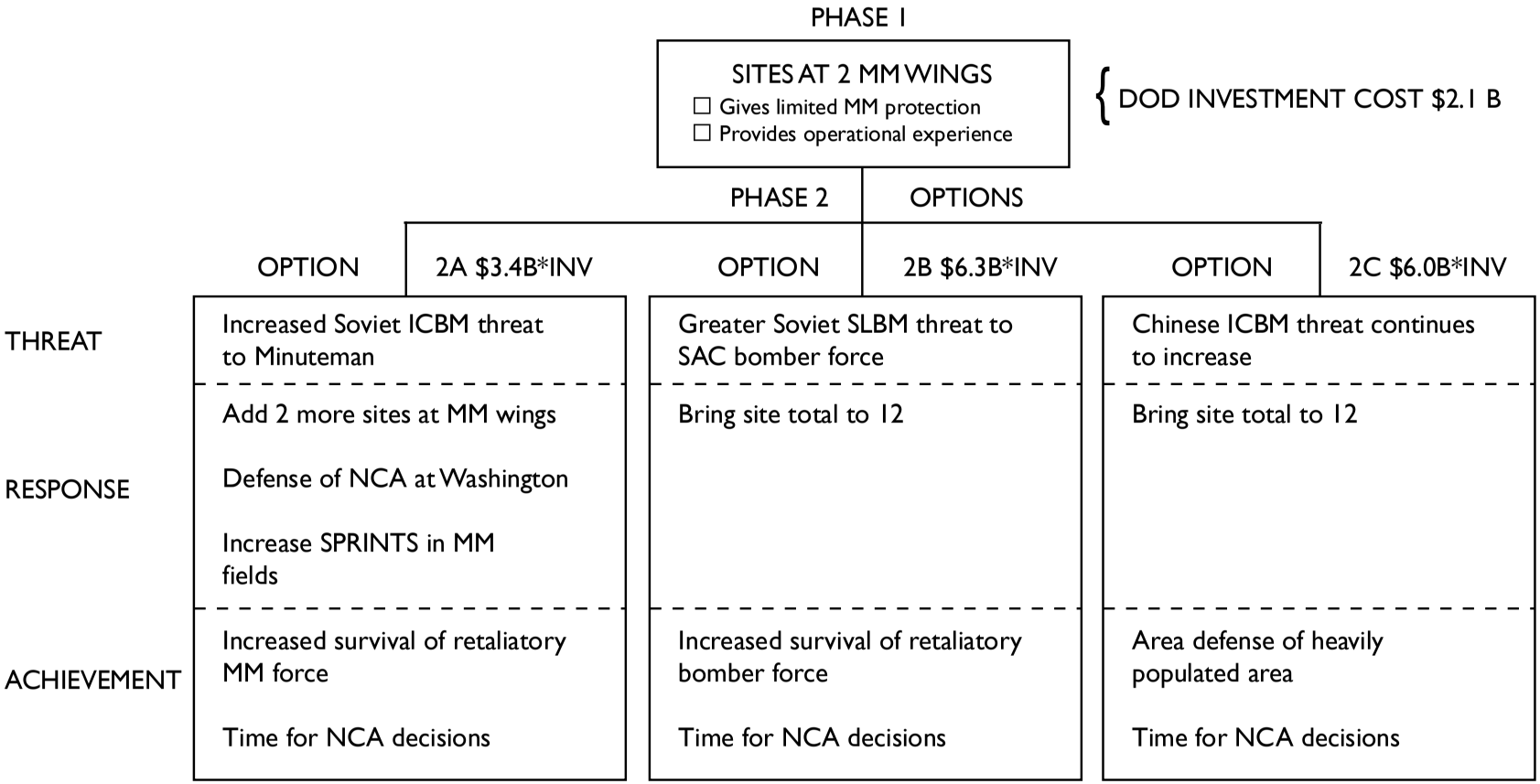
The Administration began a campaign to gain acceptance of the Safeguard plan immediately after the decision was announced. The President met with his Scientific Advisory Council, Vice-President Agnew talked with freshman senators about supporting the decision. The opposition responded. Senator Kennedy sponsored a book edited by Drs. Abram Chayes and Jerome B. Wiesner entitled *ABM: An Evaluation of the Decision to Deploy an Antiballistic Missile System*. It was thought that "it might be useful, in the forthcoming Congressional debates over the decision to deploy an antiballistic missile system, if the Congress had available to it an independent, non-government evaluation of the ABM issue."[239]

There is no intent to cover the debate that followed in this chapter. It is covered well in open literature. The Administration based its case on the increasing Soviet threat: the new SS-9 ICBM which would provide the Soviets a first strike capability; the Fractional Orbit Bombardment System (FOBS); evidence of a new ballistic missile defense system being tested. It also argued that Safeguard was needed to provide a strong bargaining hand at SALT. The opposition attacked the deployment on the basis of its need, feasibility, desirability, effectiveness, and wisdom of deploying Safeguard.

The intense struggle continued through the summer until on 6 August 1969 by a vote of 51 to 49 the Senate endorsed the President's proposal by defeating a bipartisan amendment sponsored by Senators Cooper and Hart to permit research and development of Safeguard to continue but bar deployment or site acquisition. The vituperation began to subside. Almost every element of our society was involved. Polls

[239] *ABM: An Evaluation of the Decision to Deploy an Antiballistic Missile System*, edited by Abram Chayes and Jerome B. Wiesner, Signet Books, May 1969, p. xi.

Table 26—Safeguard Phases and Options



Possible additions to the above full deployment—Alaska, Hawaii

*Note: For fully equipped 12-site deployment (Phase 2), DOD investment cost is $6.6B.

were taken of public opinion. Professional integrity was abandoned to make a point. There was no formal or regulated discussion of a proposition or motion according to parliamentary procedure. As Claude Witze, Senior Editor of *Air Force* magazine said:

> To begin with, there was no debate about the ABM issue. Some people called it a debate. In truth, it was a verbal orgasm staged by frustrated critics of all that is military, who saw in ABM a "war figure." Their flagellation of this image brought out the worst in otherwise calm and sensible men. For sheer unreasonableness, the things they said have had no equal in this capital since attorney Joseph Welch, moved to tears during the so-called Army-McCarthy hearings, asked Senator Joseph McCarthy if he had no shame.[240]

On 8 December the House of Representatives approved the $69.9 billion Defense Department appropriation bill which included $359.5 million deployment funds for Safeguard and $400.9 million for research and development. By a vote 78–25, the House rejected an amendment that would have eliminated deployment funding. The Senate, on 16 December, approved by a vote 85–4 the $69.9 billion appropriation after defeating a move to delete almost all of the $760 million for the Safeguard[241] system.

In October the Army opened field offices in Great Falls, Montana and Grand Forks, North Dakota. In November the Omaha District, Corps of Engineers conducted Community Impact Studies in the Grand Forks and Malmstrom areas. The studies included surveys of all towns within a 50-mile radius of the planned Safeguard sites, and all cities of 10,000 or more population within a 100-mile radius. The objectives of the studies were to evaluate the impact of Safeguard on the local area and to identify programs available to assist in community planning.

As the big debate began to wind down, the Soviets on 24 October 1969, accepted President Nixon's invitation to discuss arms limitation. Thus, ballistic missile defense was formally linked to SALT. The talks were to begin in Helsinki on 17 November 1969. There was considerable evidence that the Soviets were concerned with the BMD decision. They had blamed Pentagon Hawks and munitions makers for the Sentinel decision. After the program was switched to Safeguard, in March of 1969, they accused the United States of stepping up the arms race by initiating the ballistic missile deployment and asserting a Soviet first-strike buildup.[242] In April, the Soviets claimed that while the Safeguard Phase I deployment was not too large or aggressive, it was the prelude to a larger deployment. They also indicated that they were no more eager to start SALT than the United States.[243] In June they voiced displeasure with the United States' defense policies, which would upset the current arms balance, and with the Administration's failure to set a date for the start of SALT.[244]

By December 1969, the Administration had decided that Safeguard should be expanded. In arriving at that decision the Administration had to weigh the risks of another fight in Congress, where the money would come from—non-defense or defense, and the impact on SALT. Those in favor of the expansion favored a complete 12-site expansion because of the rapidly growing SS-9 deployment and Soviet strategic threat and the steady progress in the Chinese threat. Failure to expand, they felt, would result in a two year delay of full operational capability, and less incentive for the Soviets to negotiate seriously at SALT. The opponents

[240] Claude Witze, "Fight over the ABM: Debate or Witch Hunt?," *Air Force and Space Digest*, April 1969, p. 34.
[241] *Ballistic Missile Defense Chronology (1957 to present)*, Safeguard System Command.
[242] Bernard Gwertzman, "Nixon ABM Plans Arouse Soviet Press Critics," *The New York Times*, March 28, 1969, p. 15.
[243] Henry Kamm, "Moscow Scores Arms-Talk Foes," *The New York Times*, April 20, 1969, p. 27.
[244] Bernard Gwertzman, "Pravda Voices Soviet Displeasure with U.S. over Missile Policies and Delay on Arms Control Talks," *The New York Times*, June 11, 1969, p. II.

were concerned with expenditures and whether expansion would be viewed by the Soviets as an act of bad faith.[245]

On 30 January 1970, President Nixon announced his decision for further deployment of the Safeguard. The recommended expansion would consist of a new site at Whiteman Air Force Base for additional defense of Minuteman sites, and advanced preparation for five additional sites in the Northeast, Northwest, Washington, D.C., Warren Air Force Base, and in the Michigan-Ohio area, with no deployment commitment at these sites.[246] It was obvious that this was a step toward a full 12-site deployment. The fiscal FY 1971 budget included $1.5 billion for Safeguard.

On 24 February, Secretary of Defense Melvin Lai rd presented the Administration's proposal for the expanded deployment to a Joint Session of the Senate Armed Services Committee and Defense Appropriations Subcommittee.[247] In supporting the expansion he indicated that if the Soviet strategic buildup continued, the United States could find itself a second-rate power by the mid-1970's. Without a SALT agreement, the United States would be compelled to rush into development and production of a new series of offensive systems. However, the proposed Safeguard program would allow the Administration to postpone for a year, any decision for increasing and improving strategic offensive forces. By expanding Safeguard to hedge against a moderate threat and the option to meet a heavy threat, the United States would be able to pursue SALT without exacerbating the arms race.[248]

In his presentation Mr. Laird also recommended construction for increased Sprint farms in the Grand Forks and Malmstrom areas. He also suggested that the Soviet threat might turn out to be greater than the proposed Safeguard deployments could handle. The Defense Department was pursuing several courses to reduce the vulnerability of Minuteman should this happen, rather than expanding Safeguard. If Minuteman defenses had to be expanded, a new and smaller radar which would be less costly than the MSRs could be placed in ICBM fields. A program to determine the optimum radar for such a defense was provided in the Fiscal 1971 budget.[249]

Mr. Laird estimated that the cost of the expanded deployment program in FY 1971 would be $920 million or less than $100 million more than that needed for Phase I work already approved by Congress.[250]

The Strategic Arms Limitation Talks opened in Vienna on 16 April. Earlier in February, the Soviets had proclaimed in a *Pravda* article that they could hit attacking missiles at any speed at great distances from the defended target.[251] A week later on 7 March they criticized United States weapons development and deployment plans as potentially damaging the chances of reaching an arms control accord.[252] Whether the first statement was designed to assure Soviet citizens or provide a basis for SALT bargaining is not clear, but the second article was clearly aimed at the United States ABM program and at influencing the United

[245] Adams, *Ballistic Missile Defense*, p. 222.
[246] *Ballistic Missile Chronology (1957 to Present)*, Safeguard Systems Command.
[247] *Chronology of Ballistic Missile Defense (1957 to Present)*, Safeguard Systems Command.
[248] Adams, *Ballistic Missile Defense*, p. 223.
[249] Mr. Laird was undoubtedly referring to the Hard-Site defense system. This system would use the improved Sprint missile and a smaller phased array radar. It would be deployed in cells of three mutually supporting radars each with a collocated missile farm and up to six remote Sprint farms. Each radar would be capable of launching and guiding the missiles from any farm. The system would be essentially unmanned with only one manned Tactical Operation Center per Minuteman Wing. The name has been changed to the Site Defense System, which is still in R&D.
[250] *Ballistic Missile Defense Chronology (1957 to Present)*, SAFSCOM.
[251] Bernard Gwertzman, "Soviet Says Its ABM Can 'Reliably Hit' Attacking Missiles," *The New York Times*, February 24, 1970, p. 1.
[252] William Beecher, "Soviet Criticism on Arms Dismays Top U.S. Aides," *The New York Times*, March 9, 1970, p. 1.

States bargaining strategy for the second round of SALT. In the second article they had implied that they were just attaining parity, were willing to accept this new balance, and were not seeking superiority over the United States.

As the Congress began debates over the FY 1971 budget the national climate was one of concern with MIRV, SALT, military spending and influence, and Vietnam. As far as Safeguard was concerned, there were indications that Congress was willing to fight any further expansion. The reasons were cost and the thin area deployment rationale.[253]

The Congressional hearings in 1970 were a repeat of those in 1969 but much less vitriolic. On 24 February the House Armed Services Committee approved the funds requested by Secretary of Defense Laird for the expanded Safeguard deployment, and on 11 June the House of Representatives approved by a vote of 307 to 57 the FY 1971 Defense Procurement Authorization Bill (HR17123). However, on 17 June, by a vote of 11 to 6, the Senate Armed Services Committee approved funds for Safeguard construction at Whiteman AFB and preliminary work at Warren AFB but refused appropriation of funds for preliminary work at all other sites including Washington, D.C.

The 1970 ABM debate reached its climax in mid-August when the Senate defeated three amendments to restrict Safeguard. The first amendment offered by Senator Hughes, would eliminate all funds from the Defense Procurement Authorization Bill for Safeguard procurement and deployment. The amendment was defeated by a vote of 62–33. The second amendment, offered by Senators Cooper and Hart, would have denied funds for construction at Whiteman AFB and preliminary work at Warren AFB. The vote was 52 against, 45 for. The third amendment, sponsored by Senator Brooke, would have deferred all work on the Whiteman and Warren sites and diverted $320 million to strengthening the two sites already under construction.

By 7 October the House, Senate and Administration had reconciled their differences agreeing to the expansion as restricted by the Senate Armed Services Committee. On that date the President signed the Defense Procurement Authorization Bill. The agreed version authorized $1.3 billion for continued development, production and construction but limited that work to the four Minuteman sites.

The year 1970 demonstrated the fickleness of the American public. In 1969 almost every element of it was involved in the missile defense debate. By the end of 1970 that involvement had diminished to almost zero. The Senate Foreign Relations Committee with its familiar witnesses of Wiesner, Rathjens, Chayes, Weinberg et al., remained the hard core opposition to Safeguard. By the end of 1970, if there were any questions pertaining to BMD policy, they were related more to SALT and to providing a strong bargaining position for the United States than with the Soviet threat, which continued, and still continues, to grow.

Development and testing of the Nike-X components of the Safeguard deployment continued during 1970 and 1971. The Spartan missile made its first intercept of an ICBM nose cone over Kwajalein in August of 1970. In June CINCONAD forwarded a letter to the Joint Chiefs of Staff outlining his concept (agreed to by CG ARADCOM) of the role of Subordinate Unified Commanders in ballistic missile defense. In November 1971, after some public debate, underground nuclear test, CANNIICAN, was successfully completed on Amchitka Island in the Aleutians. This test was identified as necessary in developing the warhead

[253] In his February 29, 1970 Posture, Statement, Laird had stated that the Administration had decided to continue Safeguard deployment because the additional cost to defend Minuteman was small "if the full area defense is bought."

for the Spartan missile. The widespread destruction predicted in the unsuccessful legal actions aimed at preventing the tests, failed to occur.

The FY 1972 Defense Procurement Authorization Bill presented to Congress in January 1972 contained $1.267 billion for Safeguard, $60 million less than the FY 1971 bill. In November, in a joint House-Senate Conference, a compromise version was approved providing $1.106 billion for Safeguard. The bill limited construction to that already authorized for Malmstrom and Grand Forks. Activities at Whiteman and Warren were limited to advanced site preparation.

K. SALT

By the time the second round of SALT got under way on 16 April 1970 the President had decided that the United States should push for a comprehensive limitation on strategic weapons rather than attempting to approach the issue on a weapon-by-weapon basis. This had been Kosygin's position in his 9 February 1967 statement in London. As the spring ended, reports[254] began to circulate that the shape of a possible arms accord could be a freeze at present levels of sea- and land-based missiles plus the acceptance of ABM systems to protect Washington and Moscow. In contrast to United States SALT proposals which provided three alternatives (no ABMs or MIRVs but on-site inspection or, a joint offensive weapon launcher freeze with no on-site inspection and freedom to switch from land to sea and visa versa within agreed numbers, or a current level freeze on ICBMs and SLBMs without regard to MIRVs) the Soviets had proposed either a total ABM ban or ABM around national capitals only and a freeze on the current number of ICBM launchers. The Soviets had argued that a curb on the arms race would only occur if no area ABM was deployed, it was reported. The Soviets contended that the United States ABM deployment would lead to an area defense and they would have no choice but to deploy more SS-9s. From these reports it appeared that Safeguard was a prime target of the Soviets at SALT. *The New York Times* reported that the Soviet proposals had put the United States on the defensive but that it appeared, from statements in congressional hearings, the Administration would be willing to scrap, the whole ABM system if necessary.

By the end of the second SALT conference in Vienna it was reported that the United States had indicated a willingness to scrap ABM completely if the Soviets agreed to a limitation on the numbers of SS-9 ICBMs and scrapped their ABM around Moscow. As a compromise the United States was willing to accept ABMs around the national capitals with a corresponding freeze on SS-9s. In December 1970 the Soviets proposed a separate agreement to limit deployment of ABMs to an unspecified number of interceptors within an unspecified radius of Washington and Moscow. This was rejected by the United States. The United States ABM system was being deployed around Minuteman sites and more money was being asked to continue that deployment in the FY 1972 budget. That entire deployment would have to be scrapped if the Soviet proposal was accepted. However, the United States was willing to do this if the Soviets were willing to scrap their system and limit the number of SS-9s.

Negotiations continued through 1971 and into 1972. There has been much written about the dissatisfaction of our negotiators with the conduct of the Soviets during these negotiations and the lack of a cohesive, unified approach by the United States and the unilateral actions of the President and the Secretary of State.

[254] Chalmers Roberts, "Shape of Arms Pact Emerges, with 50-50 Chance of Accord," *Washington Post*, May 21, 1970, p. A1; "State Hits Post Story on SALT," *Washington Post*, May 22, 1970, p. A2; John Finney, *New York Times*, May 22, 1970, p. 5, as reported in Adams, *Ballistic Missile Defense*, p. 227.

On 26 May 1972, however, the President of the United States and the Secretary General of the Central Committee of the Communist Party of the U.S.S.R. signed a treaty on the limitation of antiballistic missile (ABM) systems and an interim agreement on the limitation of strategic offensive weapons. The ABM treaty limited deployment of ABM defenses to two sites: one for the defense of an ICBM site, and another for the defense of the national capital. This treaty has subsequently been extended to reduce the ABM deployments to one site only.

On 2 August 1972 the Senate ratified the ABM treaty by a vote of 88 to 2. And on 13 September 1972 Congress approved the FY 1973 Defense Appropriation Bill but banned the use of funds in connection with a ballistic missile defense of Washington.

Thus the 17-year debate over ballistic missile defense came to an end. The system that would accelerate the arms race played the most significant part in bringing the Soviets to the negotiation table. Whether the United States negotiators were as adept as the United States engineers and scientists who were able to build and prove the technical feasibility of the system—at least to the satisfaction of the Soviets—is yet to be seen. As General Wheeler said deterrence exists in the forces in-being and in the minds of men. Since the signing of SALT there has been indiscernible decrease in world tensions and the Soviets continue to increase their strategic offensive forces and are experimenting and testing advanced ABM systems. The United States continues to maintain the forces it had in 1971. How long will our deterrence be credible in the minds of the rest of the world?

Section IV. Space Defense

A. Approach

Like the other sections in this chapter, the approach in writing the history of the United States' effort in space defense had been selective rather than exhaustive. Whereas air and ballistic missile threats have been extensive, the space threat is generally limited to the Fractional Orbit Bombardment System (FOBS), which has been considered more of an ICBM type threat because of the similarity of terminal trajectories, and reconnaissance or communication satellites at various altitudes. There have only been two space defense systems developed during the 17 years covered by this volume although several others have been postulated and proposed. In the main, United States space defense efforts have been directed toward detecting, identifying, and keeping track of objects in space. In this connection, the sensors developed and deployed to provide early warning against ballistic missile attack have been major contributors to the space defense programs. The need for these systems, their development and deployment were never controversial, as were the ballistic missile defense systems. As a result, procurement and deployment have been rather orderly with the biggest problems lying in competing with other systems and programs for the necessary dollars within the constraints of rather tight defense budgets.

The dual role played by the ballistic missile defense early warning sensors, and the non-controversial role they had in development and deployment posed a rather interesting problem with respect to where they should be covered in the overall history of United States systems. It was finally decided to include them in this section. Insofar as it has been able to be determined, they have had no major impact on strategic arms competition.

In view of the fact that space defense and ballistic missile early warning systems have been relatively non-controversial and contributed little, if any, to the strategic arms competition, this section presents the history of these systems in a chronological order culminating with a tabulation of the systems in operation in 1972.

B. Missile and Space Surveillance and Warning Systems

1. Authority

The Air Force was initially assigned responsibility for developing the ballistic missile early warning system on 5 October 1956 when the then Special Assistant for Guided Missiles to the Secretary of Defense informed the Secretaries of the Army and Air Force of their Services' responsibility in the antiballistic missile field.[255] This was subsequently confirmed by Secretary of Defense Charles E. Wilson on 25 April 1957 when he directed the Air Force to develop the anti-ICBM early warning system, to carry out research and development on the advanced acquisition radars required by the active anti-ICBM system, and to study the communications between these radars and the active portion of the system. Soviet announcement of a successful ICBM launching in August of 1957 followed shortly thereafter by Sputnik I, added impetus to the program.

2. Composition

The missile and space surveillance and warning system currently consists of five systems and a space computational center located in the NORAD Cheyenne Mountain complex. The five systems are: the Ballistic Missile Early Warning System; the Defense Support Program (DSP) formerly called Project 647; the Forward Scatter over the Horizon Radar (440L) system; the Sea-Launched Ballistic Missile Warning System; and the Space Detection and Warning System. Each of these systems is discussed in some detail in the following paragraphs.

3. BMEWS

By 14 January 1958, eight months after being assigned responsibility for ballistic missile early warning and four months after the Soviet announcement, the Air Force presented the results of a feasibility study on a ballistic missile early warning system to the Secretary of Defense. This system called for three radars located in Alaska, Greenland and the United Kingdom directed toward the Soviet Union in such a manner as to cover all northern great circle trajectories from the U.S.S.R. to the United States. The Alaska and Greenland radars would project two fan shaped beams—one high and one low—in a sector of about 120 degrees in azimuth and out to a range of approximately 2,000 miles, toward the Soviet Union. ICBMs launched from the Soviet Union would pass through these beams during the boost phase and provide the alarm of a ballistic missile attack. By measuring and recording the point that each missile penetrated each beam an approximate area of impact (an ellipse about four hundred miles wide and 800 miles long) could be computed. To assess the validity of each event a threshold, based on probabilities of false alarm, was established and reflected as alarm level. Alarm level one was the lowest indicating very little probability of an actual attack while alarm level five—the highest—indicated a high probability. Later, tracking radars were to be added to these radars to reduce the Impact area prediction error and to assist in validating events.

[255] Memo, Special Asst for GM, OSD, for Sec Army, Sec Air Force, 2 October 1956, sub: Anti-ICBM Systems.

The third site, to be located in the United Kingdom was to be equipped only with three tracking radar. Initially, it was to be jointly manned and eventually solely manned by the British.

After the briefing on 18 January the Secretary of Defense authorized the Air Force to proceed with the development of the system. A contract was let with the Radio Corporation of America and on 1 October 1960 the first BMEWS site became operational at Thule, Greenland and achieved an automatic capability on 1 February 1961. On 30 September 1961 BMEWS site Number 2 became operational at Clear, Alaska. In the meantime, a Memorandum of Agreement between the United States and the United Kingdom authorized construction and operation of the third BMEWS site at Fylingdales Moore, Yorkshire, England. This site became operational in 1962 to complete the BMEWS system.[256]

4. SLBM Warning System

In July 1964 the USAF Air Defense Command notified USAF Headquarters that it supported the minimum cost SLBM system pending design and deployment of a more permanent system to provide early warning of this threat. The proposed minimum cost system would be composed of the Moorestown radar on the East Coast, which would be diverted from its Spacetrack mission to the SLBM mission at the appropriate DEFCON, the AN/FPS-85 radar at Eglin AFB, Florida which already had a secondary mission of providing warning of an SLBM attack from the south, and two AN/FPS-35 radars on the West Coast, one at Baker, California and the other at Boron, Oregon.[257] At the same time ADC established a requirement for an over-the-horizon, backscatter radar to provide maximum warning against this threat.

At best the minimum cost system provided a very limited capability against the SLBM. Further, approval for development of the OTH backscatter radar was slow in coming. As a result it was decided to develop an interim system using modified air defense height finder radars. Seven sites were planned at Mill Valley, California; Charleston AFB, Maine; Mount Laguna, California; Mt. Hebo Air Force Station, Oregon; Fort Fisher Air Force Station, North Carolina; McDill AFB, Florida; and Laredo, Texas. The new system, designated 474N by the Air Force, was to become operational in December 1970. At that time, however, it was determined that, as then configured, the modified radars, newly designated the AN/FSS-7, would be unable to detect the Soviet SS-N-6 SLBM, which was a longer range missile that could be launched from beyond the range of the radar and overfly the radar search envelope. It was therefore decided to make further modifications to the radar to increase its range to 750 NM, and to postpone the operational date to December 1971. The system finally became operational in Mid-1972.[258] In the meantime, it was decided to increase the coverage provided by the system by reactivating the Moorestown, New Jersey radar for the SLBM role. This radar had originally been a part of the Space Detection and Tracking System but had been inactivated in 1969, probably for budgetary reasons.[259] After reactivation it was designated the AN/FPS-49.

5. Over-the-Horizon, Forward Scatter Radar (440L)

At the same time that the Air Force was constructing the BMEWS ICBM warning system, it was recognized that that system provided only limited coverage to the north and that launches to the south could go

[256] USAF Air Defense Command, Historical Study # 19.
[257] Ibid.
[258] "Continental Air Defense Command History, 1968," and "Continental Air Defense Command History, 1971," Headquarters CONAD, May 1969 and May 1972, respectively.
[259] Ibid.

undetected. To cover this possibility, it was decided to install a forward scatter over-the-horizon radar net around the Soviet Union. The net would consist of four transmitters located in the Philippines, Okinawa, and Japan (2) and five receivers in Cypress, Italy (2), Germany, and England, with a correlation center in Aviano, Italy connected to the NORAD Combat Operation. Center in Cheyenne Mountain.[260] The system was to be designated 440L. Using the ionosphere and the earth as a gigantic wave guide over the Soviet Union, the transmitters would generate a continuous radar signal which would be constantly monitored by the receivers in Europe. Interruptions in the signal caused by ballistic missile launches would be detected by the receivers which would pass this information to the correlation center in Aviano, Italy, where the data would be processed to provide the time and inclination of launch. Processed data would then be flashed to NORAD.

The 440L system became operational on New Year's Eve 1965 but for a time was beset with operational difficulties which impacted upon its ability to detect launches. By 1968 these problems were not all solved and the detection rate was very low. For instance during one period 7–14 June 1968 the system was only able to detect 20 percent of the launches that actually occurred.[261] As a result, extensive revision of the operating procedures was undertaken which resulted in a significant improvement in the number of launches detected.

6. Space Detection and Tracking System

The Space Detection and Tracking System (SPADATS) was placed under the operational control of CINCNORAD on 1 December 1960, by the Joint Chiefs of Staff. In July of 1961, the National Space Surveillance and Control. Center (NSSCC) was discontinued as the new SPADATS Center became operational at Ent AFB, Colorado. Officially, this marked the beginning of aerospace operations by CINCNORAD.[262]

SPADATS consists of a Space Defense Center in the NORAD Cheyenne Mountain Complex (NCMC) and three systems provided by the Air Force, Navy, and Canadians. The Air Force contribution is the SPACETRACK system which is composed of three radars at Shemya, Alaska; Dyabikur, Turkey; and Eglin AFB, Florida, and four Baker-Nunn cameras located at strategic places throughout the world. The Canadian contribution is one Baker-Nunn camera in Canada. The Navy contribution is the NAVSPASUR system which is a radar fence consisting of three transmitters and six receivers extending from Charleston, South Carolina to San Diego, California, across the Southern United States. Headquarters for the NAVSPASUR system is located at Dahlgren Island, Virginia, where all NAVSPASUR data is processed before forwarding to the Space Defense Center in the NCMC.

7. Defense Support Program (DSP)

The DSP traces its origins to the Air Force 949 program which was conceived in late 1967 or early 1968. This program called for placing synchronous orbiting satellites equipped with short and long wave infrared sensors along the equator to overlook the eastern and western hemisphere. The exhaust fumes of launched missiles would be detected by the infrared sensors on the satellites and data concerning numbers

[260] Ibid.
[261] "Continental Air Defense Command History, 1968," Headquarters CONAD, 1 May 1969.
[262] *Ballistic Missile Defense Chronology (1957 to Present)*, SAFCOM.

of launches and their inclinations would be flashed to ground stations where it would be processed and flashed to NORAD, SAC and the NCA. The system would increase the warning time from 15 minutes as provided by BMEWS to approximately 30 minutes—the ICBM time-of-flight.

DSP is a somewhat less sophisticated version of the original concept but involves the same principles. Its purpose is to provide tactical warning of missile attacks, ballistic missile defense alerting, origin of attack, attack assessment, raid description, nuclear test ban monitoring, nuclear diagnostic and intelligence data. The system was to be deployed in two phases. Phase I called for two synchronous orbital satellites, one to cover the eastern hemisphere and one to cover the western hemisphere. The purpose of the latter is to provide early warning of SLBM attack. The first satellite, covering the eastern hemisphere, was launched on 5 May 1971. The second was launched in February 1972.

C. Space Defense Systems

With the launch of Sputnik I a requirement was generated for a system to intercept satellites in space. Although various requirement papers have been developed for such a system and, indeed, concept and feasibility studies have been conducted, the United States has only had two actual systems for this purpose—and only one of these was specifically deployed for this purpose.

As early as April 1962, the Secretary of Defense placed a requirement on the Nike Zeus program to provide the capability for a satellite intercept demonstration by May 1963. The demonstration was to be conducted from Kwajalein Atoll and was assigned the code name Mudflap. On 21 March 1963, the first Mudflap test was conducted with limited achievement of objectives. Neither the missile nor ground equipment had performed as required. On 23 May a second test was conducted when a Nike Zeus missile launched from Kwajalein successfully intercepted an Agena D satellite. All test objectives were achieved within the time frame specified by the Secretary.[263] Shortly thereafter, the Nike Zeus program was assigned a mission of maintaining a satellite intercept capability to engage designated satellites within 24 hours from the time directed. From then until relieved in late 1968, several missiles were maintained on hand for this purpose.

About the same time that the Nike Zeus program was assigned the satellite intercept mission, the Secretary of Defense directed the Air Force to achieve a similar capability from their installation on Johnston Island, in the mid-Pacific, using a Thor, IRBM. The project was designated the 437 SIS (Satellite Intercept System). The Thor was to be launched using satellite ephemeris data and launching data generated in the Space Defense Center in the NORAD Combat Operations Center. The 437 SIS became operational in May 1964. Four Thor missiles, each equipped with a 1.45 MT warhead were maintained for this purpose—two on launchers on Johnston Island and two at Vandenberg AFB, California. The system was capable of intercepting satellites at altitudes between 100 and 700 nautical miles and at ranges from 100 to 1,150 nautical miles.[264] The Thor missile provided a much larger intercept envelope than the Nike Zeus and Johnston Island was more advantageously placed for the intercept of satellites launched on inclinations to pass over the United States. The much larger warhead on the Thor was used to compensate for system inaccuracies. Successful demonstration launches were made on 21 November 1968 and 25 April 1970. The

[263] Ibid.
[264] "Continental Air Defense Command History, 1968," Headquarters CONAD, 1 May 1969.

latter was the first Special Defense Program Launch at Johnston Island.[265] On 1 October 1970 the 437 SIS alert requirement was reduced from 24 hours to 30 days. All missiles and personnel were transferred back to the Continental United States.

As mentioned, several Required Operational Capability (ROC) documents were written by the Aerospace Defense Command and NORAD/CONAD for Satellite Intercept Systems. None came to fruition. Similarly, several system concepts were developed. One such system called the Orbital Inspection and Negation System was proposed by the Lockheed Aircraft Corporation in 1968. Although the system showed promise funds were not available for development and no further effort was expended on it.[266]

D. Status—1972

By 1972 the United States defense forces had no space defense systems in operation. Ballistic Missile defenses were restricted to the one site then in construction and air defense forces were rapidly being phased out of the inventory. The mission of the Continental Air Defense Command and its components was gradually shifting from one of defense to one of surveillance and early warning. To accomplish this mission for space and ballistic missile attack CONAD had the forces shown in Table 27.

Table 27—Missile and Space Surveillance and Warning Systems[267]

31 December 1971

System	Number Operational
BMEWS	3
DSP	1
OTH (440L)	
Transmitters	4
Receivers	5
SLBM Warning	
AN/FSS 7	7
AN/FPS 49	1
SPADATS	
Spacetrack	
Radar	3
Baker-Nunn cameras	4
Canadian	
Baker-Nunn camera	1
NAVSPASUR	
Transmitters	3
Receivers	6

[265] ADC Historical Study # 19.
[266] "Continental Air Defense Command History, 1968," Headquarters CONAD, 1 May 1969.
[267] "Continental Air Defense Command History, 1971," Headquarters CONAD, May 1972.

Section V
Civil Defense 1955–1972

A. Introduction

In contrasting Soviet and U.S. defense systems, one key point emerges: Whereas there were a number of cases in which Soviet strategy could be analyzed in terms of what the Soviets *did* in response to international tensions or U.S. actions, the U.S. strategy was more often analyzed in terms of what the Americans *did not* do in these action-reaction situations. This was particularly true regarding civil defense efforts. It has been sufficiently established among observers that the Soviets have been consistently more defense-oriented, but this hypothesis was too general to explain intricate philosophies dictating active and passive defense postures.

During the period 1955–1972, the U.S. Civil Defense programs experienced two significant changes—the first in 1958 when President Eisenhower issued Reorganization Plan No. 1, transferring civil defense duties to the Executive Office of the President. This was followed by the enactment of Public Law 85-606 expanding the responsibility for organizing and administering civil defense activities to the Federal level, in addition to the State and local groups already in existence. The second modification to civil defense organization occurred in 1961 when, under the authority of President Kennedy, civil defense was placed under the auspices of the Secretary of Defense. Although reasons for both events can be determined—in 1958 the changing strategic posture and the gradual emergence from the "massive retaliation" policy to "mutual assured destruction" may have prompted Eisenhower to take some action in passive defense areas. However, the "reorganization plan" was a "paper command," changing titles, locations of offices, and directorships, but the true test lay in its acceptance and support by the public and the administration. Promoting civil defense programs, by actively providing up-to-date protection for the population, continued in a state of limbo. Kennedy's 1961 successes in promoting a closer interaction between civil defense and the Department of Defense was precipitated by both his growing interest in improving civil defense programs and the Berlin Crisis of that same year. The public awareness and support was at an all-time high following the activities in Europe, but they were short-lived. Again it was an example of the American attitudes towards remedying immediate needs, in this case an immediate perceived threat; other national priorities soon regained precedence.

B. History

Between 1955 and 1957, U.S. civil defense programs experienced little attention. Frederick V. Peterson continued as the Administrator of the Federal Civil Defense Administration (FCDA), a position he had held since 1953. Civil defense duties continued to be divided between the Office of Defense Mobilization (ODM) and FCDA. Early pressures were surfacing within the Department of Defense for additional military support of civil defense programs, but they did not reach fruition until the early 1960's.[268] Sputnik I on 4 October 1957 and the earlier TASS announcement of an ICBM capability[269] prompted some interest in civil defense, primarily in the form of contracted studies and Congressional hearings. Among these studies were the Gaither Committee Report, two McKinsey and Company reports, a Rockefeller Brothers Fund

[268] DCPA. *The Development of Civil Preparedness in the United States,* p. 5.
[269] SRI. *An Analysis of the U.S.-Soviet Strategic Interaction Process*.

panel report and a RAND "Study of Nonmilitary Defense." The consensus of these studies was that civil defense programs were outdated in light of the new strategic environment and needed improvements in areas ranging from shelter protection to a modification of the existing organizational structure. The most significant proposals appeared in the classified Gaither Committee report on national preparedness and the McKinley and Company finding.[270]

Between November and December of 1957, McKinsey and Company, a private consulting firm commissioned by the Bureau of the Budget to examine existing civil defense programs, produced Part I of a two-part report. In emphasizing the President's role, the "Framework for Improving Non-military Defense Preparedness" recommended that he issue a message acknowledging the importance of non-military defense and the need to remedy the duplicity in the overlapping organization then in existence. Part II, the "Organization for Non-military Defense Preparedness," submitted in March 1968, advocated the abolishment of FCDA and ODM and the establishment of a new agency in the Executive Office of the President. It also called for greater coordination between Federal, State, and local governments.[271]

President Eisenhower requested a study in 1957 which was carried out by H. Rowan Gaither, a former chairman of the board of the Ford Foundation.[272] The Gaither Committee, as it was known, was to review active and passive defense plans against nuclear attack. The results, classified Top Secret for the next 15 years, emphasized the growing Soviet Air Defense capabilities and the vulnerability of U.S. SAC forces. In response to FCDA's 40 billion dollar request for blast and fallout shelters, the Committee recommended a $22 billion long-term fallout shelter construction program, as well as additional funding for civil defense research and planning.[273] Eisenhower followed the advice of the McKinsey report but did nothing to promote the shelter program.

In addition to these recommendations, the Military Operations Sub-committee of the House Committee on Government Operations, chaired by Congressman Chet Holifield, began hearings in 1956 on the inefficient operations of the existing civil defense structure, noting the overlap of FCDA's and ODM's responsibilities.[274] The Committee was motivated in part by a 1955–1956 report in which FCDA officials recommended that FCDA and ODM be consolidated under the administration of a Cabinet Department. Holifield and his followers, in agreement with the unpublicized FCDA proposal, made similar recommendations but did not receive Congressional approval.[275]

Eisenhower took action on these recommendations in April 1958 by requesting that Congress approve Reorganization Plan No. 1, transferring responsibility for all non-military defense functions to the President. In addition, ODM and FCDA were to be consolidated into the Office of Defense and Civilian Mobilization (ODCM) with offices in the Executive Offices of the President. The Plan received approval during the 85th Congress in August, the only alteration in Eisenhower's request being the name change to Office of Civil and Defense Mobilization (OCDM). Public Law 85-606 was also approved, which added responsibility for

[270] Gessert, et al., *Federal Civil Defense Organization*, *The Rationale of Its Development*, p. II-31, 32.
[271] Ibid., pp. II-24, 26.
[272] Wigner, *Who Speaks for Civil Defense?*, p. 40.
[273] Cooling, *The Army Support of Civil Defense 1945–1966: Plans and Policy*, p. V-49.
[274] Gessert, et al., op. cit., p. II-24.
[275] Maxam, William Pierce, *Federal Civil Defense 1946–1963*, p. 162.

civil defense at the Federal level in the form of assistance to the numerous State and local agencies.[276] Leo A. Hoegh took over as Director of the new OCDM and was simultaneously given a seat on the National Security Council as a consequence of the new developments. Presidential responsibility for the new organization was redelegated to Hoegh.[277]

OCDM prepared a National Plan for Emergency Preparedness as well as a National Shelter Policy during Hoegh's tenure.[278] The National Plan attempted to establish a civil defense doctrine on survival plans and assign responsibilities for the various operations at all levels, the guidelines of which were accepted within State and local jurisdictions. However, the Plan was criticized from the start for its "lack of definitiveness within the national strategy."[279] The Shelter Policy urged private citizens to provide their own shelter facilities, approving building loans for the purpose, but public stimulation was not sufficiently strong to motivate excessive construction.[280]

As Frank B. Ellis took over the Directorship of OCDM in March 1961,[281] tensions were growing between the Soviet Union and the United States. The new Kennedy administration faced the end of the "missile gap" scare,[282] an American U-2 spy plane was shot down over the U.S.S.R. in 1960,[283] and in 1961 Khrushchev began threatening to sign a peace treaty with East Germany.[284] In May 1961, prior to the Berlin Crisis, Kennedy publicly endorsed a shelter program. By the time of the Berlin Crisis in July, he was more urgently supporting shelter construction and the education of the public concerning civil defense preparedness.[285] A five-year shelter program was requested by Kennedy in November, with a projected cost of $700 million the first year and $3.5 billion over the remaining years.[286]

In addition to these efforts, Kennedy announced in May that he was assigning responsibility for civil defense to the Secretary of Defense. As a consequence, the Office of Civil Defense was constituted in August under Executive Order No. 10952, OCDM was made a small staff agency under the name Office of Emergency Preparedness (OEP), and Stewart L. Pittman was named by President Kennedy to be the first Assistant Secretary of Defense (Civil defense).[287] Civil defense headquarters which had been moved to Battle Creek, Michigan, in 1954 were transferred back to Washington,[288] allowing for more continuity within the organization. This reorganization, brought on by threatening international situations, denoted a closer relationship between the military and civilian aspects of civil defense. As a result of the 1961 developments and the 1962 Cuban Missile Crisis, the civil defense administrators requested and received their largest budget to date—$207.6 million plus an additional $49.5 million from unexpended OCDM funds.[289]

[276] DCPA, op. cit., p. 6.
[277] Gessert, et al., op. cit., p. II-27.
[278] Ibid., p. II-19.
[279] *Basic Report of Civil Defense and Defense Mobilization*, p. 66–67.
[280] Ibid., p. 71–74.
[281] DCPA, op. cit., p. 6.
[282] SRI, op. cit.
[283] Gessert, et al., op. cit., Appendix – p. 72.
[284] Cooling, op. cit., p. VII-2.
[285] Wigner, op. cit., p. 54.
[286] Ibid., p. 55.
[287] DCPA, op. cit., p. 7.
[288] Gessert, et al., op. cit., Appendix – p. 74.
[289] Cooling, op. cit., p. VII-5.

Pittman, between 1962 and 1964, set about identifying shelter spaces and locations in public buildings for stocking supplies.[290] Although he located as many as 121 million spaces and stocked over 23 million of them by 1964 (Table 28), political support was waning. Congressional hearings on Kennedy's 1961 "Shelter Bill" began in 1963, chaired by Edward Hebert.[291] Secretary of Defense Robert McNamara's efforts to link ABM deployments with an effective shelter program were failing as early as 1964.[292]

Coincident with Pittman's 1964 resignation and the appointment of William P. Durkee as his successor, OCD responsibilities were transferred to the Secretary of the Army,[293] a move considered by some to promote greater military interaction but by others to be politically motivated within the Department of Defense.[294]

McNamara continued voicing his endorsement of civil defense programs and blamed Congress in 1966 for the failure of Kennedy's 1961 five-year shelter program.[295] Although he publicly proclaimed that strategic offensive and defensive forces, including civil defense, constituted the general nuclear war forces of the country,[296] his pro-shelter efforts appeared to have been a ploy to prevent an ABM program.[297]

Durkee resigned his position in December 1966 and Joseph Roam, another advocate of a low-key civil defense program predicated on a fallout shelter system, was appointed the new Director. In 1969 following President Nixon's successful Presidential campaign, John E. Davis was named to succeed Romm.[298]

As those before it, with the exception of Kennedy, the Nixon administration took little more than a token interest to civil defense. In 1969, Nixon combined a number of 1962 Executive Orders which had delegated various emergency preparedness activities to different Cabinet posts and agencies into one Executive Order No. 11490.[299] In the same year, following a press conference query concerning civil defense and ABM systems and at the urging of Congressman Holifield, Nixon ordered General George A. Lincoln, Director of the OEP, to prepare a study, for presentation to the NSC, of civil defense and its costs in relation to a Safeguard system and other force and arms control decisions.[300] A National Security Study Memo (NSSM #57) was submitted by the OEP in mid-1970. Two years later, as OCD was being renamed the Defense Civil Preparedness Agency and reinstated under the Secretary of Defense, a National Security Decision Memo (NSDM #184), signed by Henry Kissinger, relayed President Nixon's decisions on civil defense. The decisions were later publicized in a letter from General Lincoln to Walter Murphy, Editor of the American Journal of Civil Defense, *Survive*, quoting the administration's policy to "maintain the current overall level of effort in its civil defense efforts."[301] These indications persisted in reminding the public and civil defense officials that the political leadership was not taking any steps to improve the existing civil defense structure.

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[290] Wigner, op. cit., p. 43.
[291] House of Representatives, Subcommittee No. 3, Committee on Armed Services, 1963.
[292] See Murdock, *Defense Policy Formation: a Comparative Analysis of the McNamara Era*, p. 123, and Wigner, *Who Speaks for Civil Defense*? p. 44, for a discussion of the Congressional hearings.
[293] DCPA, op. cit., p. 7.
[294] Murdock's discussion of the relationship between McNamara and the Assistant Secretary of Defense (CD), p. 123, hints at political disagreements. This was further substantiated in an interview on May, 1975, with Dr. W. K. Chipman of the DCPA.
[295] See excerpts from House Appropriations Committee transcript in Wigner, *Who speaks for Civil Defense*? p. 55–56.
[296] See, for example, Wigner, *Who Speaks for Civil Defense*?, p. 44–45. and Leonard, *Civil Defense—Its Role in Nuclear Deterrence*.
[297] Murdock, *Defense Policy Formation: a Comparative Analysis of the McNamara Era*, p. 123.
[298] DCPA, op. cit., p. 7–8.
[299] Ibid., p. 8.
[300] Davis, *U.S. Strategic Defensive Concepts, Part II—Passive Defense Measures*, p. 12.
[301] Chipman interview, May, 1975.

C. Threat Perceptions

Other than the "threat to the Homeland" imposed by Soviet missiles in Cuba and Kennedy's July 1961 speech on the intensity of the Berlin Crisis, the United States' public had never experienced a direct threat to their survival. Some may even doubt that these two events were actual threats to the U.S. population. In the mid-1950's, as the U.S.S.R. was steadily gaining in the field of offensive nuclear weapons, the Eisenhower administration resorted to a tight budget and the "massive retaliation" policy of John Foster Dulles. Post-Korean attitudes leaned toward meeting Soviet economic competition rather than preparing for future conventional wars.[302] It was not until 1955, following an explosion of a nuclear device on Bikini Atoll in 1954, that public demands forced the Atomic Energy Commission to release fallout information on a multi-megaton thermonuclear device.[303] Such changes in the strategic environment and pressures on the administration for shelter programs eventually prompted Eisenhower to commission the Gaither Report in 1957, though he largely ignored its recommendations for improved civil defense and shelter programs. This was best explained by Eisenhower's acceptance of Dulles' policy: "For our security we have been relying above all on our capacity for retaliation. From this policy we should not deviate now. To do so would imply we are turning to a 'fortress America' concept."[304]

Other proponents of civil defense were more harsh in their analysis of Eisenhower's contributions to future civil defense programs, claiming his decision to keep the Gaither Report from the public was the beginning of a "deliberate, unpublicized national policy that nuclear defense is hopeless and that reliance should be almost entirely on deterrence."[305] Public awareness of the status of civil defense programs continued to be minimal except in small circles. The Army Mobilization Capabilities Study (AMCS-61) of 1959 was the first of these studies to include bomb damage assumptions and civil defense as an appendix.[306] An official OCDM report in 1961, which estimated casualty figures from a nuclear attack, assumed 60 percent of American lives would be lost compared to the Soviet's 20 percent.[307] Foreign policy analysts expounded their views on the subject: "As the increasing power and speed of delivery vehicles multiply the difficulties of active defense, ever greater importance should be attached to civil defense. While active defense seeks to destroy the largest possible proportion of the enemy attacking force before it reaches its target, civil defense strives to blunt the enemy offensive by reducing as much as possible the damage which it can inflict."[308]

Such statistics, coupled with the Soviet actions in Germany, most likely influenced President Kennedy's civil defense speeches of May and July 1961. In addition, Kennedy was aware of many of the inconsistencies in the existing civil defense structure. His decision to incorporate civil defense into the DOD infrastructure was prompted by desires to integrate civil defense and DOD budgets, take advantage of better management which he felt existed in DOD, and to accelerate the shelter program under DOD's auspices.[309]

The reactions to Kennedy's July 1961 speech informing the public of the Berlin problem further exemplified the public's naiveté concerning nuclear threats:

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[302] *Basic Report* . . . op. cit., p. 36–37.
[303] Gessert, et al., op. cit., Appendix – p. 68.
[304] Eisenhower, *Waging Peace*.
[305] Wigner, op. cit., p. 47.
[306] Cooling, op. cit., p. IV-17.
[307] *Basic Report* . . . op. cit., p. 28.
[308] Kissinger, *Nuclear Weapons and Foreign Policy*, p. 112.
[309] Maxam, op. cit., p. 164–165.

> In the event of an attack, the lives of those families which are not hit in the nuclear blast and fire can still be saved—if they can be warned to take shelter and if that shelter is available. We owe that kind of insurance to our families—and to our country . . . the time to start is now. . . . In the coming months (I will) let every citizen know what steps he can take without delay to protect his family in case of attack. I know that you will want to do no less.[310]

In suggesting that the public take steps to protect themselves, without knowledge that civil defense organizations had no guidelines, Kennedy precipitated a chaotic situation. There was "general panic" at the thought that the U.S. might be attacked. Others took advantage of the situation by attempting to "get rich quick" on "do it yourself" shelter plans, the results of which inaugurated an anti-civil defense constituency.[311] However, by the end of the year, when OCD issued the pamphlet, *Fallout Protection*, and Khrushchev ended his campaign to sign a treaty with East Germany, public apathy was returning[312] and civil defense programs "stepped out of the limelight."

Whatever renewed interest was stirred by the Cuban Missile Crisis the following year was transcended in Congress when Representative Albert Thomas of Texas, a civil defense opponent, was given control of civil defense appropriations and denied funds for additional shelter spaces.[313] Thus, Kennedy's proposed shelter program and the temporary support for civil defense measures the preceding year met with early defeats.

Other than depleting the budget, indirect threats, such as tensions in the Mid-East and Vietnam, did not influence U.S. perceptions regarding civil defense needs. The formal detente overtures of the late 1960's have served to further undermine U.S. funding for civil defense. The perceived Chinese threat, following their firing of a nuclear weapon in 1964, served to initiate civil defense discussions relating to ABM systems, but no significant steps were taken in the area.

One of the greatest threats to U.S. stability since the late 1950's has been the possible failure of deterrence. In 1955, the U.S. Army, in conjunction with State and local civil defense organizations, participated in "Operation Alert," to test the vulnerabilities of the system in the event of a nuclear bomber attack. During the simulation, Eisenhower declared martial law to curb the "hysteria" in the cities, an action that evoked considerable criticism because of the unforeseen demands imposed on the military. However, the act was the crisis toward which civil defense had been building since 1951—that of a conflict between "civil defense planning and American deterrent needs." The Army realized that civil defense should be an "integral part of military strategy,"[314] and the emphasis shifted toward "mutual deterrence" and atomic parity. That same year, Secretary of Defense Charles E. Wilson directed the JCS to change the military role in civil defense.[315]

The Rand and Rockefeller Brothers Fund reports in 1958 found the strategic posture of deterrence to be dependent on civil defense.[316] The Holifield Subcommittee determined that civil defense "must be considered in a strategic sense . . . to be an integral part of the Nation's ability to deter war. . . ."[317] Although the Gaither Committee's shelter recommendations were shelved, the report was used to strengthen areas of the

[310] Wigner, op. cit., p. 41–42.
[311] Ibid., p. 42.
[312] Cooling, op. cit., p. VII-10.
[313] Wigner, op. cit., p. 43.
[314] Cooling, op. cit., p. IV-46.
[315] Ibid., p. V-2.
[316] Gessert, et al., op. cit., p. II-32.
[317] Cooling, op. cit., p. V-25.

strategic deterrent. This prompted General Maxwell Taylor to dispute its findings that the Army was incapable of handling certain eventualities, and he reemphasized the Army's role in civil defense "emergency missions."[318] Major General Earle G. Wheeler, Director of Plans for DCSLOG, felt that the "Army should assume some responsibility for civil defense."[319]

Taylor's attitude had changed considerably since 1956 when, as the new Army Chief of Staff, he had testified: "First I am not responsible for civil defense, I don't want to be responsible for civil defense, and if the Army had to take over any role of this sort, every additional function would have to be paid for in terms of new men and new dollars."[320]

At that time, as he told the Subcommittee, he was still under the impression that the U.S. would not be threatened on her own soil and therefore the Army would be deployed overseas and would not be available in sufficient numbers to participate in civil defense.[321] Air Force General Nathan Twining and Navy Admirals Arthur Radford and Arleigh Burke refuted Taylor, arguing more realistically that atomic offensive operations would not allow such troop movement.[322]

Ten years later deterrence, military capabilities, and civil defense remained a problem. Although civil defense had been made a responsibility of the Secretary of the Army after 1964, the position served little purpose other than cutting civil defense budgets by utilizing Department of the Army personnel in such services as communications and supply.[323]

The Soviets were rapidly approaching parity with the U.S., not only in weapons deployment and expanding technology, but in population growth, economic endeavors, and political stabilization.[324] A 1962 report cited the major threats as "airplane bombing, missiles fired from sub-marines, long-range ballistic missiles, sabotage and espionage, chemical and biological warfare, and propaganda."[325] Although the United States had reacted to Soviet strategic offensive forces, with improvements to their own active defense stockpiles and air defense activities, they had not devoted comparable time to civil defense efforts.[326] Despite the claims of some U.S. civil defense opponents that an improved shelter program would threaten detente, the Soviets continued with shelter construction and increased emphasis on other civil defense activities.[327]

The U.S. military's exaggerated views on the power of offensive measures over defensive measures substantiated the belief that little or nothing could protect the population from the effects of nuclear weapons.[328] The U.S. refused to admit that deterrence could fall. However, if the theory of deterrence and "mutual assured destruction" is based on the idea that no power would ever attack or threaten the U.S. because our retaliatory ability would completely destroy them, then the theory is a myth insofar as Soviet civil defense preparations negate this possibility.[329]

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[318] Ibid., p. V-52.
[319] Ibid., p. V-53.
[320] Subcommittee of the Committee on Government Operations, Testimony by General Maxwell D. Taylor, 1956.
[321] Cooling, op. cit., p. V-21.
[322] Ibid., p. V-22.
[323] Wigner, op. cit., p. 44.
[324] *Basic Report* . . . op. cit., p. 13–14.
[325] Mitchell, *Civil Defense: Planning for Survival and Recovery*, p. 7.
[326] SRI, op. cit.
[327] Schnieder, *Survive*, May–June 1972, p. 11.
[328] Wigner, "The Myth of 'Assured Destruction'", p. 2.
[329] Ibid., p. 4.

D. Congress, Shelters, and the ABM

The mid-1950's and the advent of thermonuclear weapons necessitated a shelter program in the United States. After Sputnik and the ICBM capability in 1957 cut the warning time from six hours to 30 minutes,[330] it was realized evacuation was anachronistic. Under Hoegh's leadership, the newly organized OCDM in 1958 proclaimed a National Shelter Policy. Although a similar policy in 1951 had been initiated, it was felt that the new plan's emphasis on providing shelters in non-target areas to protect against fallout and the desire to be independent of massive Federal funding would insure a successful program.[331] However, the "penny-pinching" Eisenhower Administration, combined with general apathy, never gave the program its needed boost. There were no demands for funds, no requirements for good performance on the part of the Federal agencies involved, and no endorsement by the President in his messages as compared with his push for military defense.[332]

The Army and other DOD elements saw the fallacy in U.S. employment of air atomic strategies without an effective civil defense.[333] However, there was internal disagreement within the Army as to the feasibility of a shelter program. Opponents saw increased shelter protection as a "Maginot line" mentality and feared it would detract from military appropriations.[334] Others, DCSLOG in particular, cited that shelters would lower the responsibilities of the Army as well as allow more of the population to survive. There was also the ever present emphasis on funds for offensive capabilities rather than defensive measures.[335] The military did agree by 1960, however, to promote plans for shelter facilities for air defense units and other military installations.[336]

Frank Ellis, the last Director of OCDM, brought the shelter problem to the attention of President Kennedy in 1961. He cited the need for identifying and equipping shelters in existing structures and suggested that more research and development be done to improve their efficiency.[337]

Kennedy's speech in May 1961 advocating federally funded fallout protection for the population in the form of family and group shelters was not in response to a threat, although two months later the Berlin Crisis further supported his proposals. His decision to place civil defense under Secretary of Defense McNamara's jurisdiction was the turning point in the shelter program controversy. The appointment of Stewart Pittman to head OCD further attempted to accord shelter programs the attention they deserved.

Kennedy's proposed 5-year shelter plan touched off Congressional debates within the Armed Services Committee which lasted through the 1960's. One of the arguments voiced by Congressional opponents against the shelter program claimed there, was inadequate public support. This theory was substantially abrogated by Pittman's 1962–1964 efforts to gain cooperation in locating and stocking shelter spaces. He was able to obtain the commitment of 105,000 building owners (97 percent of those contacted) and 75 percent cooperation from homeowners in identifying basement spaces.[338] In addition, a survey on missile defense, conducted in 1965 by the National Opinion Research Center of the University of Chicago for

[330] *Basic Report* . . . op. cit., p. 35.
[331] Gessert, et al., op. cit., p. II-19.
[332] Maxam, op. cit., p. 163.
[333] Cooling, op. cit., p. V-8.
[334] Ibid., p. V-42.
[335] Ibid., p. V-43.
[336] Ibid., p. VI-38, 39.
[337] *Basic Resort* . . . op. cit., p. 75.
[338] Wigner, op. cit., p. 58.

General Electric TEMPO and ARPA, disproved the "lack of support" theory. It indicated a public acceptability and desire for shelters, therefore disproving the views, of Congress.[339]

The most profound impact on civil defense programs under McNamara was his insistence on the interdependence of ABM deployments and an adequate shelter program. It was the general consensus that an ABM program, with its fallout potential in target areas, was useless without concurrent shelter protection. According to one source:

> Secretary McNamara has indicated in 1965 that he is reluctant to embark on an operational deployment of the Nike-X ABM. He and most of his advisors are logically convinced that an ABM system must be accompanied by an adequate civil defense shelter program, i.e., without fallout shelter programs there is no apparent point in deploying or preparing to deploy a ballistic missile defense of urban areas.[340]

In the 1964 hearing, when Congress was unable to obtain a commitment from McNamara that he would procure an ABM system if shelter appropriations were approved, the "Shelter Bill" was killed.[341] However, the ABM-shelter controversy continued, involving arguments during the Johnson administration on a "thin versus thick" ABM system for use against new Chinese nuclear arms. Since the JCS and Congress advocated a "thick" system, and McNamara was a proponent of a "thin" ABM, agreements were never reached—a result of McNamara's refusal to endorse ABM and the Congress' refusal to endorse a shelter program.[342]

Speculation exists as to McNamara's sincerity in promoting shelter programs. He was known as an advocate of "assured destruction" through offensive measures, subordinating defense to this goal: "Once sufficient forces have been procured to give us high confidence of achieving our Assured Destruction objective, we can then consider the kinds and amounts of forces which might be added to reduce damage to our population and industry in the event deterrence fails."[343]

Pittman has labeled this philosophy the "doctrine of assured vulnerability." Sensing that Congress would appropriate little or nothing to civil defense and shelter programs, McNamara used them as a ploy to prevent ABM deployment. Although ABM and civil defense could be considered alternate means for achieving the same end, it seemed a mistake to neglect the Soviet approach on the same problem and, therefore, the effects on deterrence.

Since these debates, little has been done in this area. The OCD and DCPA have continued to locate and identify existing facilities which might be used for shelter space (see Table 28) but no funds have been requested for stocking these spaces since 1965.[344] Budgets have dropped considerably since 1962, causing the most frustration to OCD officials in 1969 when, because of increased spending in South East Asia it dipped to $61 million (see Figure 32). McNamara, in his budget requests, explained that civil defense requests were being held at "the lowest possible sustaining rate, pending the end of the Vietnam Conflict."[345]

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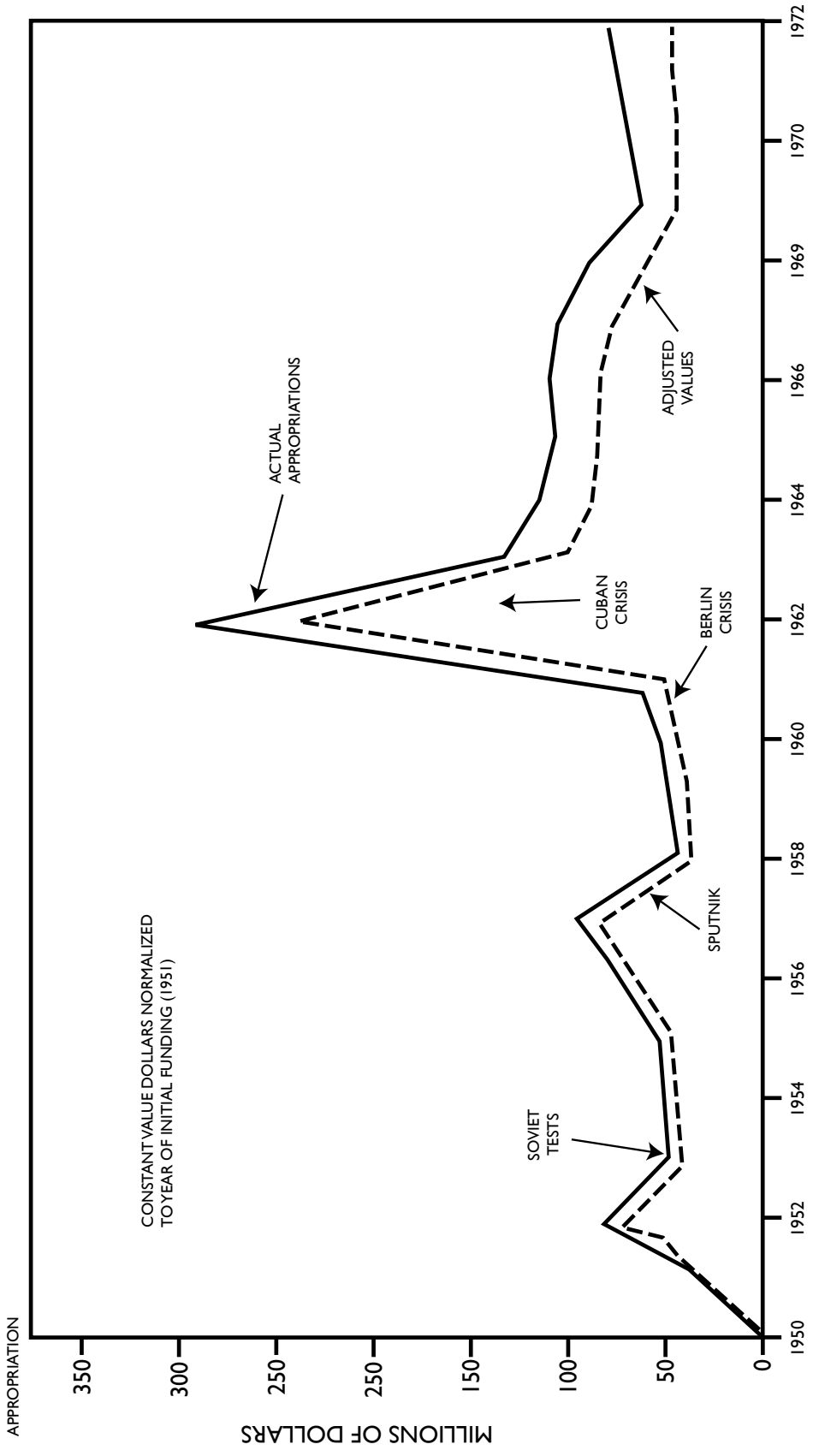
[339] Adams, *Ballistic Missile Defense*, p. 117.
[340] Kintner, et al., *Alternative U.S. Strategies and America's Future*, p. IV-25.
[341] Murdock, op. cit., p. 123.
[342] Wigner, op. cit., p. 99.
[343] Ibid., p. 45.
[344] Chipman interview, May, 1975.
[345] See McNamara, *The Fiscal Year 1969–73 Defense Program and the 1969 Defense Budget (1968)*, p. 76, and Clifford, *The 1970 Defense Budget and Defense Program for Fiscal Years 1970–74 (1969)*, p. 66.

Table 28—U.S. Total Standard Shelter Space Located, Licensed, Market, and Stocked

Year	Located		Licensed		Marked		Stocked		
	Facilities	Spaces (000)	Facilities	Spaces (000)	Facilities	Spaces (000)	Facilities	Spaces	
								Rated Capacity (000)	Stocked Capacity (000)
1963	125,445	103,680	50,046	47,426	53,839	42,771	20,894	16,985	9,715
1964	143,653	121,390	70,724	62,783	79,777	63,761	45,663	36,082	23,800
1965	155,064	135,640	81,789	77,219	87,886	75,894	63,041	56,248	33,814
1966	165,839	149,624	93,032	89,268	95,419	85,286	74,667	68,782	41,294
1967	175,496	160,237	100,468	98,697	101,018	92,664	83,042	78,424	47,066
1968	189,053	176,539	109,725	108,883	107,456	101,053	91,075	88,058	52,748
1969	195,751	188,181	117,221	119,689	108,952	105,082	98,445	96,589	58,489
1970	202,298	194,774	124,533	127,812	110,235	107,501	104,491	103,414	63,837
1971	210,382	203,517	127,957	132,352	117,601	114,388	106,398	106,701	65,630
1972	217,171	212,617	129,149	135,234	118,264	116,448	105,722	107,542	65,431

Figure 32—Civil Defense Appropriations



Between 1945 and 1966 approximately $50 billion were spent on air defenses, with only $1.5 billion allocated to civil defense.[346] It is an established fact that per dollar expanded, more lives could be saved by a fallout shelter system than by ABM or blast shelters.[347] According to Eugene P. Wigner, a civil defense research, the average expenditures per person in the U.S. had dropped from 50 cents in 1967[348] to 35 cents in 1970,[349] not a bright outlook for the future of civil defense.

E. Conclusions

Why has civil defense always been a secondary priority? It was true that it suffered most of the time from insufficient funds, but why was there not sufficient political and public support for civil defense appropriations? Was it the fault of the administration or the public themselves that they were never totally aware of decisions being made and their implications, that they were uninformed and apathetic? Did they actually prefer not to face the reality of the threat or were they not aware that any threat existed?

Civil defense has never achieved a level high enough to change the nation's economy, government budget, or lives and attitudes of the citizens. Only after public pressures and direct enemy threat's were any actions taken, and those resulted in name changes and reorganization from one virtually inconsequential arrangement to another. The history of civil defense in the U.S. has been marked with a series of statements, studies, and proclamations as to what *should* be done, but was not. A multitude of well-meaning persons have drawn up numerous plans for shelters, civil defense education, evacuation, mobilization and post-attack recovery, and other civil defense operations, in attempts to stress the importance of civil defense, but the system has remained grossly inadequate.

Walter Cronkite, in the introduction to Eugene Wigner's book on civil defense, cites cost priorities, political maneuvering, public relations and psychological impacts, and the potential for atomic blackmail as reasons for the inadequate civil defense program, as explanations for the public's concern with immediate threats which quickly abates as other immediate needs supersede these threats.[350] There is an accepted unspoken belief on behalf of the public that the government, or some "abstract being," will protect them from the ravages of nuclear war.[351]

From the standpoint of the less naive, of those involved in the administrative and political aspects of civil defense, there is a feeling, perhaps as an excuse for their personal disinterest, that the public could not accept the impact of an active civil defense program. The constant reminders of the possible horrors of a nuclear war was not a pleasant thought for the spoiled, pampered American public which more often than not has viewed the U.S. as invulnerable.

The trends of the 1970's have not dissipated this eternal apathy. Davis' directorate[352] is focusing on evacuation plans once more, a mode of protection not considered practical since the advent of missile technology. This alternative to the unsupported fallout shelter program and the lack of blast shelters was in accordance with the more recent attempts to relate civil defense to Soviet targeting doctrine and to concentrate on evacuating metropolitan areas and strategic military complexes.

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[346] Wigner, op. cit., p. 95–96.
[347] Ibid., p. 98.
[348] Wigner, op. cit., p. 13.
[349] Wigner, "The Myth . . ." op. cit., p. 4.
[350] Wigner, op. cit., p. 9–11.
[351] Chipman Interview, May, 1975.
[352] Davis, *Strategic Defensive Concepts*, op. cit., p. 9; Schlesinger, *Annual Defense Dept. Report* (1975); and notes from the interview with Dr. W. K. Chipman, May, 1975, further substantiate this trend.

Davis has also supported the de-emphasized role of the Federal administration, delegating more authority and responsibility to the State and local levels. The emphasis on civil defense preparations for natural disasters has placed additional weight on the State and local levels. Whether this increasing lack of Federal assistance is attributable to budgetary or attitudinal problems in the higher echelons is not known. Perhaps their Sisyphean efforts have frustrated them to a feeling of incompetence.

Many civil defense administrators, however, never doubted the effects of or the possibility of a nuclear war. Pittman's 1963 speech to the House Armed Services Committee said it best:

> Those of us who have responsibility for the safety of others cannot brush this responsibility aside with an intuitive feeling that nuclear weapons would never be used just because it would be suicidal, insane, and irrational. This is an easy out, not just for civil defense, but for many other defense activities which we are pursuing as a Nation.
>
> The men at the top of our Government—I am referring to the President and those who were his executive committee during the Cuban Crisis—have had the experience of looking down the wrong end of a gun barrel during the summer of the last Berlin threat, and again during the Cuban threat. They are persuaded that the vast destructive power of nuclear weapons is no adequate assurance that they would not be used. They do not think it likely that these weapons would be used, but they have concluded that there is enough uncertainty to justify moderate steps to reduce potential damage and improve the base for recovery.[353]

In a 1970 speech by Davis, at which time he quoted population losses at 35 to 45 percent and industrial losses at 35 to 55 percent (optimistic figures compared to later quotes), he reminded his audience that neither of these losses can assure destruction if the nation has the "will to survive and adequate preparedness measures."[354] The former does not pose a dilemma for most sane individuals, but the latter has remained the problem of U.S. civil defense since its inception.

[353] Subcommittee No. 3., Committee on Armed Services, House of Representatives, testimony of Steuart Pittman, 1963.
[354] Davis, *U.S. Strategic Defensive Concepts*., op. cit., p. 7.

Chapter V

Soviet Systems for Strategic Defense

A. Introduction

Objectives, slogans, and myths which prevailed in postwar Soviet aviation can be summarized in the phrase, "Further, faster, higher," which traced back to the 1920's. In the course of making a reality of this mythology after World War II, the Soviets were confronted with technological constraints. In 1946, a program was set in motion which would expand the tightest of those constraints—jet engine technology.[1]

Geography confounded the technological constraints. While Stalin wanted an advanced-technology intercontinental bomber,[2] he could not have it. No Soviet engine could support such a design. Tupolev apparently acknowledged the limitation and lost his "Chief Designer" status temporarily because of his honesty. Myasishchev was less forthright and committed himself to a marginally capable engine; the Mya-4 (Bison) resulted.[3] The aircraft was less than successful. An alternative approach used counter-rotating propellers driven by a jet turbine engine was produced by Tupolev eventually with more success. A producible engine to drive either aircraft was not available until 1953 or 1954. Engine technology combined with geography to deny the Soviets an intercontinental jet bomber force until the mid-1950's. Meanwhile, on the order of 1300–1400 TU-4S (Bull) were built as an interim measure. It was not a question of either defense or offense. They did both. With the TU-4 and later the TU-16 (Badger), the lack of a visible and viable system of forwarding basing made the offensive effortless impressive. The aircraft were in capabilities and numbers comparable to our B-29's and B-47's and they effectively projected Soviet offensive, power over the entirety of Western Europe.

The same level of engine technology which produced an unimpressive bomber force, supported an impressive fighter force. By 1955, Soviets had produced 10,000 jet fighters. While technology caused the Soviets to sacrifice range for speed and altitude, geography required large numbers to defend the vast area of the country. Also affecting the number of MiG's was the fact that Mikoyan and Gurevich had molded technology to provide a machine better adapted than that of any competitor to the needs of all potential customers—Soviet Naval Aviation, Frontal Forces and PVO Anti-air Defense. There were a number of additional factors, however, that related to the character and capability of actual aircraft chosen for strategic defense. In the first volume of this study, eight factors were related to the designs produced between 1945 and 1955. In broad terms; they were: (1) perception of air defense, (2) central planning, (3) aviation institutions, (4) preferential information flows, (5) engine allocations, (6) a system of rewards and incentives, (7) incompatible objectives, and (8) personal politics.

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[1] The Post-War Ministry of Aviation Industry Plan is discussed in Book l of the earlier draft of this study, pp. V-20–V-21.
[2] Tokaev, G.A. *Comrade X*, Chapter 27.
[3] [Khrushchev, N.S.] *Khrushchev Remembers: The Last Testament*, pp. 38–39.

The focus of the section that follows is on the process of Soviet decisions and not on the decisions themselves. The focus is one of necessity. U.S. intelligence and the academic community understand a great deal about the process and very little about the decisions themselves. Further, direct access to "critical" decisions is rare, so rare that it should not be used as a channel for routine reportage that forms the basis of analysis. The reason is simple. Spies are shot. Complicating the understanding of decisions are three other considerations. First, Russians are noticeably more reticent about discussing security policy than are Americans. Second, what Russians do say frequently tends to distort rather than illuminate—occasionally it is intended to do so. Khrushehev's statements on the ABM are a classic example. Third, Russian memoirists, few in number, allow a decent time to elapse before telling their version of a decision. Further, changes in administration are not so frequent in the U.S.S.R. and while departing officials sometimes have the opportunity to reflect on their deeds, their access to publishers is by an awkward channel.

The task of analysis is not hopeless though. It is suggested that the process of decision affects the decision itself. The following section examines three aspects of the processes of Soviet forces structure decisions—design, production, and deployment—as they apply to the components of the Soviet strategic defense force. In addition to the major systems of the Soviet defensive structure, an associated area, that of civil defense, will be addressed. Each of the following sections will endeavor to relate observable evidence about the process and the outcome of decisions in order to reflect on the nature of the decisions themselves.

B. The Systems of PVO Strany

PVO Strany, Protivovozdushnaya Oborona Strany or Anti-air Defense of the Country, is the branch of the Soviet military structure concerned with strategic defense. It is distinguished from PVO Voysk which is its counterpart organization assigned to the protection of field forces. Because PVO Strany consists of functional organizations and their associated systems, the following will be addressed in turn:

(1) Aviation of Anti-air Defense—Aviatsiya PVO (APVO)[4]
(2) Anti-aircraft Missile Troops—Zenitno-raketnyye Voyska (ZRV)
(3) Anti-Missile Defense—Protivoraretnyye Obornoa (PRO)
(4) Radio-Technical Troops—Radio-rekhnicheskiye Voyska (RTV)

Although the formal existence and composition of the third, PRO, function is subject to mixed evidence, an organizational structure is perceived to control the Moscow ABM function and to oversea antisatellite capabilities. Each of the following sections will relate how the forces associate with these functions emerged.

1. Systems of Anti-Aircraft Defense Aviation (APVO)

The first volume of this study relates how post war developments in engine design, airframe design and production influenced the composition of the fighter forces which provided the backbone of PVO Strany while it emerged as an independent branch of the Soviet armed forces. In particular the earlier study examined the design process and focused on the decisions which led to the Soviet's first all-weather fighter, the

[4] Formerly identified as IAPVO (Istrebitelnaya Aviatsiya) or Fighter Aviation of Air Defense. The term has been modified since 1970 presumably to account for the role of MOSS (TU-144) Aircraft in PVO Strany.

YAK-25. The following section will continue the examination of the design process and introduce evidence which relates to aircraft production and deployment.

a. Engine Developments

The 1946 Ministry of Aviation Industry plan to achieve technological superiority in jet engine design met with success in the early 1950's. The Mikulin AM-3 axial-flow engine represented a break from dependence on German and British Innovations. The huge engine produced approximately twice the thrust of western engines of the early 1950's.[5] It also represented a lower drag configuration necessary to long-range jet bomber designs. Eventually the AM-3 would power the TU-16 and MYA-4 bombers as well as the Soviets first jet airliner, the TU-104—all aircraft that are still flown today.

The smaller axial flow AM-5 engine available in 1952 made possible the development of the Soviets' first supersonic interceptor, the MiG-19, and their first all-weather area interceptor, the YAK-25. From 1952–1957 Mikulin and his deputy, S. K. Tumansky developed five prototype engines which entered production: the AM-3, RD-3M, AM-5, RD-9B, and the R37F. It was two years after the RD-9B became operational in 1954 that the United States had its first comparable transonic compressor turbojet in production. The RD37F, which was first qualified for production in 1957 has powered numerous generations of the MiG-21. The Foreign Technology Division of the U.S. Air Force Systems Command judges that "the overall performance [of the RD37F], developed in the 1952–1957 period, was found to be superior to currently [1974] operational Western engines for moderate duration, high altitude, and air superiority missions."[6] This FTD finding was based on the exploitation of the actual Soviet engine. Tumansky, the man credited with the design of the RD-37, seems justified in claiming in 1967 that "I particularly value the jet engine installed in the MiG-21 aircraft. Its parameters —weight, dimensions, and specific thrust—have not been excelled in the world practice of engine construction. . . ."[7]

Another bureau had been established in 1947 to pursue axial-flow designs—that of A.M. Lyulka. The most notable success of the Lyulka effort was the 19,850-lb. thrust Mach 2.0 engine that powered the Sukhoi Su-7 and Su-9. Successors of the 1955 AL-7F were eventually rated at 15,432 lbs. and at maximum thrust of 22,046 lbs. with afterburner. The Lyulka contribution, although it represented a significant advantage in size (thrust/volume) when compared with the trend of western development did not exhibit the thrust/weight advantages of the Tumansky engines. Thus, it was destined to be associated with heavier interceptors and attack aircraft.[8]

Although both the Tumansky RD-37 and the Lyulka AL-7 were developed in the late 1950's, they exhibit sufficient differences in technology to allow the conclusion that Soviet engine designers worked quite independently and that they were permitted a rather large degree of freedom in design concepts within manufacturing, material and maintenance constraints.[9]

Hard data are scarce concerning Soviet military engines which entered production subsequent to 1960.[10] It is believed that five engines have been derived from the 1957 Tumansky concepts. These now

[5] DIA, *Air Breathing Propulsion Technology*, ST-CS-04-009-74, p. 7.
[6] DIA, *Fighter Aircraft (Trends) ECC*, ST-CS-09-006-75, p. 8.
[7] DIA, ST-CS-04-009-74, p. 18.
[8] Ibid., pp. 18–20.
[9] DIA, ST-CS-09-006-75, p. 9.
[10] DIA, ST-CS-04-009-74, p. 9.

power the MiG-25, the MiG-23, and the YAK-28. The Mikoyan and Yakovlev association with the Mikulin collective's engines dates back to the 1952 Stalin decisions on the MiG-19 and YAK-25. Sukhoi, however, appears to have maintained his ties with Lyulka, the Su-l5 being powered by an AL-21-F3 engine.[11]

Despite the lack of hard data on engine performance derived from captured equipment, it is known that jet engine development activity has progressed at a nearly constant rate. Between 1947 and 1967 some 22 new turbine engines were qualified—a fairly constant rate of better than one per year.[12]

Soviet jet engines are frequently faulted for their fuel consumption, slow acceleration and short engine life. The short time between overhauls (frequently less than 300 hours as compared, with 1500 hours in U.S. military applications) may be a reflection of high reliability standards which trade frequent overhauls for minimizing field maintenance.[13] Likewise, fuel consumption seems to reflect the lack of Soviet insistence on long-range systems as does the lack of emphasis on the more economical turbo-fan technology. A continuing reliance on the turbojet probably reflects a concentration on maneuverability and high altitude performance (particularly afterburner performance) in favor of fuel economy or range.[14] It appears that the Soviets basic indexes of evaluating engine effectiveness are the "given expenditures per kgf of thrust of the engine per hour"—an index most easily resolved by designing for higher thrust.[15] Likewise a more comprehensive design index which involves a hypothetical aircraft seems most easily resolved by designing for a high thrust/weight ratio. A more general objective also seems clear.

> The basic planning of scientific research work in aircraft engine building is the scientific-technical forecast of aeronautical developments for 10–15 years or more. The scientific-technical forecast determines the basic features and the type of aircraft engines of the future which, by the time of their placement into operation, should considerably surpass the engines of our country and those abroad.[16]

Given such a clear design objective and sustained resources, it follows that engine technology should support an aggressive program of aircraft design. Further, given indices of progress toward this objective which favor thrust in relation to other mission requirements it follows that Soviet engine development has favored advanced fighter design more than advanced bombers.

b. Aircraft Developments

At the 1956 Tushino Air Show, the U.S.S.R. introduced at least four prototype fighters. Two were of a swept-wing design and two were delta-wing aircraft. As in earlier major advances into jet aircraft and into swept-wing designs, a competition cum hedging activity was evident. Two aircraft by Mikoyan employed Tumansky engines, the Ye-2A having a wing swept to 55 degrees and the Ye-5 having a delta wing. These aircraft were respectively dubbed Faceplate and Fishbed by the Air Standards Coordinating Committee. (Another Mikoyan aircraft, the Ye-50, was apparently shown at Tushino. It featured the Faceplate configuration with a rocket motor exhausting above the main jet exhaust.[17]) Two other aircraft by Sukhoi used

[11] Ibid., p. 10.
[12] DIA, ST-CS-09-006-75, pp. 12–14. Although the FTD report mentions a rate of 3 engines every two years, i.e., thirty engines, only twenty-two are discussed.
[13] Ibid.
[14] Ibid., pp. 20–21.
[15] Tikhomirov, V. I. and Paramonov, F. I., *Organizational Planning of Production at Aircraft Engine-Building Plants*, (FTD Trans), p. 180.
[16] Ibid., p. 155.
[17] Green, W. F. and Stroud, J., *Observers Soviet Aircraft Directory*, p. 52.

Lyulka engines in heavier adaptations of the same two major design configurations. The Su-7 with wings swept at 62 degrees and the Su-9 with a 57-degree delta wing.

In 1957, it became apparent that the round of new fighter designs included an area interceptor development effort also. As in the case of the YAK-25 it appears that a multiple application airframe was envisioned, a two-seat, extended-range interceptor or a reconnaissance aircraft. Tupolev's OKB, normally associated with bombers, produced the TU-28P which employed the Lyulka engines. A competitive design, the Lavochkin La-250, was apparently abandoned in 1958.[18] Meanwhile Yakovlev adapted the YAK-25 to improved Tumansky engines and provided a separate model, the YAK-27R (Mangrove), for the reconnaissance requirement. A diagram of these competitive and complementing programs of the 1956–1958 period appears in Figure 33.

Within the Soviet aircraft industry, there is the criterion of design inheritance.

> Design inheritance consists in the fact that the maximum possible number of components, subassemblies and assemblies, taken from previously elaborated and similar designs is used in the new design.
>
> The production of a new product having a high degree of design inheritance does not require the assimilation of an entire new series of components, subassemblies and assemblies and thus shortens the time necessary for its manufacture and assimilation and also lowers the net cost and decreases the volume of production design planning work.
>
> The indicator of the degree of design inheritance is the importance of components taken from previously elaborated and similar designs within the total number of the components of the newly elaborated design.
>
> The design inheritance method also has a negative side; the dogmatic utilization of this method can result in slowing down of the rate of progress of aviation technology. Thus, upon reaching a certain, as a rule high, stage in the development of a given type of aviation design, it is necessary to forsake the design inheritance method and to look for new solutions with the object of substantial improvement of the quality of aircraft equipment.[19]

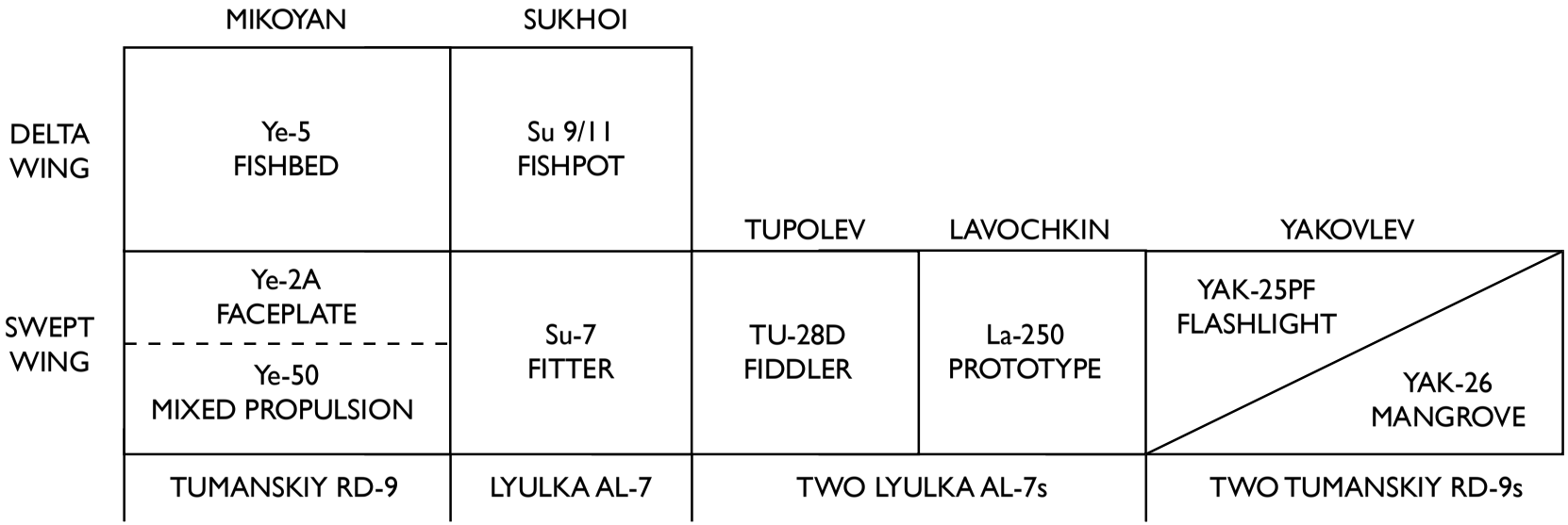
Perhaps the best examples of design inheritance occur in this period of Soviet aviation development. The Su-7 and the Su-9 had essentially the same engines, fuselages, and tail surfaces. The wing structures differentiated capabilities for supersonic interception or for lower speed ground attack, the swept-wing being more suitable for the latter role. The Su-7 was assigned to frontal aviation and the Su-9 to IA-PVO as the Su-11 with some modifications for a nose radome. As a curious and unexplained anomaly, one regiment of the Su-7 appears in the PVO order of battle from 1962 to 1970.

Yakovlev provides other examples of design inheritance. The most notable would be the 1945 adaptation of the YAK-3U to accommodate a jet engine. More relevant to this point in the discussion of Soviet defense capability is the evolution from the YAK-25 to the YAK-28P. The commonality between the YAK-25 area interceptor and the associated reconnaissance aircraft of 1953 was the genesis of at least seven years of design activity. In 1955 the YAK-25 was upgraded with RD-9 engines as the YAK-27P. Again a reconnaissance version was produced on the same concept as the YAK-26 (Mangrove). The design was thoroughly reworked to take advantage of yet another generation of Tumansky engines and lengthened somewhat to provide the YAK-28B tactical bomber (Brewer) and the YAK-28P long-range interceptor in 1960.

At the 1961 Tushino show, an aircraft was introduced which appeared to be an enlarged MiG-21 which mounted two engines and large air-to-air missiles. It was designated Flipper in the West while the Mikoyan

[18] Ibid., p. 66.
[19] Andrianov, D. P., et al., *Management, Planning and Economics of Aircraft Production*, (FTD Trans.) pp. 295–296.

Figure 33—Fighter Design Activities, 1956–1958



designation is thought to be I-75F. Four months later, the Soviets claimed a world speed record of 1,492 mph for an aircraft designated the Ye-166. However, the record setting aircraft was claimed to have but one engine. Not until the Ye-166 was displayed in 1967 did it become evident that it and the two-engine Flipper were single and twin-engine versions of the same basic design. Conjecture is that the Flipper was abandoned because the missiles proved too difficult to develop or that the size of the supporting radome justified a change of design approach toward jet inlets on the side of the fuselage. It is also possible that the exploitation of U.S. Sidewinder technology in the Atoll missile allowed the Flipper mission requirement to be satisfied by a modification of the MiG-21.[20]

In 1967, nine new fighters were demonstrated to westerners at the Domodedovo show. Competitive designs were apparent among a number of variable-geometry wing and VSTOL aircraft. Most of the new designs had high speed capabilities in excess of Mach 2. However, two complementing designs appeared which had potential application to strategic air defense—the Su-15 and the MiG-25.

The Su-15 appears to be the earlier of the two designs to fly, probably in 1964 or 1965. It appears to have been intended for replacement of the aging fleet of Su-9/11 aircraft. As such it is a short-range interceptor having a moderately high altitude capability. It features side engine inlets which facilitate a large radome and a sufficient size to accommodate the electronics associated with an advanced automated data link system. As another example of design inheritance, it featured stabilizers, wing sections, canopy, missiles, and radome from the predecessor Su-11. The engine derived from late-model MiG-21's.[21]

The MiG-25, also first shown in 1967, has the characteristics of an aircraft designed for intercepts at extremely high altitudes and speeds. It had speed and altitude characteristics in excess of any aircraft then operational in the world with the notable exception of the U.S SR-71. The interceptor is generally associated with the Ye-266 experimental craft which set sustained speed records of 1,411 mph in April of 1965.[22]

Although there was an initial argument that such a capable aircraft would be assigned to an air superiority role with Frontal Aviation, it has since become clear that the MiG-25 in its interceptor version has been deployed with the APVO. A high-speed reconnaissance version has been deployed with Frontal Aviation.[23]

It is noteworthy that, thus far, there appear to have been no competing aircraft prototypes associated with either the Su-15 or the MiG-25 requirements. The tradition of design competition was much in evidence in 1967 with respect to variable-geometry wing and VSTOL aircraft, but the two PVO aircraft were evidently developed in complementary, non-competitive programs. Competitive designs, if there were any, were abandoned before prototype construction—possibly at the stage of design approval or mock-up.

c. Aircraft Design Trends

The MiG-25 closes a significant gap in aircraft performance between the mainstream of Soviet fighters and the performance of long-range interceptors. Since WWII each successive generation of Soviet fighters has demonstrated increased speed and altitude compared to its predecessor. The YAK-25, in 1955, departed from this overall trend, however. It represented a distinct sacrifice of performance to gain range

[20] Green, W. F. and Stroud, J., op. cit., p. 72.
[21] FTD, *U.S.S.R. Aerospace R&D Overview*, FTD-CW-01-05-74, page unnumbered.
[22] Green, W. F., and Stroud, J., op. cit., p. 19.
[23] DIA, DI-3 Working Papers.

and to accommodate the bulky accouterments of an all-weather capability. Successive modifications of the Yakovlev aircraft maintained this trend while the Tupolev fighter epitomized it. The MiG-25, however, represents a merger of the two trends of development. It apparently signifies the increased importance of range and avionics equipment. Likewise it represents heavier designs required for higher and higher speeds. The very light short-range vehicle of the MiG-21 genre is eliminated in this progression. Meanwhile improvements in propulsion technology have provided engines which allow heavier aircraft to achieve higher speeds and altitudes.

The neglect of range and avionics requirements may be illustrated by the Soviets reluctance to abandon nose inlets. These require that a large proportion of the fuselage be used for ducting which obviated internal space for fuel and electronic gear. One alternative, initiated by Yakovlev was to mount engines under the wings in pods, but such an approach results in drag as a result of both frontal and surface (wetted) area. It was not until the Tupolev fighter that the Soviets resorted to side inlets to release a large volume for fuel and electronics in the fuselage. Notably, both the Su-15 and MiG-25 also feature side inlets.[24]

d. The Aircraft Industry

The aircraft industry retained its WWII character through the regime of Stalin. With his death on 5 March 1953, however, the industry was caught up in the wave of party and government reorganization. On March 15, Malenkov announced to the Presidium a consolidation of eight manufacturing ministries in two ministries. Concurrently, the Ministry of Armaments Production and the Ministry of Aviation Industry were merged to form the Ministry of Defense Industry. The former head of Armaments, D. F. Ustinov, would head the merger. The rejection of M. V. Krunichev, the former aviation chief, prompted speculation that the aviation industry had lost its special status. The reorganization was short-lived, however. The Ministry of Aviation Industry was reinstituted as a separate entity on 15 September 1953 with Peter Dementyev, Krunichev's long-time deputy, as its head. Thus, the aviation industry retained its status through the early post-Stalin changes.[25]

The verbiage which accompanied the political shuffles of 1953 aimed at increased efficiency throughout Soviet industry.

> The Plenum of the Central Committee Communist Party U.S.S.R., in September 1953, uncovered a number of serious shortcomings in the work of the administrative apparatus. It stated that the major shortcoming in the administration of production was the official-bureaucratic style of management, in which the administrative apparatus spends most of its time, not in improving production and in organizational work among the workmen, but in composing, and filling out numerous technical, planning, statistical, and other papers, in holding meetings and conferences, thus losing its initiative and failing to notice shortcoming.[26]

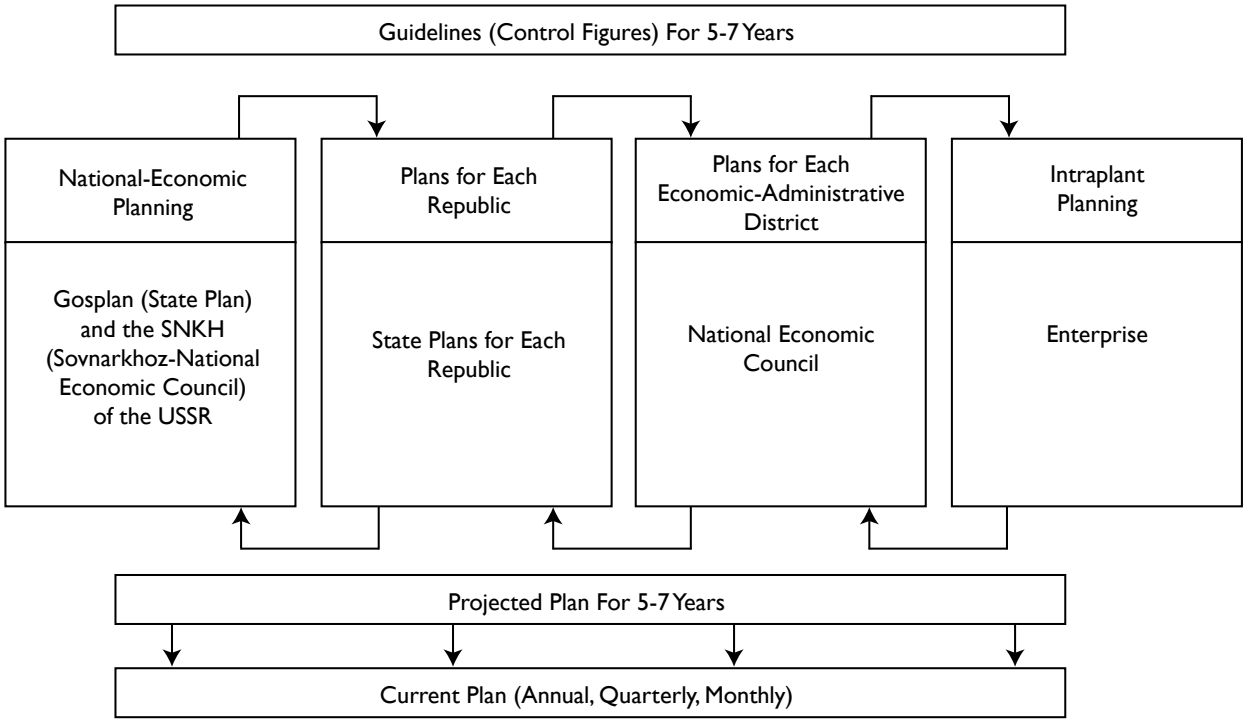
Among the necessary responses was a demand for reduced paperwork. Four years later it was claimed that documentation in the aviation industry had been cut by four-fifths.[27]

It was not until December of 1957 that another reorganization affected aviation in the wake of the decentralization campaign which began earlier that May. Dement'yev was named Chairman of the State Committee on Aviation Technology. The change indicated that the ministry, reconstituted as a commit-

[24] DIA, ST-CS-009-006-75, p. 37.
[25] CIA, *The Aircraft Industry of the U.S.S.R.*, RR-50, January 1955, p. 10.
[26] Tikhomirov, V. I., *Organization and Planning of an Aircraft Construction Enterprise*, (FTD Trans.) p. 162.
[27] Ibid., pp. 162–163.

tee, would have more responsibilities for technological coordination[28] while the State Planning Committee (Gosplan) and the newly formed Councils of National Economy (Sovnarkhozy) assumed a role in aviation production planning. The most important effect of the reorganization was that it expanded the authority of plant managers and put the industry on a cost-accounting basis within the context of annual technical-industrial-financial (Techpromfin) plans. The web of planning activities which subsequently involved individual aviation plants is diagrammed in Figures 34 and 35. Notably, within the context of the 1957 reorganization, the design bureaus (OKB's) remained directly subordinate to the State Committee on Aviation Technology. The OKB's and their associated fabrication facilities were in large part exempted from the profit standards of the accounting system as "State-budgeted development enterprises."[29]

Figure 34—The Basic Links of the Socialist Planning System, 1957–1965

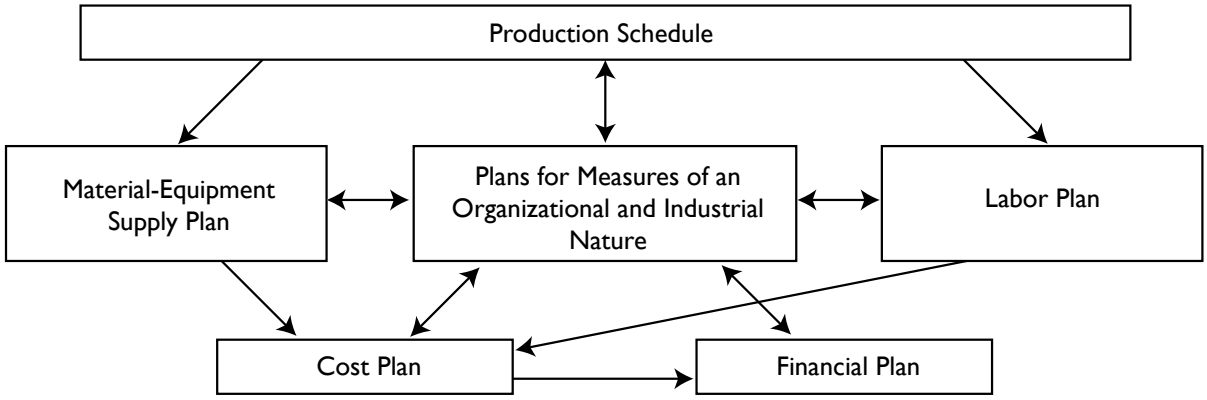


SOURCE: D.P. Audrianov, et al., Management Planning and Economics of Aircraft Production, Moscow, 1963 (FTD Trans.) pp. 556–57.

The aircraft industry was modernized somewhat between 1953 and 1957. New construction was not prominent prior to 1950 and a lack of planning was evident. The production of bombers and transports had been frequently limited by the size and height of assembly buildings. For example, to produce the 11–18 (Coot) at the Moscow 30 plant, portions of the roof trusses were cut out to allow installation of the vertical stabilizer and holes were made in the wall to allow wings to protrude. Aircraft were produced in batches and disassembled for removal.[30] New construction during the period was primarily aimed at relieving such limitations at bomber and transport plants. In conjunction with modernization, a number of plants were deactivated after 1955.

[28] CIA, *The Aircraft Industry of the U.S.S.R.: 1954–59*, RR ER 60-9, May 1960, p. 10.
[29] Tikhomirov, V. I., op. cit., p. 24, and Andrianov, D. P., et al., op. cit., p. 292.
[30] CIA, ER 60-9, p. 7, and interview with CIA aircraft production analyst, 28 April 1975.

Figure 35—Organization and Interrelationship Between Basic Sections of the Industrial Financial Plan of an Aircraft Plant



SOURCE: D.P. Audrianov, et al., Management Planning and Economics of Aircraft Production, Moscow, 1963 (FTD Trans.) pp. 556–57.

The aircraft industry, despite modernization and some increase in floor space, declined precipitously in production after 1955. Numbers of aircraft produced declined from an estimated 6,800 in 1955 to 2,200 in 1959—a decline of 68 percent. Airframe weight declined an estimated 81,000,000 to 28,000,000 lbs. a decline of 74 percent.[31] Fighter production declined 90 percent, from 3150 to 305 aircraft, during the same period. The year 1959 represents the bottom of the trend as the new generation of MiG-21 and Sukhoi fighters were just beginning production.

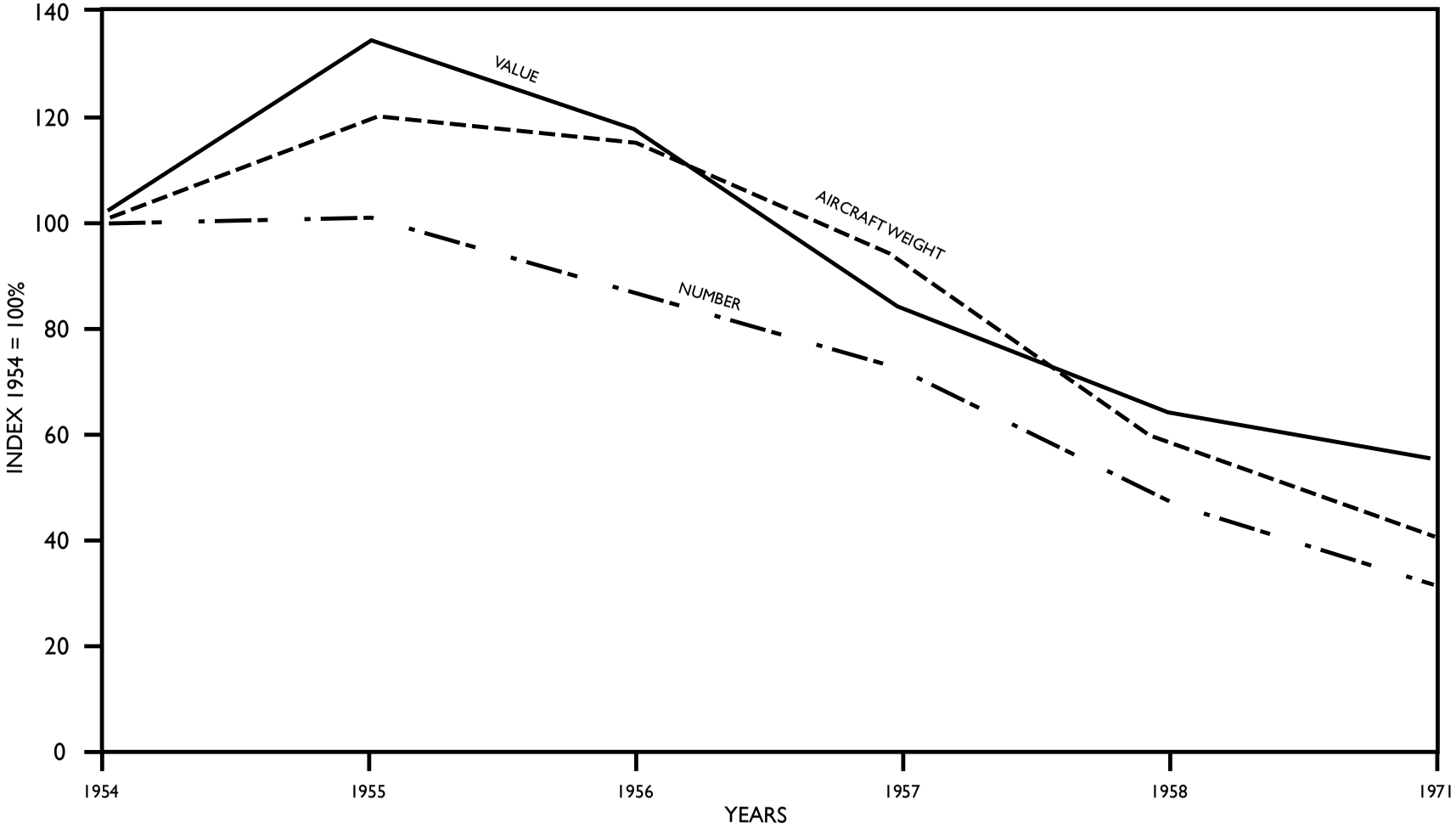
The character of the industry changed during the late 1950's. Sometime during the period it appears that one shift was adopted instead of two-shift operations as a standard for the industry.[32] Guidance for the industry which included an emphasis on the variability of defense requirements and the maintenance of a mobilization capacity gave way to guidance which omitted such emphasis.[33] More importantly, the emphasis of the industry shifted from combat aircraft to civilian and military transports. Figures 36 and 37 represent the decline in production and the shift in the application of production.

In a wider context, there was a world-wide decrease in fighter production during the same period. U.S. production declined 64 percent between 1955 and 1958 while the production of other nations (except U.S.S.R.) also declined by about 72 percent.[34] The world-wide trend points to some general factors which affected aircraft production of the time. They might be summarized by the term "complexity." Aircraft approaching Mach 2 required finer tolerances, better electronics, and new production techniques. Contrasted with the MiG-15 which was put in production 3 months after it first flew, the MiG-21 did not enter production until more than two years after the prototype appeared in 1956. Complex aircraft required more time to develop and to produce. Complexity and time also reflected in costs. Costs of basic fighters doubled or tripled during the early 1950's.[35]

Several factors were peculiar to Soviet fighter production, however. First were the forthcoming Sukhoi and MiG fighters which only began production in 1958 and 1959. The Mikoyan and Yakovlev aircraft of

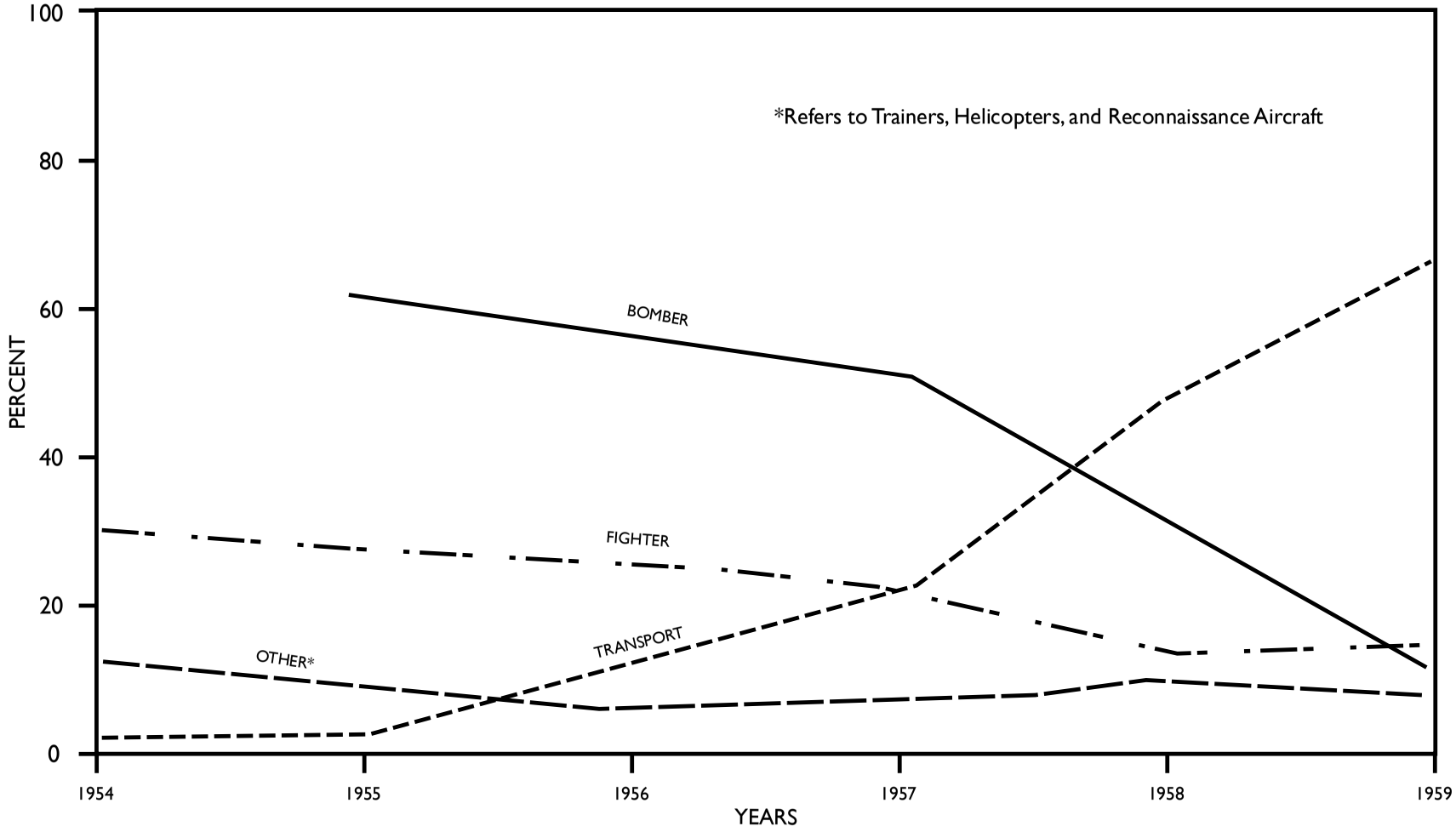
[31] CIA, ER 60-9, p. 47.
[32] Interview with CIA Production analyst, 28 April 1975.
[33] Tikhomirov, V. I., op. cit., pp. 19–21, versus Andrianov, D. P., et al., passim.
[34] "Soviet Fighter Production Shows Sharp Decline," *Air Intelligence Digest*, April 1959, p. 25.
[35] The Price of the F-84 was about $500,000, while the price of the later F-100 was about $1,500,000. Ibid., p. 13.

Figure 36—U.S.S.R.: Indexes of Estimated Production of Aircraft by Number, Airframe Weight, and Value,* Including Initial Spares, 1954–1959



*Value is defined as the expenditure for the procurement of the aircraft based on dollar figures.
Source: The Aircraft Industry of the USSR, 1954–1959, CIA, May1960.

Figure 37—U.S.S.R.: Distribution of Estimated Expenditures for Procurement of Aircraft, Including Initial Spares, 1954–1959



the late fifties suffered from extraordinarily quick obsolescence. Second was the relatively unspectacular improvement of the YAK-25 and MiG-19 aircraft over their predecessors. Although the axial engines were a breakthrough, the real payoff of the new technology did not come until the late 1950's. Likewise, the performance of the YAK-25 air intercept radar system would be obsolescent by 1960. A third factor was that air-to-air missiles were a proximate technology which had not then been incorporated into earlier production designs. The political necessity of such designs will be discussed later.

The decline of bomber production may be more easily explained. It would seem that bombers were in direct competition with missiles for the strategic offensive mission. In August 1957, the Soviets experienced their first fully successful ICBM test. In September, Mya-4 (Bison) production, which had peaked at three per month, began to decrease. During 1958, production averaged only one aircraft per month. Although the production of the Mya-4 resumed at the rate of two per month in 1959, the curtailment of the program is correlated too closely with missile success not to presume some causality. Likewise it is believed that Tu-16 (Badger) production stopped at two of three producer plants in 1958 and ceased altogether in 1959.[36]

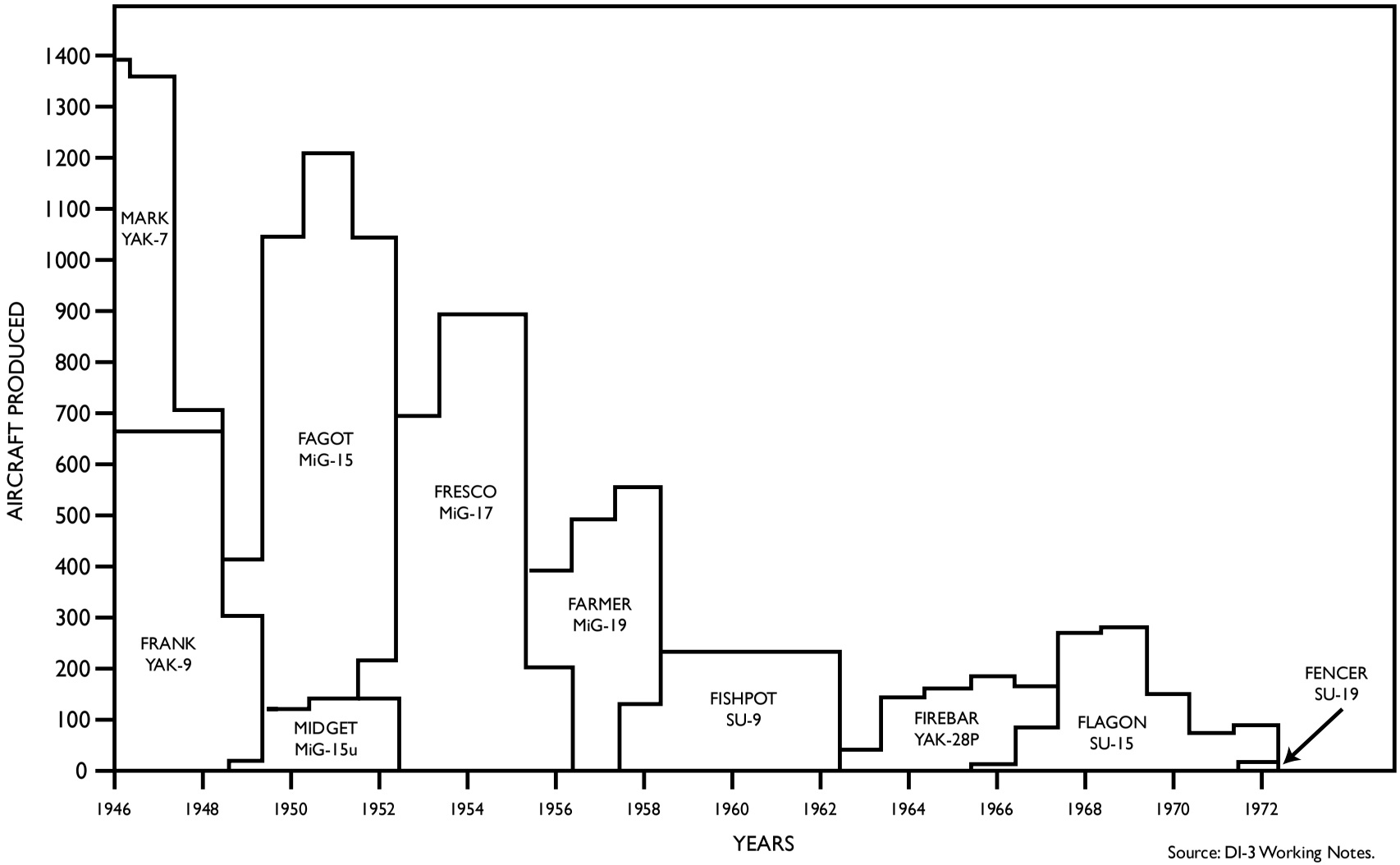
In the mid 1960's, the aviation industry regained its organizational strength. In 1965, subsequent to Khrushchev's deposition, the Sovnarkozy were divested of their functions in aviation production planning and the Ministry of Aviation Industry resumed its traditional authority over the industry. This reorganization, appeared to have such little impact that it might be assumed the system of regional economic councils had had little real effect on aviation production activities. Usefulness of the system was probably limited to assuring the flow of materials to the industry from regional sources. Otherwise the Sovnarkozy represented an additional layer of bureaucracy which ultimately relied on the Gosplan and Ministry of Defense for relevant decisions.

During the 1960's aviation procurement remained stable. Within the overall procurement budget, Ministry of Aviation Industry products consistently occupied between 45 and 50 percent of the overall budget for acquisition of major military systems.[37] This stability is reflected further by a regularization of the source of APVO aircraft. One plant, Novosibirsk 153, provided the majority of PVO aircraft during the decade. Only the Tu-128P, of a size comparable to a bomber, was produced in facilities which accommodated other Tupolev bomber and transport activities. The Su-7 was basically a Frontal Aviation aircraft and the 35 aircraft deployed to PVO were apparently drawn from the tactical force production series. The one apparent deviation from a stable pattern of APVO investment occurs in 1963 as Novosibirsk changed from Su-11 to YAK-28 production.[38]

Even the more recent MiG-25 production is notable for its leisurely pace and lack of impact on the industry.[39] The MiG-25 does depart from the pattern of Novosibirsk production for PVO; it is manufactured at Gorkiy plant 21 which has produced only, Mikoyan aircraft since 1948. Meanwhile, at Novosibirsk, a tactical fighter, the Su-19 (Fencer), has started production to maintain that plant's tie with Sukhoi.[40] Novosibirsk production is detailed in Figure 38.

[36] CIA, ER 60-9, pp. 14–16.
[37] See resource allocation discussion Chapter III.
[38] Figure V-6.
[39] Interview with DIA Aircraft Production Analyst, 21 April 1968.
[40] Figure V-6.

Figure 38—Estimated Production Novosibirsk Plant 153



Source: DI-3 Working Notes.

e. Competition Between Aircraft and Missiles

In the fall of 1957, Khrushchev stated that "Mankind [is] at the threshold of a technological development when fighter and bomber planes [are] relegated to the museums and rockets, against which there is no defense, [take] their place."[41] That same year he said of manned bombers, "You might as well throw them into the fire."[42] a more revealing statement was offered by Marshal Vershinin, in September of 1957:

> Bombers are, of course, still being built. . . . But rocket weapons today make questionable the wisdom of developing bomber forces because the former are more dependable and surer weapons.
>
> From the history of World War II, we know how many bombers returned from their missions and how many failed to reach their target areas. For a rocket to fail to reach the target is practically out of the question. None of the modern anti-aircraft means are effective against these rockets.[43]

Although the competition for a strategic mission affected bomber production, it seems clear that the competition for resources did not. Design and fabrication of offensive missiles took place within the Ministry of Defense Industries. Later in 1964 the Ministry of General Machine Building was established as a separate entity for ballistic missile and spacecraft development and production. Despite the similarity between aircraft and missile production resources there does not seem to have been a significant transfer of people or plants from one activity to the other. Curtailment of bomber production left the aviation industry with surplus resources.[44]

A similar competition for a mission seems to have taken place between missile and aircraft air defense weapons. The clearest statement of the conflict was that of Col. General Gastilovich writing in the first of the classified volumes of Military Thought: ". . . [F]ighter aviation within the system of anti-aircraft defense will become archaic in the near future. It is needed only until anti-aircraft missiles have achieved the necessary technical perfection."[45] A number of self-serving arguments were produced in the context of the classified discussion by representatives of aviation on the one hand and of artillery on the other. The latter were to dominate both the strategic Rocket Forces and the PVO missile units (ZRV) which replaced antiaircraft artillery. Thus a consensus arose on the appropriateness of replacing AAA where the same individuals would assume the more modern mission. Conflict did arise on the appropriateness of deleting the aviators' mission, however. Eventually, a formulation arose in which the air forces embraced the missile and promoted air defense aircraft as a mobile launch platform. ". . . [T]he guided missile weapon of the air-to-air class is acquiring increasing significance and is becoming the main type of weapon of modern fighters."[46]

In the same context, a more blatant, but less successful case was made for the bomber. "As a matter of fact, the mother aircraft becomes the missile carrying aircraft and the commonly used term 'bomber' will obviously disappear with time from our military lexicon and be replaced with the term 'missile-carrier.'"[47]

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[41] FBIS, *Soviet Statement on Antimissile Defense Capability*, RS. 83, 10 February 1957, p. 3. From a ADN news account of East German Embassy Reception 8 October 1957.
[42] CIA, RR 60-9, p. 34.
[43] FBIS, op. cit., p. 2. From Pravda, 8 September 1957.
[44] CIA, RR 60-9, pp. 33–34. Previously ICBM production had been in the Ministry of Defense Industries.
[45] Gastilovich, A. I., "The Theory of Military Art Needs Review" *Military Thought*, Top Secret First Issue, 1960. Also see Chapter III for detailed discussion.
[46] Sinyakov, S. and Kozhernikov, M., "The Air Forces in the New Stage of Development of the New Soviet Armed Forces". *Military Thought*, Top Secret Third Issue, 1960 (CSDB3/649, 109) p. 7.
[47] Ibid., p. 6.

In reality, the classified argument was somewhat a sham. By the time these discussions took place in 1960, Novosibirsk 153 was producing Sukhoi fighters at its peak rate. The associated air-to-air missiles had also been committed to production. Although the Tupolev long-range interceptor, the Tu-128P, may have also been selected for production, a recognition of the need to kill "missile carriers" before the launch of their weapons may have been considered in the eventual commitment to a 1966 deployment of the large Tupolev interceptor. Likewise, SA-2 deployment was underway at its peak rate. The discussion of the relative merits of aircraft versus missiles appears to have been resolved earlier, at least as far as PVO Strany forces were concerned.

As the outcome of competition between fighters and missiles for a mission is less than clear cut, neither is the competition for resources as easily resolved. Both fighters and aerodynamic missiles fell to the Ministry of Aviation Industry for development and production. Some aviation industry personnel, the Lavochkin design team for example, were involved in air defense missile programs. Likewise, some aviation production facilities were converted to surface-to-air missile construction. In some cases missiles and aircraft were produced in the same plant.[48] In face of the 75 percent drop in industry productivity (measured by weight) during the period when missiles were being introduced to quantity production, it appears that aerodynamic missiles may well have been a useful activity with which to absorb the surplus of productive capacity resulting from curtailed aircraft programs. A resource constraint appears unlikely.

The suggestion that considerable slack existed in the aviation industry during the late fifties raises the question of how excess capacity was employed if not applied to missile programs. It seems that a significant portion of the industry turned to the manufacture of consumer goods. Such a tradition was of long standing in the industry. In addressing excess (mobilization) capacity, a textbook on aviation construction states: "All this creates reserve capacity at the aircraft construction plants, which is used in peacetime mainly for the production of a widely varying line of civilian goods."[49] A later text states:

> The achievement of mobility and maneuverability at various levels of production and at various periods of time results in unavoidable reserves of production capacity on the part of the aircraft industry (in terms of production space, plant, equipment, etc.). Therefore, for the total utilization of existing production capacity the aircraft industry produces ship engines, refrigerators, vacuum cleaners, etc., in addition to the output of aviation equipment.[50]

The production of consumer goods appears to have persisted into the 1960's. In 1967, according to Ministry spokesman, plants of the aviation industry produced 411 types of civilian products: Among those were half of the country's total production of vacuum cleaners. Goals for 1968 were for 585,000 vacuums, 300,000 refrigerators, 240,000 washing machines, and 65,000 tape recorders.[51] One of the reasons for this application of resources may be that the skilled manpower pool built up during the huge production runs of the early 1950's may have been one of the few sources that Khrushchev and his successors could turn to for a reasonable quality of consumer production. The result was that toy horses were built on a parallel line to the production line for Il-18 transports.[52]

[48] Interview with DIA Aircraft Production Analyst, 21 April 1968.
[49] Tikhomirov, V. I., op. cit., p. 19.
[50] Andrianov, D. P., et al., op. cit., p. 18.
[51] Gregory, W. H., "Soviet Union Seeks Balance in Technology" *Aviation Week*, 18 March 1968, p. 85.
[52] Ibid.

f. APVO Deployment

1) Quantity Versus Quality

The number of aircraft assigned to strategic defense of the Soviet Union has ranged from a peak of 4,675 aircraft in 1959 to 3,071 in 1972. The decline in numbers should not mask the overall size of the force, it represents a sustained commitment to strategic air defense.[53]

The force has improved in quality throughout the period of declining numbers. Aircraft withdrawn from the force have been replaced with better armed, all-weather aircraft. As an index of quality, the proportion of the force representing an all-weather capability is displayed in Figure 39. The MiG-15 aircraft were phased out in 1964 and thereafter essentially the same rate of attrition was applied to the MiG-17.

The apparent peak in 1959 is a quantitative illusion caused by the reorganization of Soviet Naval Aviation in 1956 and 1957.[54] Prior to that time, designated naval fighters were assigned the PVO function but remained under naval control. Operationally, these aircraft protected the areas of naval facilities and were a segment of PVO perimeter defense. Their actual operations were coordinated by Air Defense Districts and like other APVO units working through subdistrict filter centers. In 1956, these defensive aircraft were subordinated to PVO Strany. The organizational transfer resulted in 500 additional aircraft appearing in the APVO order of battle during 1958 and 1959. In reality, these had been performing the same PVO function prior to the transfer.[55]

2) Defense Priorities

The order of Soviet defense priorities is demonstrated by the deployment pattern of APVO aircraft. Since World War II, Moscow, Leningrad, and Baku have been the most prominent areas of Soviet defense concern. In general, new systems have been deployed to these areas in the stated order. Reference to the deployment of the medium range YAK-28P, Figure 40, indicates the general areas of priority defense.[56] Aircraft with shorter range than the YAK, concentrate in these same areas but somewhat more to the periphery of the country. Figure 41 displays the Tu-128 deployment to illustrate how its long range has been used to cover awkward eastern approaches to Moscow and to cover gaps toward the interior of the country. The Tupolev fighter has also been equipped to work with the Tu-114 (Moss) Airborne Warning and Control System. In effect, the radar-equipped AWACS extends the coverage of ground-based control radars. Activities of the AWACS indicate that it was deployed primarily to provide extended coverage of the Northern ocean approaches to the Western U.S.S.R. In general, these deployment patterns conform to the distribution of population and industrial capacity in the Soviet Union. Defense of peripheral areas with overland approaches, for example the China Border and the Western periphery, is supplemented by interceptor aircraft assigned to tactical air forces. Under the integrating concept of air defense operations, however, these tactical aviation aircraft would be under operational control of PVO Strany in the event of an attack on the U.S.S.R.

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[53] Figure V-7.
[54] CIA, *National Intelligence Survey, Volume 26, Section 83*, April 1961.
[55] See Book I, Vol. I, Chap. III of earlier draft for PVO Command Relationships.
[56] See "U.S.S.R.'s Best-Defended Areas," *Air Intelligence Digest*, April 1957, pp. 21–25.

Figure 39—Estimated APV0 Aircraft

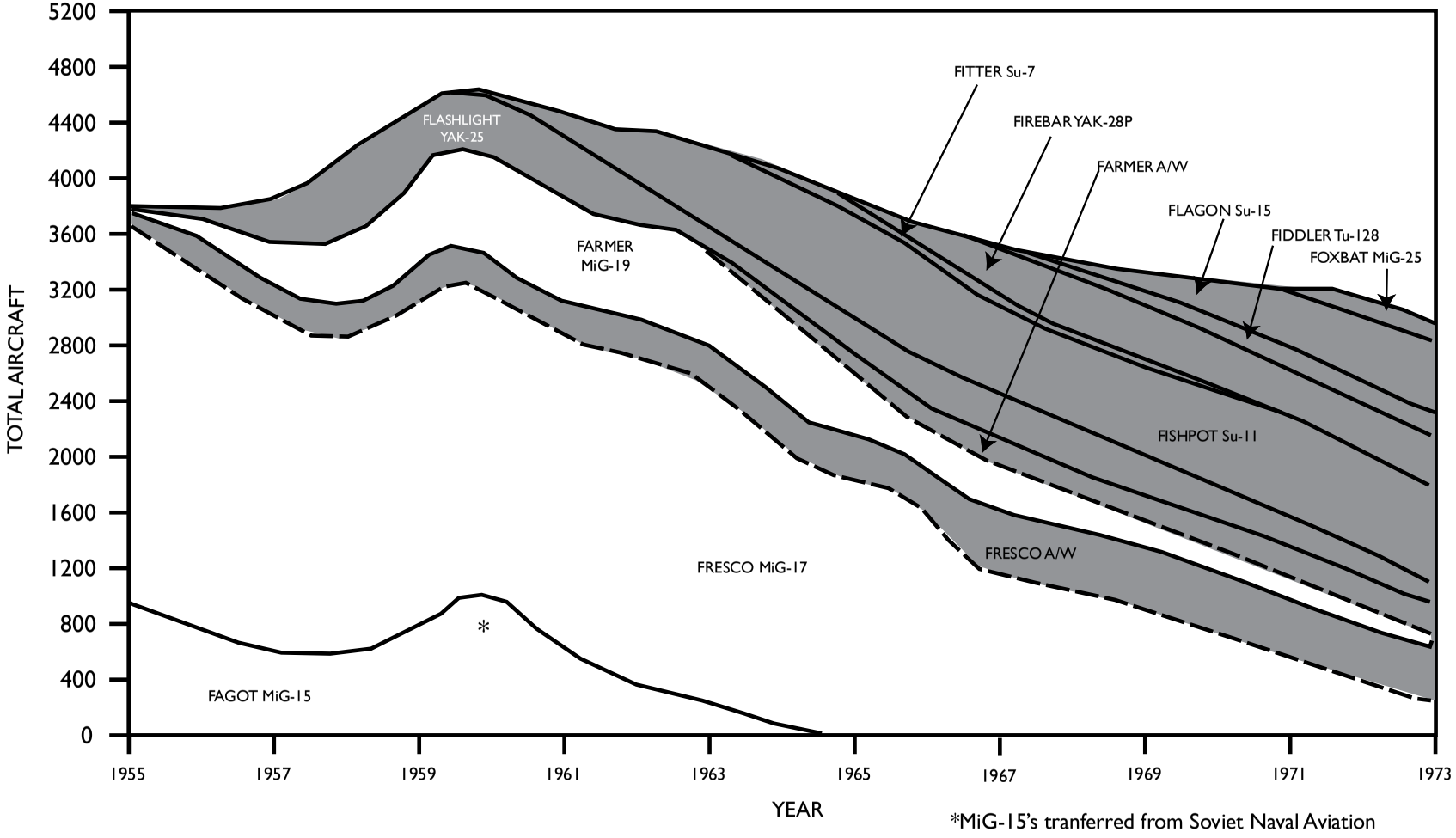
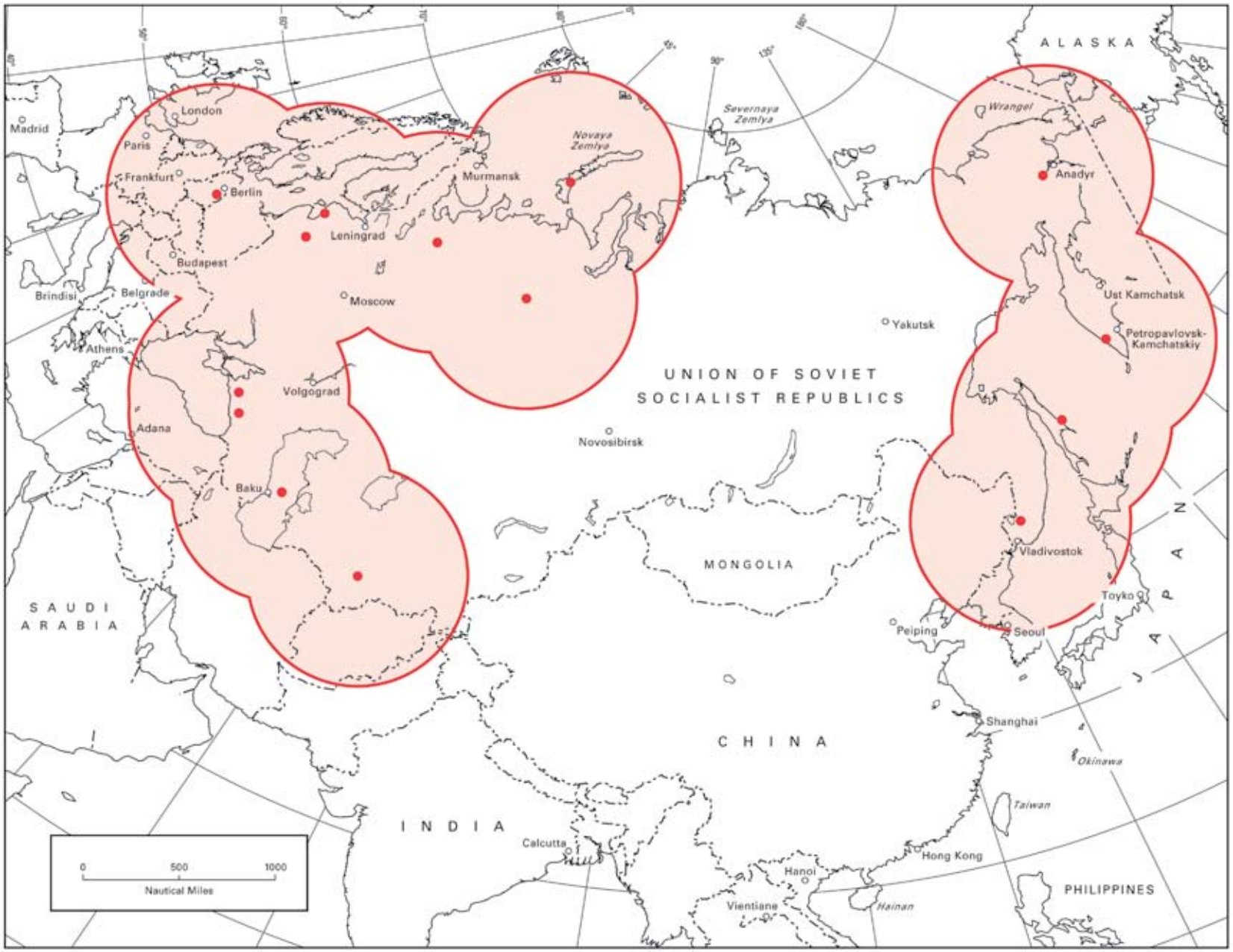
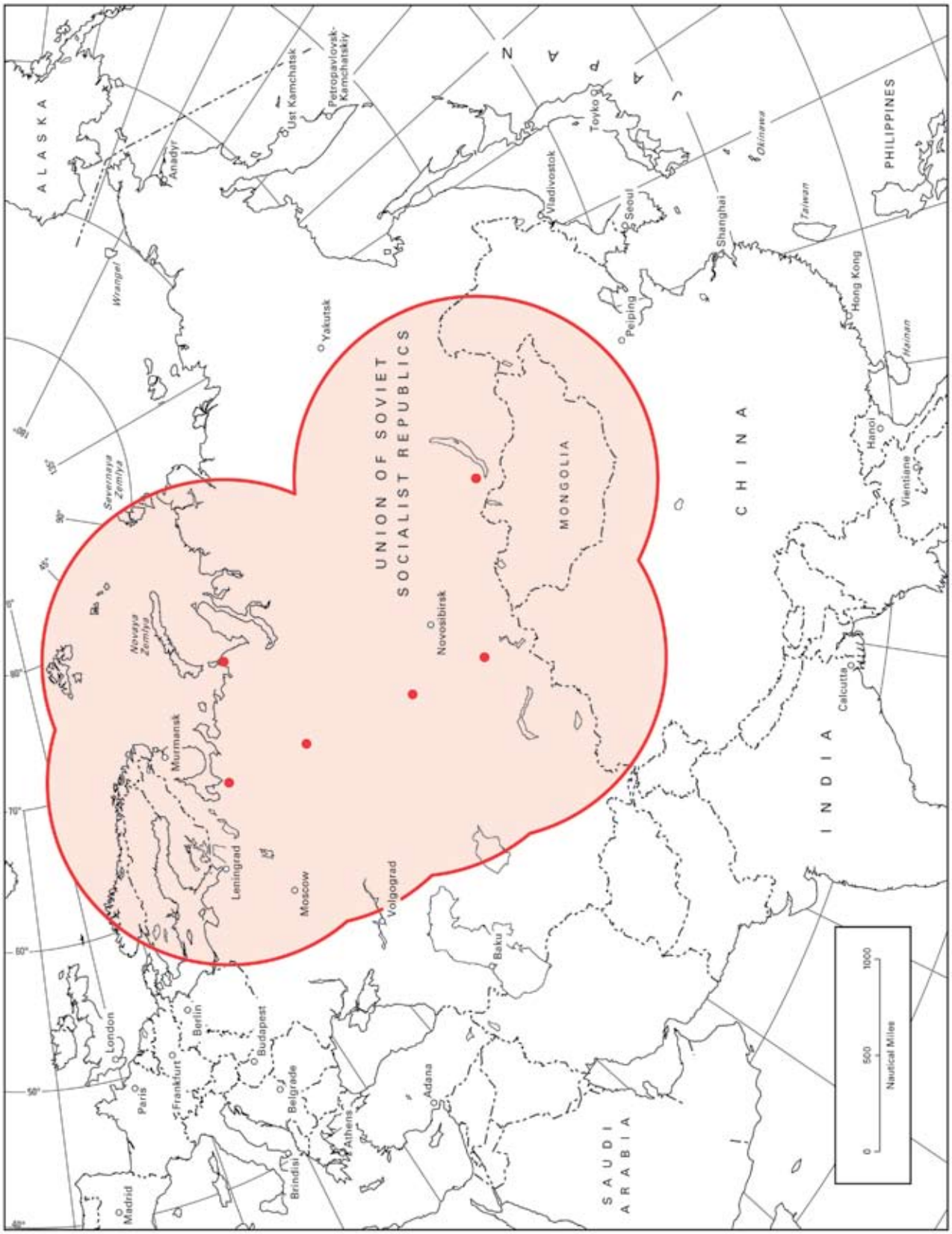


Figure 40—YAK-28P (Firebar) Deployment



Note: GDR deployment is detached to Frontal Aviation PVO.

Figure 41—Tu-128P (Fiddler) Deployment



A comparison of the geography of more recent deployments with a late-1956 deployment indicates a shift of PVO resources to the north. The more recent YAK-28P basings near Murmansk and on Novaya Zemlya are an example. Again understanding of the deployment pattern is complicated by the transfer of Soviet Naval Aviation aircraft. In 1956, defense of the Murmansk and Chukotsk Peninsula areas was the responsibility of naval interceptor forces, but with short-range aircraft.

A 1965 deployment, Figure 42 demonstrates a pattern similar to that of 1972. The exception is that a greater number of short-range aircraft supplemented coverage along the Trans-Siberian Railroad and the Kurile Islands—areas covered by the Tu-128P and the YAK-28P in 1972.

2. Systems of Anti-Aircraft Defense Missile Troops (ZRV)

The patterns of design, development, and deployment of surface-to-air missile systems show a striking similarity to patterns which apply to APVO fighter systems. The sources of similarity are evident in the fact that development and production of both aerodynamic missiles and aircraft are the responsibility of the Ministry of Aviation Industry. Likewise, early development of SAMs appears to have been directed by a design bureau, Lavochkin's, previously devoted to fighter development efforts. Deployment similarities result from the administration of both SAMs and fighter aircraft by PVO Strany as well as from tactical necessity.

The following sections outline the evolution of SAM systems and the pattern of design, production, and deployment processes.

a. Surface-to-Air Missile Design

The design of Soviet surface-to-air missiles has followed an orderly evolutionary pattern. Unlike the design of aircraft, a pattern of competitive design activities and multiple prototypes is not apparent. There is, however, the same separation of research and development activities from production that exists elsewhere in the Soviet aviation industry. In the early 1950's, prior to the repatriation of German technicians who assisted in the exploitation of World War II systems, it is apparent that Semyon Lavochkin transferred from fighter design activities to the support of the SAM program. Likewise, a set of reactive engine designers evolved from within the group of aircraft engine design activities to work with the missile groups. Two other design bureaus associated with V.N. Chelomey and P. D. Grushin came to support the aerodynamic missile design effort. Lavochkin's OKB is credited with the design of the SA-1 and SA-2 while Grushin's has been associated with ABM development. Chelomey, on the other hand, seems not to have been involved in defensive missile work.[57]

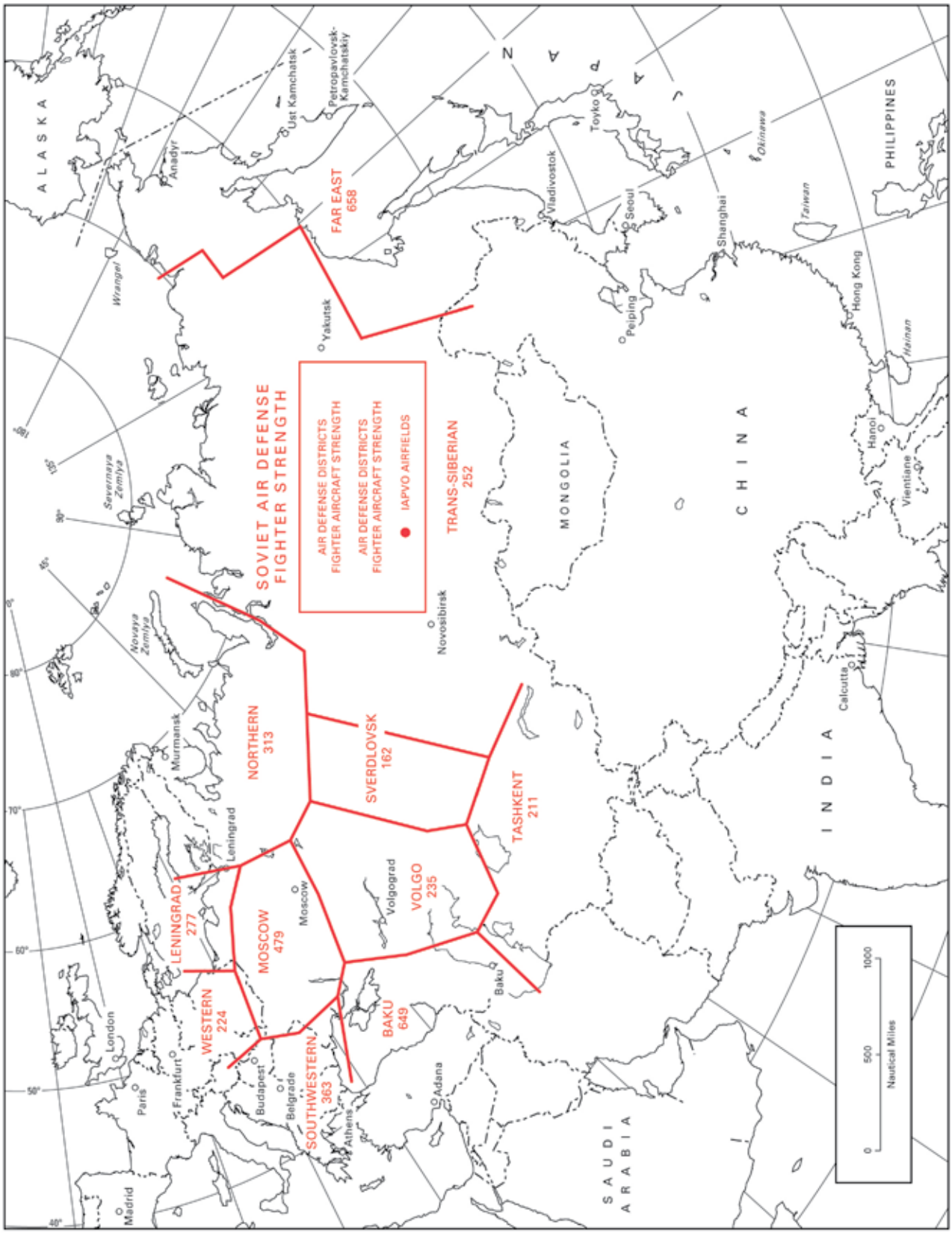
Among recent estimates of R&D expenditures, aerodynamic missiles represent about 24 percent of the aviation industry effort. The rate of growth over the decade of the 1960's was large in comparison with aircraft R&D, however. The three missile design activities grew at the estimated rate of 13 percent annually while airframe, engine, and testing activities expanded at about half that rate.

b. Surface-to-Air Missile Systems

The development of Soviet missiles for defense against strategic aircraft followed an orderly pattern between 1950 and 1960. Since 1960, attention has shifted to air defense missiles which support PVO

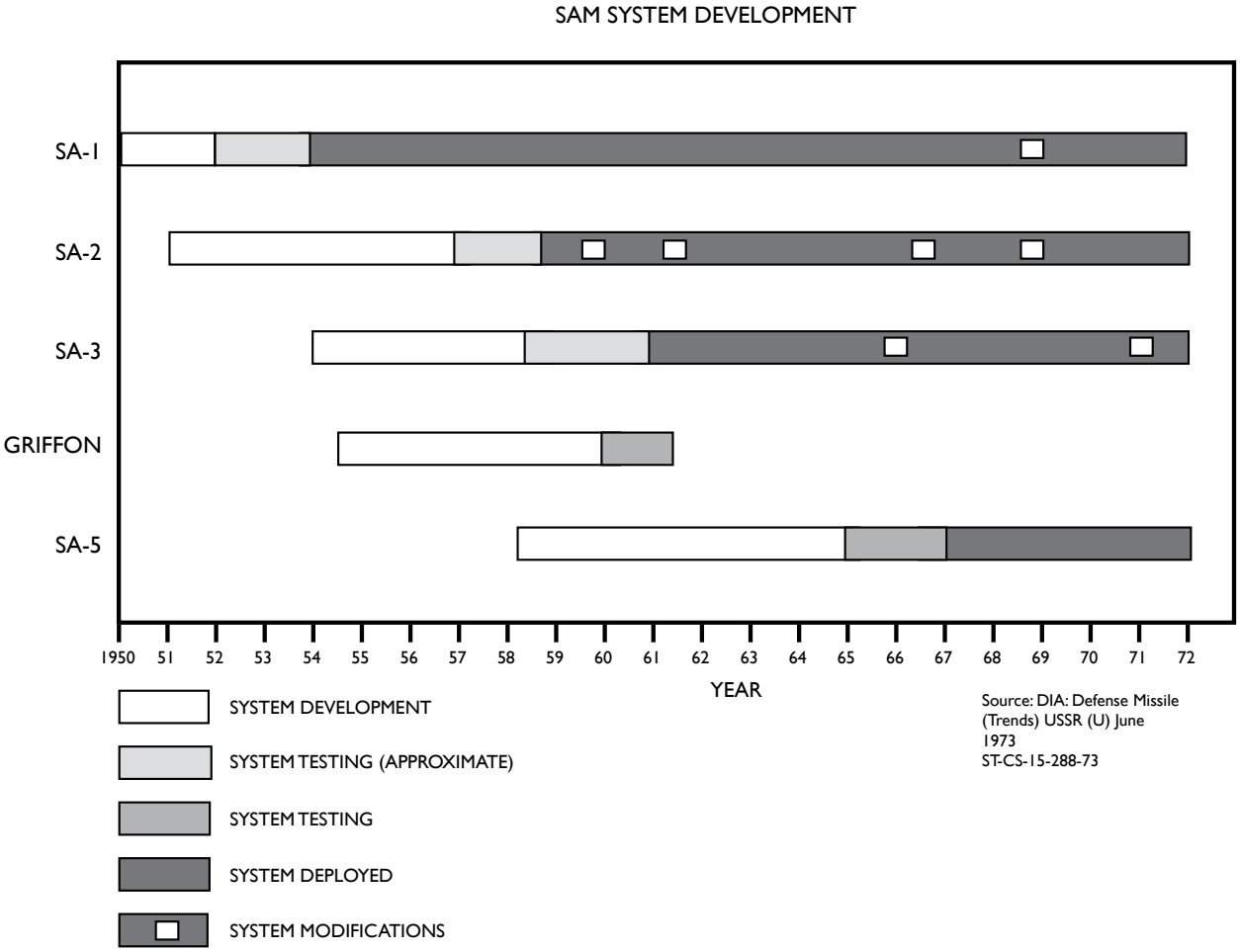
[57] DIA, *Soviet R&D Expenditures in the Ministry of Aviation Industry*, DI-450-2-6-INT, p. 5. FTD-CW-01-05-75 also mentions a Babakin design bureau.

Figure 42—APVO 1965 Deployment



Voysk—those on mobile carriers and hand-held weapons. Four air defense missile systems serve PVO Strany. The SA-1 system around Moscow (discussed in the previous draft report), the SA-2 system for high level point defense, the SA-3 low-level system, and the SA-5 high altitude, area defense SAM. Another area defense system nicknamed the Griffon was, developed during the late fifties, but was abandoned in 1964. The development chronology of these weapons is displayed in Figure 43.

Figure 43—Strategic Defensive Missile Development Cycles



1) SA-1 Guild

The SA-1 system had a capability for engaging large formation of aircraft up to 60,000 feet. The system was, however, limited by its high cost, fixed positions, and limited (54^{02} per site) sector coverage. Moreover, its extensive fixed installations and its vulnerability to ECM rendered it unsuitable for widespread deployment during the late fifties. Despite the fact that deployment of the SA-1 was limited to Moscow, the program was an enormous one. Some 3,624 launchers were emplaced around Moscow in 56 sites. It has been

estimated that, for each launcher, four missiles provided a reload capability. Thus, some 14,000 missiles were involved in the production program. With such a large sunk cost, it is understandable that the Soviets were reluctant to abandon the system. It is believed that the system was modified as recently as 1969 to improve its capabilities to engage aircraft at speeds up to Mach 2.[58]

2) SA-2 Guideline

Development of the SA-2 system began in 1951 with application of the technology used in the SA-1 associated with a solid-fuel booster engine. Elements of the system were to be moveable. A full SA-2 firing unit consists of a Fan Song guidance radar, six individual missile launchers for Guideline missiles and related support equipment housed in seven wheeled vans. The guidance system was modified four times during the 1960's. Modifications have improved accuracy, range, electronic counter-countermeasures (ECCM) and low altitude capabilities. Recent modifications include an optical tracking device and moving target indicator circuitry both of which improve low-level capabilities, reportedly down to 300 feet under optimum circumstances. Five modifications to the Guideline missile have increased its range and its maneuverability against high-speed targets. The most modern SA-2 variant can engage small targets (1 meter^2 radar cross section) at speeds up to Mach 3 to an altitude of 90,000 feet. While the range of this system is up to 27 nm, range against low-level targets is limited by terrain features and the curvature of the earth.[59]

The SA-2 was first operational in 1958 with major modifications being fielded in 1959, 1960, 1962, and 1968. Limitations in the maneuverability of the earlier versions of the Guideline missile indicate that it was initially designed for defense against a high-altitude sub-sonic threat.[60]

3) The SA-3—Goa

The SA-3 was specifically designed for improved operation against low-level attack. Included in its basic design is moving target indicator (MTI) circuitry which suppresses the effect of ground clutter on the tracking radar. There is also a special low-level tracking mode that is not yet fully understood.[61] A 1971 modification of the system added a television system to facilitate tracking during jamming or to avoid attacks by anti-radiation missiles.

A SA-3 firing unit consists of four launch positions each containing a dual launcher, a fire control radar nicknamed Low Blow, a control van, three support vans, and eight missile transporters. An early-warning and target acquisition radar is located outside the launch area. The system is capable of operating between 300 and 55,000 feet in altitude and from 3 to 12 nm in ground range from the site. Intercepts between maximum and minimum values are a function of target altitude and speed while the MTI, if required, degrades performance within this envelope.[62]

Work on the SA-3, and thus a theoretical appreciation for the necessity of defense against low-level attacks, began as early as 1954. Possible testing was detected in 1958 and the initial deployment began in

[58] Ibid., pp. 48–49.
[59] DIA, *Electronics (Surface-to-Air Associated)-ECC*, Vol. I, ST-HB-05-008-74, September 1974, pp. II-1–II-4.
[60] Ibid., p. II–15.
[61] Ibid., p. II–9.
[62] Ibid., p. II–24.

1961. An initial deployment of 100 sites was completed in 1964. Further deployments did not follow until 1967.[63]

4) The Griffon

Soviet writings have emphasized zonal defense missiles as a complement to missile defense of points. Although evidence to this effect dates from 1960, the emphasis is a rational outgrowth of the doctrine of "air defense operations" that evolved during the formation of PVO Strany.

It is believed that work on a long-range defense missile, nick-named Griffon, began in the mid-1950's. In 1960 or 1961, construction work was begun on three defensive missile sites around Leningrad. However this construction work ceased in 1961 or 1962, and further work on the system appears to have been abandoned. In 1964, however, new construction was observed around the Estonian city of Tallinn.[64]

For some time, it was believed that the reason for abandoning the Leningrad system was that it was intended as a dual capable SAM/ABM and that changes in the program related to its lack of capability against a more sophisticated threat as represented by the faster reentry speeds of Minuteman missiles then coming into the U.S. inventory. An extension of this argument is that the Tallinn deployment represented a satisfactory solution to whatever problems may have been encountered with the dual capable system.

More recently, another line of argument has been used to explain the cancellation of Griffon. During the period 1957 to 1961, data on the British Bloodhound long-range air defense system became available to the Soviets through their espionage activities. Existing evidence about the SA-5 Soviet long-range SAM suggests that a number of features of the Bloodhound were incorporated into the SA-5 system which amended the trend of Soviet missile design philosophy. Thus, an explanation of the Griffon cancellation derives from a major redesign which incorporated the British technology.[65] This second argument becomes more likely as more is known about the SA-5.

5) The SA-5 Gammon

The Tallinn construction continued to completion and an initial operational capability for the SA-5 was achieved in 1967. The system consists of the Gammon missile, the Square Pair tracking radar, and the Back Net and Side Net radars used for warning and acquisition. The system is currently estimated to have a range capability of 105 miles and an altitude capability up to 100,000 feet. Although detailed knowledge of SA-5 maneuver capabilities is unavailable, it is assessed to have a capability against high altitude, high speed aerodynamic threats including air-to-surface missiles—specifically the Hound Dog in its high-level profile.

As an ABM, the SA-5 has some residual capability, a point continuously stressed by U.S. Air Force Intelligence. Because the missile is of aerodynamic design, however, it loses its ability to maneuver during terminal stages of an ICBM intercept at high attitude. Thus, the missile has to be accurately aimed at a point in space during early stages of its trajectory. As currently constituted the SA-5 radars and computational equipment are not capable of performing the requisite aiming task. The argument continues that such radars

[63] Ibid., pp. II–22–II–24.
[64] AF/INAP Working Papers, CIA Working Papers.
[65] DIA, *Defensive Missile System (Trends) U.S.S.R.*, June 1973, ST-CS-15-288-73, p. 15.

associated with ABM terminal guidance could be added in a "SA-5 upgrade" program, or that the SA-5 could be linked to existing facilities which support the Moscow ABM system. A counter-argument is that existing ABM tracking radars communication and computational procedures would be saturated by such a requirement. On the other hand, proliferation of such supporting systems would be easily observed. Thus, an argument about covert "upgrade" became significant among SALT verification issues.[66]

During the SALT negotiations, the Soviets were made aware of U.S. concerns about possible improvements in the Tallinn system. They took some pain to explain the limitation of the system in terms which agreed with U.S. intelligence about its design and capabilities.[67] Within the context of the ABM treaty, the divergent views about SA-5 resulted in the following provision:

> Article VI
>
> To enhance assurance of the effectiveness of the limitations on ABM systems and their components provided by this Treaty each Party undertakes:
>
> (a) not to give missiles, launchers, or radars, other than ABM interceptor missiles, ABM launchers, or ABM radars, capabilities to counter strategic ballistic missiles or their elements in flight trajectory, and not to test them in an ABM mode; and
>
> (b) not to deploy in the future radars for early warning of strategic ballistic missile attack except at location along the periphery of its national territory and oriented outward.

c. Surface-to-Air Missile Deployments

1) Cycle of Deployments

The cycle of SAM deployments can be described in four periods:

(1) The defense of Moscow—1953–1956
(2) High altitude defense—1959–1964
(3) Low-level defense—1961–1964
(4) Long-range defense—1966–
(5) Additional low-level defense—1967–

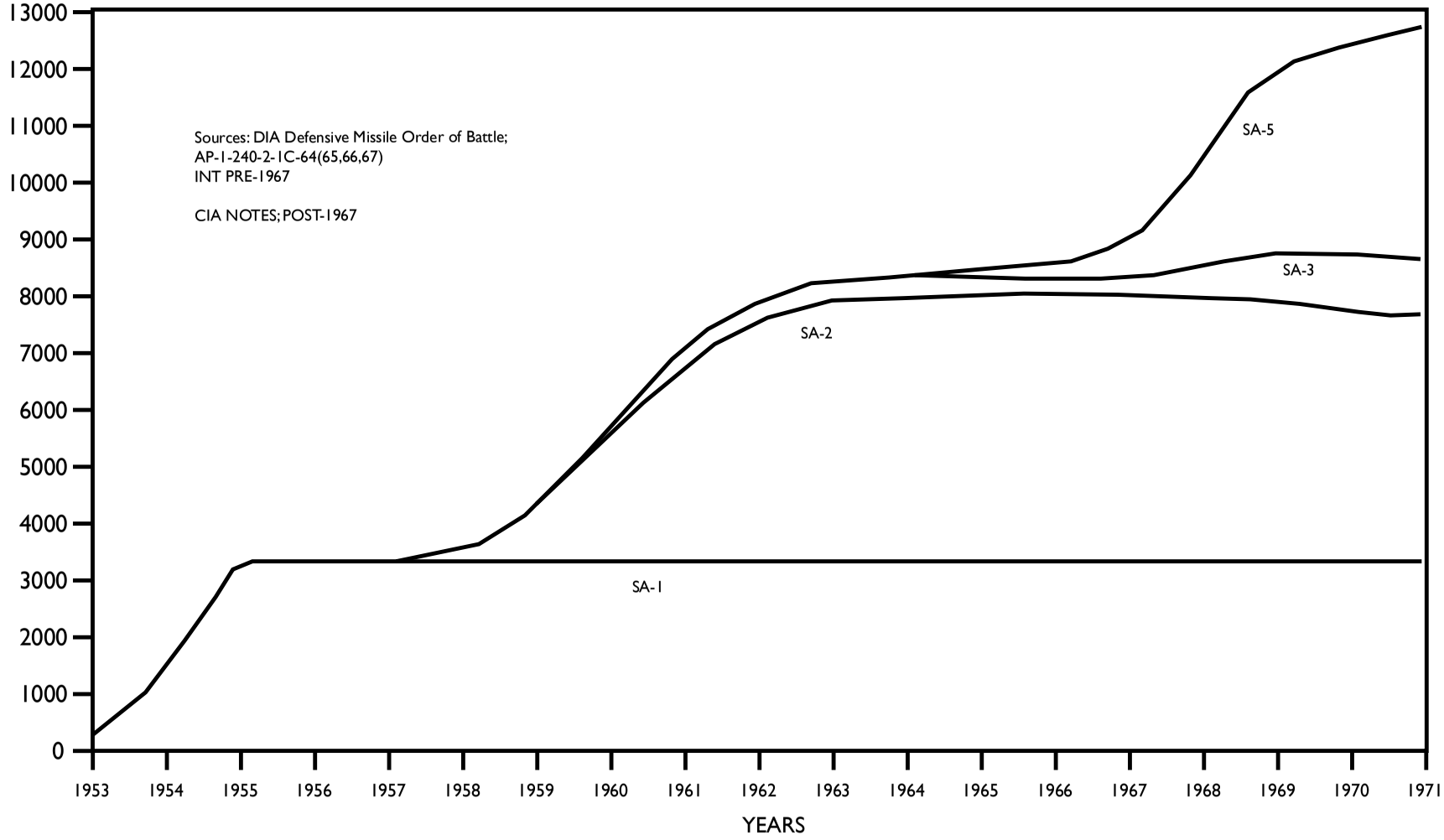
The magnitude of these deployments is illustrated in Figure 44. The break in deployment of the SA-3 system is sometimes related to a reemphasis on low-level defense following the 1967 Middle East War.[68]

2) Deployment Pattern

The SA-2 is the most widely deployed Soviet surface-to-air missile system. It provides high-altitude terminal defense for most of the important targets in the Soviet Union.[69] Both SA-2's and SA-3's are deployed as point and perimeter defenses. Gaps between complexes on the periphery of the U.S.S.R. are filled in by SA-2 sites which appear to be unrelated to specific targets. "Barriers" of SA-3's have been deployed along the Baltic seacoast, a portion of the Soviet-Polish border, and in areas along the Black Sea. About 10 percent of the SA-2 and SA-3 deployments appear to be related to such perimeter defenses. In general, SAM deployments are related to the general pattern of population and the distribution of industry in the coun-

[66] Ibid.
[67] Interview with CIA Surface-to-Air Missile Analyst, 3 May 1975.
[68] Ibid.
[69] AF/INAP Working Papers.

Figure 44—Soviet Strategic Defensive Missile Launcher Deployment



try. Military installations and military-industrial facilities are similarly distributed. The pattern of defense seems to reveal a national program which has not been altered by arbitrary assignment to Military or Air Defense Districts.[70]

In addition to the deployment of operational sites there appears to have been a program for the construction of dummy sites applied to PVO units. Although there are a number of legitimate training and redeployment sites most of the dummy sites, because of poor construction, appear unsuitable for operational equipment. Almost all such dummy sites, numbering in the hundreds, are located within the vicinity of an operational installation.

3) Effects of Surface-to-Air Missiles

While the USAF developed low-level penetration tactics prior to the deployment of the SA-2, one of the effects of widespread deployment has been to assure that such tactics were adopted. Because extended low-level flight increases fuel consumption, the potential effectiveness of the SA-2 became one of a number of factors in determining the eventual size of the U.S. tanker aircraft fleet which in 1972 numbered 660 aircraft.[71]

The extent of SAM deployment poses a potential problem for PVO Strany. Soviet doctrine calls for coordinating SAM and fighter defenses by zones of operations, by designating corridors for fighter movement and by time intervals.[72] Within the western U.S.S.R., however, there are few large areas which are not within SAM coverage. Therefore, SAM operations must be closely coordinated with fighter operations. Although early Soviet literature spoke of ground operators observing fighters break off the attack on SAM radars, such a system poses certain dangers to the fighter force.[73] That such problems existed was observed during U-2 operations when SAM's were believed to have brought down at least one of the fighters attempting intercepts.[74]

3. ABM Systems

a. System Evolution

Much of the confusion about SA-5 capabilities can be attributed to the parallel timing of the Soviet program of ABM development, to the Soviet's manipulative public pronouncements of a vague capability, and to a common location of SA-5 and ABM development testing.

The program of Soviet ABM development is thought to have began in the early fifties. Intimations of early efforts were made by Khrushchev in 1961. In an interview with Sulzberger of the New York Times he stated "at the same time we told our scientists and engineers to develop intercontinental rockets, we told another group to work out means to combat such rockets."[75] The early stages of ABM development were not without notice and some hesitation among the Soviet technical elite. As early as 1956, before the announcement of a successful Soviet ICBM, the prominent Soviet physicist Peter Kapitsa argued against

[70] Ibid.
[71] Interview with CIA Surface-to-Air Missile Analyst, 3 May 1975.
[72] Refer to U.S. Air Force submission for a detailed exposition of tanker fleet decisions and the effect of the SA-2.
[73] Resnichenko, V. D., *Tactics (The Officers Library)* (FTD Trans.), p. 128.
[74] Miranov, S., "Several Questions on Evaluating the Effectiveness of the Basic Means of Antiair Defense of a Front. . . .," *Military Thought*, Top Secret First Issue, 1961.
[75] "Flaws in U.S.S.R.'s Air Defenses Highlighted by U-2 Incident," *Defense Intelligence Digest*, December 1964, p. 5.

the development of an ABM on the grounds of cost and the destabilizing influence such a system would have on international relations. In his words: "If countries which are disposed to conduct their foreign policy from positions of strength are the first to discover an effective means of defense against nuclear weapons, they may forget any pledges they may have given. They may either launch atomic war or, at any rate, utilize their advantage to impose their will upon other countries."[76]

Technical evidence on early ABM development is marked by the closing of the area of the Sary Shagan Missile Test Range to foreign travelers in 1953. Such security precautions indicated development of facilities but they also reduced the information available on early testing activities. In 1957, a number of firings into the test range from the Kapustin Yar Missile Test Center indicated a program unrelated to the ICBM program which was nearing fruition in full-range testing at the time. The distance from Kapustin Yar, 1,100 miles, indicated either further study of IRBM reentry characteristics or ABM development research.[77] In April 1960, a clear picture, literally, emerged of the Sary Shagan facilities.[78] Two enormous radars (498 ft. and 918 ft. long) associated with ballistic early warning and acquisition functions were identified as externally complete. Moreover, construction was noted at what later proved to be two R&D launch facilities. The early warning radar, however, did not become operational until October 1962.[79]

During the period from 1962–1967, construction was observed at eight launch sites around Moscow; but construction on four of these was halted by 1967. By 4 March 1967 two early warning radars were operational and in 1968 another radar (Dog House), capable of ICBM tracking functions, became operational.

From August of 1968 to September of 1973 there were 31 recorded development tests of an ABM system at Sary Shagan. Of these, 10 involved the intercept of live targets and 9 involved the launch of two defense missiles. Although some testing of the Griffon and SA-5 in an ABM role may have occurred, the only operational ABM in the Moscow system.[80] A chronology of various elements of the Soviet ABM is described in Figure 45.

Although detailed studies of ABM tests have evolved a well-documented impression of the capabilities and of alternative firing doctrines for the Moscow ABM,[81] the outstanding fact is that it is numbers limited. With 64 launchers and four or five guidance complexes (one may be inactive) 69 reliable weapons exhaust and destroy operational elements of the system. While uncertainty exists about a possible reload capability, even most conservative offensive doctrine finds the impact of the system relatively small in the context of a reasonably-timed mass attack. While this discussion does injustice to the uncertainties involved in suppressing the Moscow ABM in a retaliatory attack, the system can be negated with a manageable number of weapons (in the realm of 100). The rationale of coping with the Moscow ABM did affect U.S. offensive planning and decisions to deploy numerous U.S. multiple-reentry vehicles, sophisticated warheads, decoys, and chaff systems. These effects will be addressed within the offensive forces section of this study effort.

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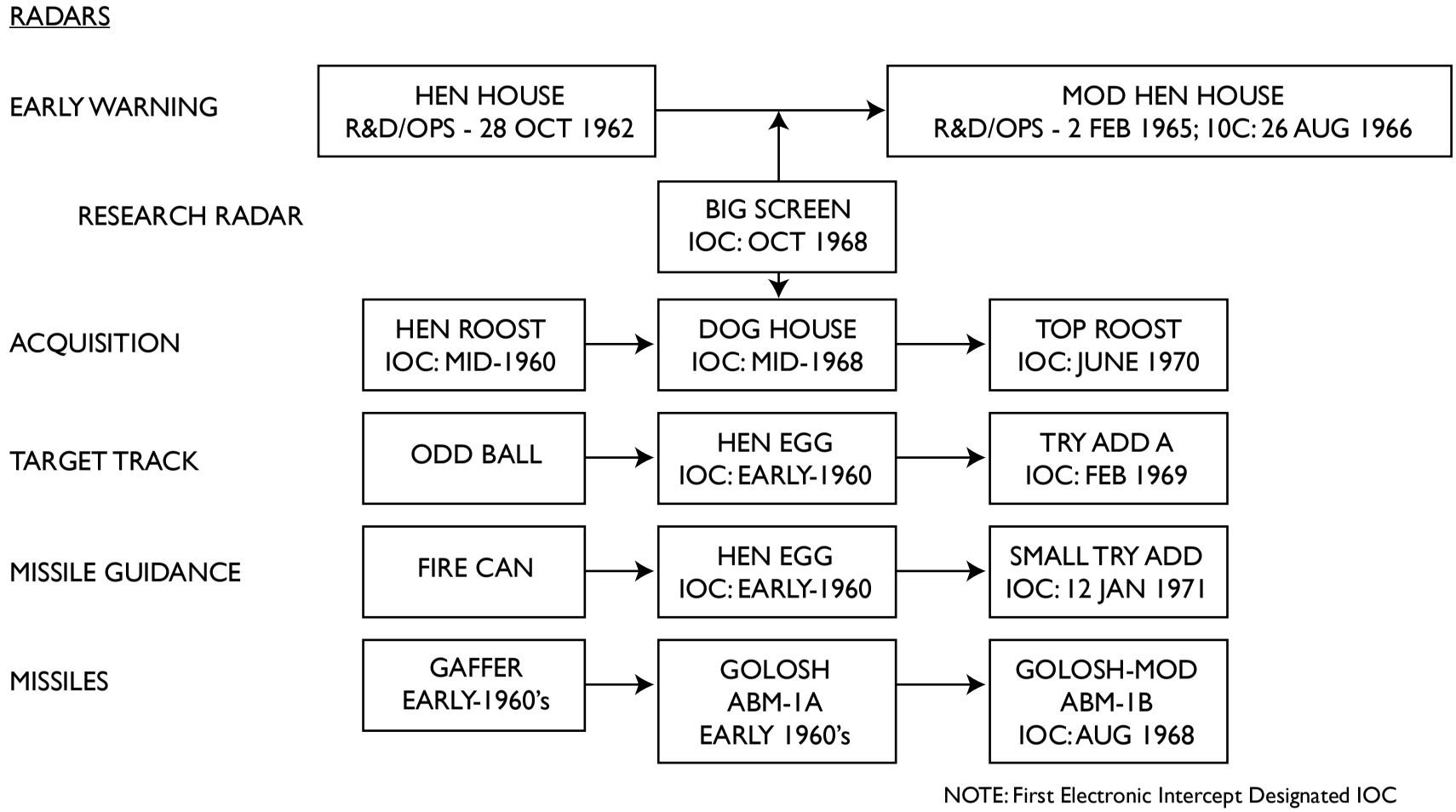
[76] FBIS, RS 83, p. 8.
[77] Ibid., p. 2. From *New Times* 39, September 1956.
[78] "A Soviet Anti-ICBM System. . . ?", *Air Intelligence Digest*, August 1960, pp. 4–5.
[79] *DIA, Electronics Associated with Antiballistic Missiles and Anti-satellite Systems—U.S.S.R.*, ST-CS-05-239-747 December 1973, p. 4.
[80] Ibid., p. 5.
[81] DIA, *The Moscow ABM System*, ST-CS-02-68-INT, July 1968, p. 7. Note: Material on predecessor systems requested 2 April 1975 has yet to be received for inclusion in this report. Ref. DIA Documents ST-CS-15-01-66 and ST-CS-15-02-66.

Figure 45—Moscow ABM Evolution



Source: DIA: Defensive Missile Systems (Trends) U.S.S.R., June 1973, p. 20.

b. The Non-Decision to Deploy the Moscow ABM

The process of developing the Moscow ABM was set in motion in the mid-1950's, certainly before the 1957 firings into Sary Shagan. A useful landmark (unavailable at this writing) would be the date of designation of the "General Designer"—probably P. D. Grushin. Within the Soviet R&D system, such a process implied a commitment to a working prototype and, usually, to pre-series production. In a system, where, relative to the U.S., the development process in highly independent of "customer," political, and, in particular, public review, the development program obtained its own momentum. Thus, the decision process reversed; a non-decision allowed the process to continue to a token deployment.

There is little evidence to support the opinion that a closer review of the program would have resulted in the process being stopped anyway. First the higher levels of review were by their nature sympathetic to the technological impetus of the program. About 50 percent of the membership of the Politburo and 75 percent of the Council of Ministers have technical backgrounds.[82] Further, the ABM program, in its very early stages became a symbol of strategic prowess at psychologically useful intervals—following the U-2 incident, during American debates over strategic policy and with foreign audiences.[83] Thus the ultimate reviewer, Khrushchev, committed his prestige to the program. The momentum of the program was not impeded.

There was evidently some resistance to the program, however, as represented by the Kapitsa statement of 1956. Likewise Marshal Chuykov in his 1966 role as leader of the Soviet civil defense effort acknowledged the impossibility of a "complete guarantee."[84] Such sources of resistance, though, were not in a channel where an ABM "stop" decision would be made.

Among the Soviet military, there was a theoretical appreciation of the techniques for overcoming an ABM. Such a general impression dates at least back to a widely disseminated review of American ABM development efforts published in 1962.[85] Practical appreciation of the difficulties was also apparent in the numerous modifications to developing ABM radars and in the Soviets own program to produce a MRV warhead for the SS-9.

In the chronology of the Moscow ABM there appears to be one stop decision—the halting of construction on four sites to the South of Moscow in 1966 or 1967. This partial step may have represented an attempt to influence the impending U.S. decisions to test MIRVs. Likewise, it may have been associated with a technical fix which allowed the system to defend against Mediterranean-launched SLBMs. The signal, if it was a signal, was too late. The system's development had created a "capability" and American development of an improved offense had justification.

On the whole, the process of developing the Moscow ABM appears to have been little influenced by considerations of the American response or by the thought that the system might be "destabilizing." During critical stages of American decisions relating to offensive force structure, the ABM was treated as a development "problem." Khrushchev's handling of information about the development had the effect of increasing uncertainty and created a perception of a greater capability than really existed. The circumstances of such statements and the silence that reigned after 1966 are evidence that their calculated effect had more proximate goals than long range strategic relationships with the U.S.[86]

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[82] FTD, FTD-CW-01-05-74, page unnumbered.
[83] See discussion Chapter III and FBIS, RS 83, passim.
[84] Ibid., p. 54. From TASS interview in Sovetskaya Moldaviya, 28 October 1966.
[85] Podgornyy, I., "The Fundamentals of Antimissile Defense," *Military Thought*, Top Secret First Issue, 1962.
[86] FBIS, *Soviet Statements on Antimissile Capability*, 1969 to date, RS 299, 13 March 1970, RS 93, 31 January 1969, RS 303, 22 January 1971.

In the end, the Moscow ABM system appears to have been overwhelmed by technology and shear numbers. During the period that the system was under construction from 1962 to 1967, the U.S. deployed in the realm of 1,000 warheads against which the Moscow system had marginal capabilities. By 1968, U.S. systems were in testing that could carry 3 to 14 effective warheads each. Two years after the Moscow ABM system was operational, U.S. systems were committed to deployment which against a Soviet planner's conservative estimate of future capability (meaning a high U.S. capability) promised up to 26,000 objects entering defense. The Moscow ABM while it might reduce an attack by up to 100 warheads had played some role in increasing the potential threat by nearly 11,000 weapons.[87]

4. Systems of the Radiotechnical Troops (RTV)

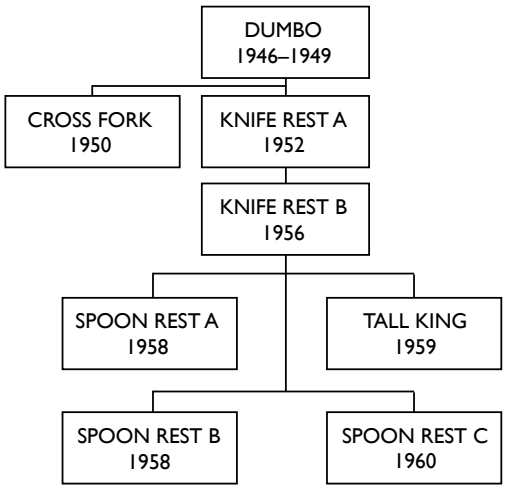
a. Introduction

The Soviets during the first ten years of the post-war period were concerned with development and deployment of an operational radar system. For the most part, supporting radar designs were derived from information gained through lend-lease, the capture of foreign systems and from German assistance. There appeared little overall structure to Soviet radar development during the first post-war decade. However, when the 1945–1955 period is considered in conjunction with the 1956–1972 period, four basic families of air control and warning can be delineated.

These four families (Metric Radars, Ground Controlled Intercept Radars, Height Finders, and Modern Acquisitioned/Early Warning) provide a basic structure for the following section. In order to illustrate the genealogy of the families, radar systems developed and deployed prior to 1955 will also be contained in the section. Further, not all Soviet radars will be contained in these four groupings, but the main trends will be portrayed. The discussion of these four families will be basically fact with Sections f and g concerning themselves with an overview.

b. Metric Radars

Metric Radars[88] (Early ACQ/EW)



[87] Based on maximum (and mutually exclusive) loadings of penaids and warheads in Titan, Minuteman, and Polaris launchers. Uses conservative assumption of all Minuteman launchers being Minuteman III and all Polaris launchers being Poseidon. Relevant maximum loadings, range and operational readiness factors excluded, would be 25,940 warheads and penaids or 10,528 warheads. See U.S. Air Force and U.S. Navy submissions for detailed loadings constrained by launcher and SLBM configurations.
[88] DIA, *Defensive Missile Systems (Trends) U.S.S.R.*, ST-CS-15-288-73, DIA, Task No. T72-15-02, June 1973 p. 23.

The first family is that of the post war acquisition and early warning group or metric radars. This family was made up of relatively simple instruments characterized by metric frequency, Yagi antennas, gonimetric techniques and nearly identical transmitters giving range, azimuth, and a crude altitude capability. During the middle to latter phases of this family, limited anti-jamming capabilities began to emerge.[89]

1) Dumbo

The P-1, developed prior to World War II, and the P-2 radar, developed late in World War II were the forerunners of the P-3 or Dumbo radar. This radar proved to be the mainstay of the Soviet early warning defensive system prior to 1951. The design of the Dumbo radars was derived, to a large extent, from the publication of the MIT Radiation-Laboratory series of books as were a number of other Soviet radars.[90]

Dumbo was designed for stationary installation and although during its deployment Dumbo was considered obsolete by U.S. standards, it represented an important capability when deployed in great numbers and well forward of the area to be defended. The Dumbo radar, when situated on a high ground, gave improved low altitude coverage, but was also more vulnerable to attack.[91] Rough height-finding capabilities were possibly attained through main-lock switching. While the secondary arrays, believed to be used for receiving, may have provided a facility for better directional fixing.

2) Cross Fork

Cross Fork, designated an acquisition radar, was usually situated with a fire control radar, Whiff, at an AA battery site. Cross Fork was either a British AAMK3 or a Soviet copy of it. Cross Fork operated on a different frequency from that of Whiff thus benefiting simultaneous operation. Cross Fork had good range capabilities, far greater than that of Whiff, but its resolution was much too poor for gun laying purposes.[92]

3) Knife Rest

The Knife Rest radar is one of the oldest in the Soviet early warning inventory and although it had limited accuracy and detection capabilities, Knife Rest was inexpensive and easy to maintain. Knife Rest A, first assembled in 1952, operated in the 70–80 frequency range and Knife Rests B and C, observed in 1956, operated in the 85–88 MHz frequency range. Knife Rest C differed from B only in the height of the antenna mast. The Knife Rest radar has been maintained as an effective gap filler in the Soviet EW system.

Knife Rest B was introduced as a highly mobile version of the A model. The antenna was mounted on a 33 foot mast atop a ZIL 151 van. While it never provided high performance, Knife Rest B became a work horse (heavily deployed) in the Soviet EW/GCI systems and also proved to be an effective gap filler.[93]

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[89] Ibid., p. 22.
[90] Air Force/INAP, Working Papers, 31 October 1973.
[91] Round-up of Red Radars, *Air Intelligence Digest*, August 1954, pp. 20–32.
[92] Six Typical Red Radar Stations, *Air Intelligence Digest*, July 1955 p. 24.
[93] OSD Historians Office, History of Strategic Arms Competition (1945–1972) Chronology U.S.S.R., Vol. III, December 1974.

4) Spoon Rest

Spoon Rest as nicknamed by Westerners was first observed in April 1958. Spoon Rest was widely deployed in the Soviet Bloc and although first believed to have been a component of the SA-2 (Guideline) surface-to-air missile system it was later found to be used independently as an early warning and acquisition radar for conventional antiaircraft defense.[94] The antenna was a six-bay, two-stack arrangement of 12 horizontal Yagi arrays. Each array was comprised of a rectangular reflector, an active element, and four directors. The complete array was approximately 41 feet long and 11 feet high. Spoon Rest, operating in the 155 to 157 megahertz range, provided additional frequency diversity for the Soviet air defense system. Spoon Rest was effective to 110 NM range and 50,000 feet altitude.

The A version of Spoon Rest was the first version observed. The construction of Spoon Rest A was simple but the system was widely deployed as the VHF radar afforded a high degree of probability in detecting targets. Mast extension sections were available for use when greater antenna height was required.

A later model, Spoon Rest B, was also widely deployed. This radar was believed to have been ready for deployment in 1958. The Spoon Rest radars had limited ECCM circuitry but continuous efforts were made to improve ECCM capabilities and overall performance.[95] Spoon Rest C illustrates this as the C version provided higher frequency and more sophistication than its predecessors.

5) Tall King

Tall King was a permanently mounted, high powered early warning radar introduced in 1959 for use against high performance, high altitude aircraft, specifically in answer to the high altitude U-2 threat.[96] Since Tall King was primarily used as a high altitude, long range initial detection radar and would turn its targets over to conventional GCI radars as the threat comes within GCI range, there appeared to be no need for an altitude-determining facility to be used with Tall King. Continued interest in high altitude aircraft by both the West and the Soviets resulted in a reconsideration of the last point and Side Net (HF) was synchronized with Tall King.

Rapid deployment of this radar was observed as Tall King was considered the most important new Soviet radar. It was a very large VHF radar and operated in the ranges of 162 to 175 megacycles per second. This radar used a huge lightweight parabolic reflector measuring about 115 feet by 41 feet with heating wires for deicing. Icing has been found to be a serious problem on some of the older Soviet radar antennas. The antenna was supported by a tall mast which extended above the reflector. The feed was composed of a pair of horizontal cylindrical dipoles with parabolic cylindrical reflectors behind them.

Tall King, believed to have been high powered, was probably the longest range operational Soviet air-defense radar.[97] Tall King had a unique mechanical design in that the antenna was mounted on a high rotating tower like structure that rested on a pedestal bearing located about 20 feet above the ground. The top of the structure extended above the antenna to a height of about 80 feet above the ground. A bearing at the top of the antenna tower was supported by six guy wires. Although most Soviet radars have been mobile, Tall King because of its size, was designed for fixed sites.

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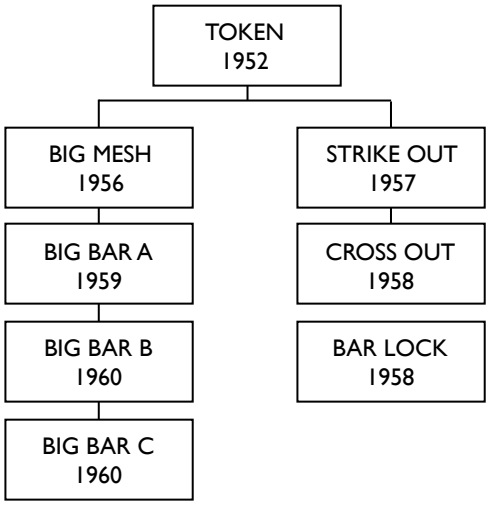
[94] OSI, Soviet Advanced Radar Techniques Applicable to Ground Radar, 24 October 1963, OSI, RS/62-29
[95] AF/INAP Working Papers.
[96] OSD Historians Office, History of Strategic Arms Competition III.
[97] OSI, Soviet Advanced Radar Techniques Applicable to Ground Radar.

By deploying Tall King in strategic areas, the Soviets significantly increased their early warning and high altitude detection capabilities. Tall King was an example of Soviet development and improvement of then current techniques through the use of more power, a larger antenna, and additional frequency diversity.[98] Although Tall King delivered higher power, its transmitting circuitry was very similar to that of Spoon Rest and their receivers are essentially identical.

At the very onset a Rock Cake or Stone Cake height finder was collocated with Tall King, however, more recently, the newer Side Net height finder took their places as it offered improved GCI capabilities. The IFF equipment associated with Tall King was Scoreboard B.

c. GCI Radars

GCI RADARS[99]



The second family to be considered is that of the ground controlled intercept (GCI) radars. Although the primary function is for ground controlled intercept, these radars have been found to be quite similar to the U.S. AN/CPS-6 and tended to use the basic V-beam technique for obtaining azimuth, range and altitude. These radars developed in two directions—the V-beam and multisearch radars were the results.[100]

1) Token

Token was the first of the V-beam generation of radars to make its appearance. Token was deployed in late 1951 or early 1952. By mid-1952 at least 50 Token radars had been deployed across the U.S.S.R. from East Germany to Vladivostok, and by 1 July 1953 the figure reached 115.[101]

The large increase in the number of Token radars lead the U.S. to believe that Soviet technicians were more successful at maintaining them than had been anticipated on the basis of U.S. experience with the AN/CPS-6.[102] Token however, did have a simpler design. Although Soviet V-beam radars were inspired by the U.S. AN/CPS-6 the AN/CPS-6 was not supplied under the lend-lease policy but contained in the M.I.T. series.

[98] Ibid.
[99] DIA, *Defensive Missile Systems*, p. 23.
[100] Ibid., p. 22.
[101] Growth of Soviet Token Radar, *USAFE Air Intelligence Study*, August 1954. pp. 27–30.
[102] The Soviet Air Defense System, *USAFE Air Intelligence Summary*, 1954.

As of 1954, Token was considered to be the best Soviet radar. It has been found that radars of older design (i.e., Knife Rest, RUS II and Dumbo) are deployed near many of the Token sites to serve as gap fillers and traffic controllers. Token with longer range but a height capability of only 45,000 feet was aided by these older radars of shorter range but a height capability of nearly 60,000 feet.

The Token, and in general the V-beam radars, represented a vast improvement over prior Soviet capabilities. This was true to such an extent that one of the most important implications of the V-beam radars was the high degree of electronic capability attained by the Soviet scientists.

2) Big Mesh

In 1956 the second Soviet V-beam, Big Mesh, was observed. Big Mesh is larger than the V-beam Token, and was believed to have higher power capabilities than Token. The duty factor of Big Mesh was found to be more than three times that of Token. Big Mesh not only has the five beams in the S-band frequency as does Token, but also has been found to have an L-band frequency.[103] This indicates an acknowledgement by the Soviets of the ECCM advantages of the diversification of frequencies.

3) Strike Out

The Strike Out radar was the third radar of this family and was first observed in 1957. The ECCM capabilities proved to be quite similar to those of Token while Strike Out had the two large antenna reflectors positioned horizontally. Since Strike Out had no height finding capabilities, it was used with a separate height finder for GCI purposes.[104] For example, this radar, when used in conjunction with the conventional single-dish Rock Cake radar, provided a better GCI capability than was provided by Token. This grouping had limited ECCM capabilities as the high side lobes reduced its effectiveness to operate in an ECCM environment.

4) Cross Out

Cross Out was introduced in 1958 and was observed to have physical characteristics similar to those of Big Mesh except that both reflectors were positioned horizontal, similar to that of Strike Out. With the introduction of Cross Out and Bar Lock into the Soviet inventory of GCI radars, a height finder (HF) having greater range capability was required to capitalize on the higher performance of these two radars. Stone Cake, a height finder, was designed to fulfill this role.[105]

5) Bar Lock

Bar Lock, first sited in late 1958, represented a major modification in Soviet early warning/GCI radar. The early multi-frequency, multi-beam Token was the forerunner for Big Bar in 1959. Bar Lock was found to have evolved away from these radars. Bar Lock is similar to Cross Out and Strike Out in that it has two horizontal reflectors, but the structural details were found to be entirely different. The power is believed to have been much higher than that for previously developed Soviet radars and it apparently had better capabilities for aircraft detection and tracking than previous Soviet EW/GCI radars.

The introduction of Bar Lock again evidenced that the Soviets were continuously increasing their ECCM capability with each new member of the GCI family. Bar Lock provided the capability to shut

[103] OSI, Soviet Advanced Radar Techniques Applicable to Ground Radar.
[104] Ibid.
[105] Ibid.

off individual beams in order to overcome the effects of spot jamming and retained all ECCM circuitry incorporated in Big Mesh.

Bar Lock proved to be the primary, long range, high performance radar in use by the Soviets at GCI sites.[106] Bar Lock's van mounted antennas were comprised of truncated parabolic mesh reflectors with clipped corners measuring 10 x 32 feet. These reflectors were also used in configuring the Big Bar radar system in 1959. Four beams emanated from the lower reflector and two from the upper.

Bar Lock was one of the more capable EW radars in the Soviet inventory and when collocated with height finders such as Side Net it was highly functional in a GCI role. It was put to wide spread use and was most likely the primary EW component at EW/GCI sites.

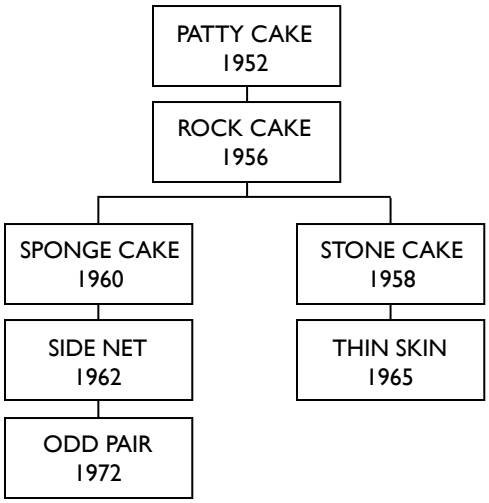
6) Big Bar

With the introduction of Big Bar and Big Mesh, the Soviets improved, to a limited extent, their radar ECCM capabilities. A modification of Big Bar (designated Big Bar B) eliminated the c-band frequency, indicating the possible ineffectiveness of its use for search or as an ECCM feature. Big Bar B was a mobile V-beam with a limited height-finding capability, used as an early warning/GCI radar. Big Bar radar information was usually supplemented by data supplied by collocated height finders such as Rock Cake and Stone Cake. Within the Big Bar family, the B variant was identified by its "clean" appearance. This was created by the absence of both Witch Four IFF and End Box side-lobe suppressors and the lack of large full horns associated with the A and C variants.

Big Bar showed a reversal in a trend, as Big Bar had a V-beam configuration, as opposed to the Strike Out and Bar Lock early warning radars, which had two large horizontal reflectors. The most commonly deployed radar of this family is the Bar Lock radar. This radar was improved to provide higher transmitting power, stability and service-ability. The lack of a moving target indicator (MTI) to aid in tracking targets in chaff and rain was the principal weakness of Bar Lock and earlier GCI radars.

d. Height Finder Radars

Height Finders[107]



[106] OSD Historians Office, History of Strategic Arms Competition III.
[107] DIA, *Defensive Missile Systems (Trends) U.S.S.R.*, p. 23.

The third set of radars is comprised of the height finders. These radars were primarily designed to supplement other radars by providing accurate height data. The later height finders (Sponge Cake, Side Net, and Thin Skin) have exhibited good mobility, high power, tuneability, MTI, and sophisticated scan control.[108]

1) Patty Cake

Deployed late in 1952, the U.S.S.R.'s initial height finder, Patty Cake, did not follow the usual Soviet development pattern. Contrary to the pattern followed in the V-beam early warning/GCI radar Token and the fire control radar Whiff which were derived directly from Western radars, Patty Cake was the sole Soviet operational HF from 1953 to 1956 and was generally installed with the Gage (EW) radar.[109]

Observations during 1954 found the Soviets developing a radar system that employed two radars as a possible means of improving upon Token. These two sets would be combined to function as a single unit. The most commonly used sets are found to be Gage and Patty Cake. This combination provided less complicated installations, simpler maintenance and operation and increased range and height finding capabilities.[110]

Other radar installations were noted in the U.S.S.R. in which each installation was equipped with four radars. These radars were situated in pairs, with Gage and Patty Cake again comprising each pair. These represented the first known Soviet attempt to establish a static system of radar defense. It was first thought to mean a trend away from the mobile V-beam Token.

2) Rock Cake

The nodding height finder, Rock Cake, was introduced in 1955 and first deployed in 1956. It was apparently designed to provide accurate altitude readings on modern manned aircraft. Rock Cake was deployed quite rapidly in 1956 as it was found that when used in conjunction with an early warning radar it would provide better GCI capability than was provided by Token.

3) Stone Cake

Stone Cake, introduced in 1958, was designed to fulfill the requirement to capitalize on the higher performance of Cross Out and Bar Lock. Stone Cake appeared to be essentially a Rock Cake radar using a higher gain antenna with reduced side and back-lobe emission and possibly an improved receiver. These changes were thought to have increased range capabilities by approximately 33 percent. Another change from the Rock Cake radar was the use of a larger and lighter weight reflector. However, there appears to have been no change in the capability for Stone Cake to operate in an ECCM environment over that of Rock Cake.

Stone Cake was observed to be a mobile, fixed-feed rocking reflector, nodding-beam height finder.[111] Stone Cake was usually operated in conjunction with a Bar Lock, Big Bar, or Big Mesh.

4) Sponge Cake

In 1960, Stone Cake was modified by the introduction of a new antenna Sponge Cake. It was lighter in weight, conforming to the Soviet trend toward reduced weight and smaller structural members, which in

[108] Ibid., p. 22.
[109] DIA, A Decade of Soviet AC&W Height Finder (HF) Radar Development, *Defense Intelligence Digest*, May–December 1963.
[110] Round-up of Red Radars.
[111] OSD Historians Office, History of Strategic Arms Competition III.

turn reduced the wind resistance of the antenna. Otherwise, Sponge Cake was equivalent to Stone Cake in performance. It was found that Sponge Cake was highly susceptible to spot jamming.

5) Side Net

Side Net when initially deployed in 1962 was sited with Tall King to provide a long range GCI capability. This was first observed in East Germany. It was later found that Side Net was deployed at other EW radar sites. When Side Net and Back Net were deployed together, they were found to form an excellent GCI network. During the 1963–1964 time period, these two radar sets developed into the backbone of the GCI air force program.

6) Thin Skin

Thin Skin, the first Soviet H-band height finder was first seen in the U.S.S.R. in late 1965, although it had been observed much earlier under development testing near Moscow. It was deployed at a number of GCI sites apparently to increase low altitude and target handling capabilities. The antenna was mounted above the radar van whereas previous antennas had been mounted on the side or end of the van. In the Thin Skin configuration the van itself rotated.

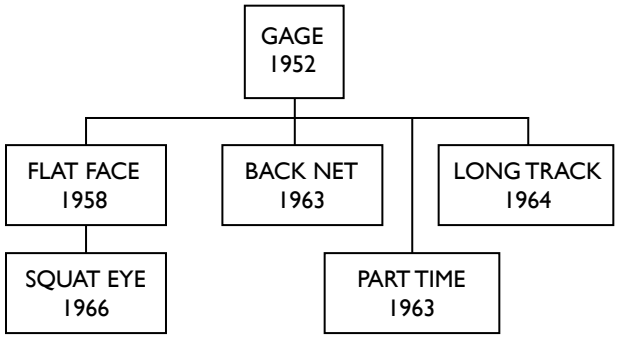
Thin Skin was observed in both truck and trailer mounted configurations. (Thin Skin B and Thin Skin A, respectively). It is believed to have had greater accuracy and better low altitude coverage than previously deployed Soviet height finders. Operating on the little-used H-band, it added frequency diversity to Soviet radar sites.

7) Odd Pair

Little is known about the Odd Pair radar but it was first observed in the U.S.S.R. at an SA-5 site near Murmansk and at two locations in the vicinity of Sevastopol—an early warning site and an SA-2 site. Odd Pair has replaced Side Net at a few sites and wider deployment is suspected since the radar provides the Soviets with increased angle accuracy and range.

e. Modern ACQ/EW Radars

Modern ACQ/EW[112]



[112] DIA, *Defensive Missile Systems (Trends) U.S.S.R.*, p. 23.

The fourth group to be studied is basically a continuation of the first ACQ/EW group but these are used in direct support of the SAM systems. These radars are also quite useful for ACQ purposes.[113]

1) Gage

Gage, initially deployed in 1952, was a Soviet designed early warning and surveillance radar mounted on a bunkered building. This was the first static radar, of any significance, employed by the Soviets.[114] There were numerous sightings of Gage and Patty Cake being situated to function as an integrated system.

Gage's antenna is quite similar to the horizontal reflector of the U.S. AN/CPS-6 and its length is estimated to be 27 feet and its height 10 feet.

2) Flat Face

Flat Face was first intercepted in 1958 in East Germany and was capable of performing many roles. At first it appeared only at antiaircraft artillery sites, but subsequently it was reported as being used as a low-altitude surveillance radar possibly for the SA-3 SAM system and a gap filler at EW/GCI sites.[115] Flat Face has also been used as an acquisition radar for the SA-2 SAM System. Flat Face has two elliptical parabolic reflectors, each 18 feet wide by 7 feet high, mounted one above the other on a mast atop a box-bodied ZIL-151 van, thus making it a highly mobile EW radar. The reflectors were rotated with the ends of the reflectors folded down. Because of the size of its two antennas, this radar could not operate satisfactorily at wind velocities exceeding approximately 32 mph.

Flat Face was stated to have two units of ECCM equipment, one for use against passive jamming, and the other against active jamming. Flat Face also contained an unknown type of anticlutter circuit to reduce the effects of ground and cloud return and of jamming.

Flat Face was introduced as being capable of shifting the pulse repetition frequency (PRF) and operating frequency rapidly and possibly used pulse position coding as a correlation method.[116] The dual antenna configuration may indicate that Flat Face was a monopulse radar, but there has been little other evidence to substantiate this.

3) Back Net

In 1963, the newest and largest radar in the EW/GCI network, Back Net, began replacing the Gage system in direct support of the SA-1 system. Back Net had a much improved tracking accuracy, anti-jamming capability, mobility and frequency diversity. Evidence during this 1963 time period indicated that the Back Net (which was most likely the best Soviet early warning and acquisition for medium to high altitude threats) was being modified to give it a dual frequency capability.[117]

Back Net has two large reflectors mounted back-to-back on a trailer van. It has good EW range and an azimuth capability. In collocation with Side Net, it has been rapidly becoming the principle system of the Soviet Air Force GCI program.[118]

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[113] Ibid., p. 24.
[114] OSD Historians Office, History of Strategic Arms Competition III.
[115] DIA, *Defensive Missile Systems (Trends) U.S.S.R.*, p. 24.
[116] OSI, Soviet Advanced Radar Techniques Applicable to Ground Radar.
[117] DIA, *Defensive Missile Systems (Trends) U.S.S.R.*, p. 24.
[118] Ibid., p. 25.

From the rapid deployment of Back Net around Moscow it was apparent that the Soviets were satisfied with its capabilities. Back Net B is quite similar to Back Net A except that the Back Net B has a smaller reflector with three feed horns fed by 20 wave guides, instead of the 2 horn single-wave guide found on Back Net A. The modified feed was most likely designed to improve the low-altitude performance.

4) Long Track

Long Track was first observed at Soviet EW/GCI sites in East Germany and subsequent observations showed that this radar was also deployed in the U.S.S.R. Long Track was a completely self-contained system mounted on a heavy tracked modified AT-7. The 2,000 to 2,500 MHz frequency range of Long Track was consistent with Soviet policy to expand the use of available R.F. frequencies. This radar is believed to have been ready for field operation in 1964.

5) Squat Eye

Squat Eye, operational in 1966, was an alternative antenna for Flat Face. The antenna was mounted on a 90–100 foot tower and provided better low altitude coverage than the original Flat Face. In addition to the high antenna it has been observed that Squat Eye was generally situated on high ground.

6) Part Time

Part Time radar signals were first intercepted in the Northern Soviet Air Defense District. A number of unique or unusual characteristics were demonstrated by this radar.

(1) Only Soviet (EW) associated radar that is invariably enclosed by a radome
(2) Integral data transmission mode
(3) Complex radar signal
(4) Comparatively low transmitter peak power.

Part Time was basically designed as a remote operations aircraft early warning radar. It features around-the-clock surveillance capability minimum operator attention and automatic transmission of target detection to a filter center.

f. Technological Progression

The U.S.S.R. has achieved well defined advancements in the field of radar technology. This is evidenced by a comparison of the U.S. and U.S.S.R. technology gap in this field. In 1945 when the U.S.S.R. radar program was in its infant stage the Soviets were rated seven years behind the United States.[119] However, by 1956 the U.S.S.R. had achieved parity in fielded gun directing radars and in 1972 the Soviets were placed ten years ahead of the United States.[120] Likewise, the U.S.S.R. achieved equality to the United States in fielded air defense acquisition and surveillance radars for a relatively short period during the late 1950's. It has been calculated, however, that the U.S. regained an eight-year technical lead by 1972.[121]

[119] Root, L. W., United States vs. U.S.S.R. Ground-Based Air Defense Radar Comparison, December 1971, U.S. Army Missile Command, p. 15.
[120] Ibid., p. 15.
[121] Ibid., p. 15.

The actual operational advantage of the U.S. may not be so great as estimated as the comparison is made on a one to one basis, thus not allowing for the overall effect of the large number of radars fielded by the U.S.S.R.

In relation to the tracking radars for SAM systems, parity was achieved in the mid 1950's and by 1972 the U.S.S.R. was estimated to be about four years ahead of the U.S.[122]

However, the radar system of either the U.S. or the U.S.S.R. is not as concerned with how it relates to the radar system of the other country but how capable it is in detecting and handling incoming enemy aerospace vehicles whether they be airplanes or missiles.

The Soviets had virtually no electronic capabilities in this area prior to WWII and relied extremely heavily on visual and sonic methods. This visual and sonic method although widely utilized was inadequate. The maintenance of this system continued but the Soviets delved into the creation of a "complete" radar system. Although ultimately occupied with the problem of early warning the Soviets had to deal with the problem of once an incoming vessel was noted what do we do with it? Is it friendly or alien and further, where exactly is it?

g. Development Cycles

It can be seen through the illustrated families and the introduction of their members that the Soviets were indeed concerned, first, with early warning—knowing that something was coming. Figures 46 and 47 show a graphical, more vivid, picture of this. From this table it is obvious that the push by the Soviets to develop and field a completely operational system did not reach fruition until 1952.

An assessment of radar capabilities apparently took place during the 1953 to 1956 period. Soviet needs, in relation to their radar system, were not the same as they were when the Soviets embarked on the fielding of a complete radar system. The previous discussion of the families and Table 29, a technical abbreviation of many members of these families and others, will help to understand the reassessment.

In many instances Table 29 outwardly appears to show a drop in requirements on radar capabilities. For instance, in 1956 a height finder, Rock Cake, was deployed with a maximum altitude of 180,000 feet and in 1965 another height finder, Thin Skin, was deployed with a maximum altitude of 100,000 feet. However, the attitude capability is irrelevant and one can see the great increase in range capabilities. The associated frequency ranges show that Thin Skin has a much higher frequency range than Rock Cake and therefore, requires a smaller disk and less power. This, in turn, has the advantages of reduced weight and smaller structural members and as the Soviet trend is not to discard old systems, complementary systems creating frequency diversity can be placed in simultaneous operation. The development of radars of reduced weight and smaller structural components enhances the mobility capabilities—a trend the Soviets have long been concerned with.

There was a drop in peak power output for the height finders and a general maintenance of peak power in GCI and acquisition radars in conjunction with an overall decrease in range and altitude requirements. This ends power wastage searching regions too high for planes and improves the signal to noise ratio. The trend toward frequency diversity is obvious and it is quite effective as a countermeasure against jamming and may also provide improved detection and tracking of a target. It is also possible to discern a move toward more varied and a greater number of anti-jamming devices. A reaction to the U.S.'s and others' ability to counter their radar systems.

[122] Ibid., pp. 1 and 6.

Figure 46—Chronology of Soviet Radar Development*

YEARS 1945										
1946	DUMBO									
1947										
1948										
1949										
1950	CROSS FORK									
1951										
1952	GAGE	KNIFE REST A	TOKEN	PATTY CAKE	FISH NET	KRUG				
1953	WITCH EIGHT									
1954										
1955										
1956	KNIFE REST B	BIG MESH	ROCK CAKE							
1957	SLANT MESH	STRIKE OUT	BIG NET	WITCH FIVE						
1958	BAR LOCK	CROSS OUT	FLAT FACE	STONE CAKE	SPOON REST A	SPOON REST B	WITCH FOUR	SCORE BOARD		
1959	TALL KING	BIG BAR A	HEAD NET	MOON FACE						
1960	BIG BAR B	BIG BAR C	SPOON REST C	SPONGE CAKE	TOP TROUGH					
1961										
1962	SLIDE NET	SCORE BOARD B								
1963	BACK NET	PART TIME								
1964	LONG TRACK									
1965	THIN SKIN									
1966	SQUAT EYE									
1967										
1968	FLAT JACK	TOP SAIL								
1969										
1970	HEN HOUSE									
1971										
1972	ODD PAIR									
	1	2	3	4	5	6	7	8	9	10

NUMBER OF RADARS PER YEAR

*Estimates were made when more than one deployment date, for a single system, was found.

Figure 47—Types of Soviet Radar in Chronological Order*

YEARS 1945										
1946	EW									
1947										
1948										
1949										
1950	EW									
1951										
1952	EW	EW	EW/GCI	HF	IFF	HF/DF				
1953	IFF									
1954										
1955										
1956	EW	EW	HF							
1957	GCI	EW	EW	IFF						
1958	EW/GCI	EW/GCI	EW	HF	EW	EW	IFF	IFF		
1959	EW	EW	EW	EW						
1960	EW	EW	EW	HF	EW					
1961										
1962	HF	IFF								
1963	EW/ GCI	EW								
1964	EW									
1965	HF									
1966	EW									
1967										
1968	EW	EW/ GCI								
1969										
1970	EW									
1971										
1972	HF									
	1	2	3	4	5	6	7	8	9	10

NUMBER OF RADARS PER YEAR

*Estimates were made when more than one deployment date, for a single system, was found.

Table 29—Widely Deployed Soviet ACW Radars

Year	Radar Designation	Use	Frequency Range	Peak Power	Range (NM)		Maximum Altitude (ft)	Anti-Jamming Devices
					$1M^2$	$50M^2$		
1952	Knife Rest A	EW	70–75	100 KW	90	90	55,000	FTC, IAGC, RPD, PWD
1956	Knife Rest B	EW	81–91	100 KW	103	103	75,000	FTC, IAGC, RPD, PWD
1959	Tall King	EW	160–180	700 KW	380	380	200,000	FS, IAGC, SPRF, JPRF
1963	Back Net	EW	2084–2470	2 MW	175	250	130,000	FTC, IAGC, RPS, PRF, STAG
1963	Part Time	EW	561–630	500 KW	185	185	50,000	UNKNOWN
1958	Spoon Rest A/B	ACQ	149–161	250 KW	110	100	53,000	FTC, IAGC, RPD, PWD, AGC
1958	Flat Face	ACQ	815–900	250 KW	125	125	42,000	FTC, IAGC, RPD, PWS, AGC, SPRF,TT
1964	Long Track	ACQ	2085–2423	1 MW	65	65	105,000	FTC, IAGC, PWD,MF, FS, IRF, AGC
1966	Squat Eye	ACQ	815–900	250 KW	75	75	42,000	UNKNOWN
1956	Rock Cake	HF	2610–2650	2 MW	60	60	180,000	FTC, IAGC
1962	Side Net	HF	2560–2710	1.5 MW	115	240	120,000	FTC, IAGC, SPRF, TT
1965	Thin Skin	HF	6460–6600	1 MW	80	200	100,000	FTC, IAGC, SPRF, TT
1956	Big Mesh	GCI	565–3130	1 MW	100	212	60,000	FTC, IAGC
1958	Bar Lock	GCI	2990–3120	1 MW	124	212	100,000	FTC, IAGC, RPS
1959–1960	Big Bar	GCI	565–3130	1 MW	100	212	60,000	FTC, IAGC

Not only did the Soviets concern themselves with faster and higher flying planes and missiles. Their concerns included low flying vehicles that could fly "under" their system. In this respect the visual and sonic stations were still of great use (visual reporting was still highly organized in 1955 with 750 visual operating posts in active operation)[123] but in this case the actual early warning is not much farther reaching than the station itself. Therefore, the push for production of radars capable of detecting low flying objects was begun in 1956.

The overall assessment culminated in the larger number of radars during the 1956 and 1960 period. This larger number of radars is partially due to differing functions associated with the individual radars and also to means of capitalizing on improved performance of a new radar. Cross Out, a GCI radar, is a prime example of this. In order to capitalize on its greater range capabilities, a greater range height finder had to be developed.

Most often newly deployed radars are slightly modified old versions. This had been found to be advantageous in many ways: (l) similar operation and training, (2) maintenance requirements are nearly the same, (3) parts for old radars are readily available and, (4) little change in production requirements.

The Soviet method of deployment, that of deploying a radar system and then deploying more advanced versions without removing the first, as compared to the U.S. method, which replaces a fielded system with that which is believed to be a better system, has much to show. First, the U.S.S.R. has a great quantity of systems at different frequencies, pulse width, etc. This must be considered in the threat analysis as compared with one or two systems to be considered in the defense of the U.S. And secondly, the U.S. aircraft must carry numerous jammers in order to counter this varied U.S.S.R. air defense system.

The trend of complementary radars is even more clearly evidenced when in 1963 two early warning radars were produced with different frequency ranges, peak power, range and latitude capabilities. The higher frequencies also illustrate a move toward greater resolution. In addition, the Soviets have an interest in antenna design. They have been devoting substantial effort to parabolic surfaces with high gains and arrays that are capable of electronic beam shaping and scanning.

C. The Soviet Civil Defense System

1. Overview

It was not until the mid-1950's, several years after the Soviets exploded their own atomic and hydrogen bombs, that actual recognition of the threat imposed by these devices was publicly acknowledged. Ensuing events propagated military-political debates between 1958 and 1961 over adequate protection against an attack from these weapons and the relevance of the civil defense programs. In the end, because of budgetary and other constraints, it was realized that a heavy blast shelter program capable of protecting the entire population was infeasible and the emphasis turned to plans for mass urban evacuation. In 1961, culminating these events, a new civil defense resolution was enacted and the responsibility for civil defense was shifted from the Ministry of the Interior to the Ministry of Defense.

The next milestone event occurred in 1966 at the 23rd Party Congress when Secretary Leonid Brezhnev cited the need to "perfect civil defense," and thus became the first major political leader to publicly endorse civil defense. The significance of this statement and subsequent adoption by the Congress of a new civil defense amendment indicated that civil defense in the Soviet Union had reached a position of prime impor-

[123] AF/INAP Working Papers.

tance in the "defense of the Homeland." The contribution of specific external and internal factors to this new policy on civil defense is difficult to ascertain in subsequent literature or speeches. Nonetheless, Soviet civil defense has continued to rank high on the defense priority list since 1966, despite the SALT I agreements and other detente overtures.

2. Post-1955 Developments (1955–1962)

The years between 1955 and 1958 were marked by an increased emphasis on compulsory civil defense training for the Soviet population and an emerging trend toward mass evacuation as an alternative to a shelter program. DOSAAF, the paramilitary organization responsible for the greater part of civil defense training, expanded its services to schools, collective farms, industry, and other public institutions.[124] In 1955, the first course in chemical/biological/radiological warfare was introduced. This instruction, intended to be a ten-hour course, eventually reached approximately 85 percent of the adult population.[125] There were estimates in 1969 that no other citizens of any country were as well informed on the effects of CBR weapons.[126] A second compulsory training course of 22 hours was completed between 1956–1958; a 14-hour course also began in 1958 followed by an 18-hour course in 1960 which focused on post-attack recovery.[127] DOSAAF also attempted to promote the relationship of civil defense to the military defense structure as indicated in their literature: "The possession of atomic, chemical, and bacteriological warfare in the hands of the imperialists, and the threat of their use, force us actively to prepare civil defense."[128]

Although these attempts at mass participation seemed impressive on paper, there were reports that the courses were not completed on schedule, and that public apathy and skepticism concerning the feasibility of civil defense abounded. This mood existed in spite of Soviet efforts to avoid "defeatism" and related morale problems by orienting civil defense literature and training towards the small-yield Hiroshima-type weapon.[129] It was not until 1961 that the effects of fallout and weapons in the megaton range were published.[130]

There is evidence that negative attitudes stemmed in part from the inadequate shelter facilities in existence during this time. Although basement shelters had been constructed in new apartment buildings since 1946,[131] they could accommodate only 35–40 percent of the urban population[132] and did not protect against blast effects. By 1958, there was evidence of a shift to free-standing heavier shelters, indicating a lack of confidence in the lighter shelters. In addition, existing structures which could be used as shelters, such as the numerous subways in Moscow and Leningrad, were equipped with blast doors.[133] However, these heavier shelters had a maximum capacity for two to three million persons and were primarily planned for the accommodation of command and control and key administrative/industrial/economic personnel.[134]

[124] "Reds Stepping Up Civil Defense Program," p. 26.
[125] NORAD, "Soviet Civil Defense," p. 5.
[126] CIA, "Civil Defense in the Soviet Union."
[127] "Reds Stepping Up Civil Defense Programs," op. cit., p. 26.
[128] Miroshnikov, et al., *Zashchita Naseleniia* . . . , p. 3.
[129] NORAD, "Soviet Civil Defense," op. cit., p. 5.
[130] "Reds Stepping Up Civil Defense Programs," op. cit., p. 24.
[131] SRI, *Soviet Strategy, Objectives, and Force Postures* . . .
[132] Goure, *The Soviet Civil Defense Program: a trip report*.
[133] "Soviet Civil Defense Construction," p. 11.
[134] "Reds Stepping Up Civil Defense Program," op. cit., p. 25.

Not only was public interest at a low level in the late 1950's, but the military and political elements of the Soviet Union voiced disenchantment and pessimism regarding civil defense. In February of 1959, the Norwegian ambassador queried Premier Khrushchev on the status of civil defense. Khrushchev replied that it had been discussed with the Council of Ministers and they had decided that "nothing effective could be done."[135] Shortly after this remark, Anastas Mikoyan noted that the vast expenditures needed for bomb shelters did not seem to be justified in light of the hopelessly excessive destruction brought by a nuclear attack.[136] Khrushchev went so far as to halt the shelter building programs during 1958–1959.[137]

These systems' inadequacies led to the need for alternative measures of protection for the population against a nuclear attack, as well as the need to redefine the Soviet philosophy on civil defense. In line with these requirements, the idea of mass evacuation emerged between 1958–1960.[138] Prior to this time, it was felt that pre-attack evacuation would lessen control, and control was an essential part of the Soviet governing philosophy.[139] Debates on the civil defense program ensued, attracting comments from the military and political leadership in the country. These debates encompassed numerous controversies affecting both civil and military defense, including degree of early warning necessary for adequate preparations, capabilities and costs of shelters, weapon sizes and targeting doctrines, and various evacuation procedures. Although the article did not appear until 1962 when the arguments had more or less been decided, Colonel General O. V. Tolstikov, the Commander in Chief of civil defense, wrote:

> However, at the present time, the problems of protecting the population are not solved in our country to a fully perfected manner. The development of new super-powerful weapons of mass destruction has given rise among some comrades to mistaken views on the problem of protecting the population, to a skeptical attitude towards the possibility of solving this problem. They are especially doubtful about the (value) of the engineering-technical (shelter) measures. They incorrectly assumed that the defensive measures consisted only in building shelters, and ignored other ways and means of defense. It is clear that such views cannot be accepted as being correct.[140]

In addition, Tolstikov pragmatically suggested that existing facilities such as underground garages, movie houses, and pedestrian tunnels could serve the dual purposes of both providing shelters during attack and economic use in peacetime.[141] These arguments suggest that an adequate shelter program was not necessarily the only way to protect the population. Other evidence also exists favoring a valid civil defense program without reliance on heavy shelters. In a 1962 *Voyennyye Znaniya* article, Lieutenant General Ye. Leoshenya is quoted as saying, "incompetent personnel think that the only reliable means of defense against nuclear weapons is special, durable shelters . . . this viewpoint is entirely erroneous."[142]

The basic dilemma in these debates was the problem of coping with the growing threat of thermonuclear weapons. Civil defense literature as late as 1960 was not fully appreciative of the characteristics of modern weapons. This was evidenced in the training programs concerning incendiary bombs and blackout procedures.[143] In addition, there were more generalized threats to national security, including the polarization of the East/West struggle, the political/propagandist implications within the Soviet Union to support

[135] CIA, "Changing Soviet Civil Defense Concepts," p. 9.
[136] Ibid., p. 11.
[137] SRI, *Soviet Strategy: Objectives, and Force Postures* . . . , op. cit.
[138] Goure, *The Soviet Civil Defense Program*.
[139] "Reds Stepping Up Civil Defense Programs," p. 24.
[140] *Voennye Znaniya*, No. 2, pp. 21–22.
[141] *Izvestila*, January 18–20, 1962.
[142] *Voennye Znaniya*, No. 2. op. cit.
[143] Goure, *The Soviet Civil Defense Program*, op. cit.

claims of aggressive intentions of the West, the increased vulnerability of the country's economy due to growing urbanization and concentration of industry, and the concern for political and economic manpower, as World War II had considerably decreased the population and a decline in the birthrate also plagued the Soviets.[144]

Changes in the existing civil defense programs may have been slow because the Soviet decision-making apparatus found it difficult to change a program as large as civil defense in a short period of time,[145] especially if military defense took precedence. Thus, when the benefits of existing shelters were in doubt and support turned to the alternative source of protection that evacuation measures offered,[146] this implied a reorganization of procedures and functions of the entire civil defense organization. The solution to many of the problems was solved in October 1961, at the 22nd Party Congress when civil defense received the attention of the Congress and a new law was enacted. The significance of these actions was exemplified by the name change from Local Anti-Air Defense (MPVO) to Civil Defense (Grazhdanskaia Oborona),[147] indicating an impact on the overall structure as well as attitudinal changes. Early the next year, Tolstikov explained the change:

> If earlier, our cities could solve the problem of protecting the population and economic installations from enemy air attacks, and deal with the damage caused by the bombardment with their own resources; under contemporary conditions, this will require the use of far greater forces and resources. . . .
>
> This is why the Local Anti-Air Defense had ceased to be local and has become a state-wide system and is therefore now called Civil Defense, since it requires the active participation of each citizen of the U.S.S.R.[148]

This new era of civil defense focused on increased control efforts, urban evacuation, and improvised shelters to reduce casualties.[149] The old program (MPVO) now became a part of the Ministry of Defense (MOD), implying greater interaction with the military. Soviet Marshal V. I. Chuykov was appointed as Chief of Civil Defense, with Colonel General of Aviation, O. V. Tolstikov as First Deputy Chief and Chief of Staff.[150]

Although the new act quelled some of the controversy, numerous speeches and editorials continued to appear during 1962, some revolving around the need for stronger shelter protection, others downplaying civil defense altogether. However, it has been hypothesized that these comments were primarily a Western-directed propaganda attack on new U.S. programs and the McNamara-inspired civil defense debates during 1961–1962.[151] For example, the Soviet Minister of Defense, R. Ya. Malinovskiy, expounded the view that "no shelter can save one from a nuclear bomb," and went on to label the shelters "ready-made coffins and graves." He condemned the U.S. construction of shelters as a front for "making capital out of the fear of people."[152] It appears that Malinovskiy was lashing out at shelters in general. His comments also risked the possibility of undermining DOSAAF's training programs and squelching whatever public interest in

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[144] Ibid.
[145] Goure, *Civil Defense in the Soviet Union*.
[146] *SRI, Soviet Strategy, Objectives, and Force Postures* . . . , op. cit.
[147] Goure, *The Resolution of the Soviet Controversy* . . . , p. 11.
[148] *Voennye Znaniya*, No. 2, op. cit.
[149] "Soviets Decentralize Government Control System," p. 21.
[150] CIA, "Soviet Civil Defense: Policies and Priorities," p. 16.
[151] Goure, *The Resolution of the Soviet Controversy* . . . , op. cit., pp. 9 and 14.
[152] *Pravda*, 24 January 1962.

civil defense existed at the time.[153] However, it is more likely that the statement was a propaganda technique for the benefit of the United States, since this and similar sentiments managed to find their way to the Western press but not to the Soviet press.[154] Malinovskiy, himself, several months prior, declared that because of the constant danger of attack, ". . . we must prepare our armed forces, the country, and the *entire people* to withstand the aggressor, mainly under conditions of a nuclear war,"[155] indicating an endorsement of civil defense. Other statements attempting to de-emphasize Soviet civil defense efforts emerged from such personalities as Mrs. Khrushchev, "we are not building shelters, because we are not getting ready for war"[156]; and Soviet Ambassador Menshikov, "we are building no bomb shelters . . . we need peace to build communism."[157] Internally, however, the number of pro-civil defense articles in the Soviet press and radio broadcasts steadily increased after 1961, as well as a renewed emphasis within DOSAAF and its training operations.[158] Some statements spelled out the importance of the new civil defense plans, such as a September 1961 broadcast:

> The most important civil defense measures for the protection of the population are: Timely warning to the public of an impending air attack, provision of shelters, dispersal and evacuation of the population, timely medical assistance for the injured, and rapid recovery from damage. . . . Shelters are usually prepared ahead of time; therefore, it is necessary to know where they are located and how to reach them. . . . Therefore, after the warning is sounded, the public must immediately take shelter.[159]

This statement indicates the continuing reliance on some kind of shelter. Although it might have been intended as reassurance for the Soviet public, later developments tend to substantiate the view that such pronouncements were more likely the official position.

In December 1961, the Fifth Plenum of the Central Committee of DOSAAF met in Moscow. Speaking primarily on the importance of civil defense training and DOSAAF were General Tolstikov, Chief of the Civil Defense Administration of the Central Committee of DOSAAF, I. Varennikov, and Chairman of the Central Committee of DOSAAF, General of the Army, D. D. Leliushenko.[160] Only the DOSAAF press carried reports of the meeting.[161] However, in May of 1962, the disputes concerning the importance of civil defense to the overall defense strategy were resolved at the Fifth All-Union Congress of DOSAAF, reports of which appeared in abundance in both *Pravda* and *Red Star*. Numerous military notables were in attendance, including the Chief of Aviation, K. A. Vershinin, and the Marshal of Aviation, V. A. Sudets, who had been recently appointed as Commander in Chief of the National Air Defense Forces (PVO Strany).[162] Several representatives of the Communist Party were there, the most significant of whom was A. N. Shelepin, Secretary of the Central Committee of the Communist Party of the U.S.S.R., whose role it was to extend greetings in the name of the Party.[163]

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[153] Goure, *The Resolution of the Soviet Controversy* . . . , op. cit., p. 15.
[154] Ibid., p. 9.
[155] *Pravda*, 25 October 1961.
[156] *The New York Times*, 7 October 1961.
[157] *Los Angeles Times*, 12 December 1961.
[158] Goure, *The Resolution of the Soviet Controversy* . . . , op. cit., p. 6.
[159] FBIS, *U.S.S.R. and Eastern Europe*, 16 October 1961.
[160] Goure, *The Resolution of the Soviet Controversy* . . . , op. cit., p. 12.
[161] Ibid., p. 13.
[162] Ibid., pp. 21–24.
[163] Ibid., p. 22.

The greatest achievement at the May Congress was the public endorsement of DOSAAF by the Central Committee of the Communist Party. Their resolution called for a strengthening of the defense of the U.S.S.R. utilizing the entire population and stressed the importance of DOSAAF.[164] Concerning civil defense, the Party's resolution stated: "DOSAAF *must* continue to actively propagandize among the population the heroic traditions of the Soviet people and of its Armed Forces, widely disseminate military-technical knowledge, *train the population in ways and means of defense from contemporary means of mass destruction*, and assist the economic organizations in the preparation of cadres of technical specialists."[165]

This was the highest official public endorsement of Soviet civil defense up until this time. It indicated that civil defense programs would receive continued support from the Party.[166]

Both Chuykov, speaking for the armed forces, and Malinovskiy, the Minister of Defense, proclaimed that civil defense must be a part of the national defense structure and must be accompanied by a viable shelter program.[167] This tendency to link civil defense with the entire defense conglomerate implied a closer relationship with the military than had existed prior to the DOSAAF Congress. This trend was to continue to flourish through the sixties, experiencing an even greater control between active and passive defense after the 23rd Communist Party Congress in 1966. The need for this relationship was best explained in a reliable military journal in 1962. The author stated that the defense apparatus was in need of a "new type of force not designated for direct command." These "troops" would be used for "rescue-rehabilitation" work during a "nuclear missile war." They would be similar to the civilian formations of MPVO (civil defense) but that these "formations exist mostly on paper, are not supported from a materiel-technical standpoint, are semi-voluntary organizations, and are not properly directed by anyone." These new "troops" would concern themselves with problems of government authority and would be under the "leadership of organs of military control."[168]

3. 1962–1968

The years following the reorganization of civil defense under the Ministry of Defense experienced a more closely directed national system of area defense, as opposed to the former local point defense system.[169] Military civil defense forces were operating in certain areas such as communications, engineering, and rescue work, often overlapping with the civilian administrative organizations.[170] The significance of this interaction among civilian and military components was best explained by Chuykov: "Civil Defense alone is not capable of assuring the protection of the population and material resources." Such protection must be "achieved only through the *joint efforts of civil defense and the armed forces*…neither is success in these areas possible without civil defense; in the event of nuclear attack, civil defense is vital to the achievement of victory."[171] Although the total size of the civil defense composition was not known, Khrushchev was to have boasted at one time of some 20 million persons involved in the program.[172] Compulsory training of

[164] Ibid., p. 25.
[165] *Krasnaia Zrezda*, 23 May 1962; *Pravda* 23 May 1962.
[166] Goure, *The Resolution of the Soviet Controversy* . . . , op. cit., p. 26.
[167] CIA, "Changing Soviet Civil Defense Concepts," op. cit.
[168] Gastilovich, "The Theory of Military Art Needs Review," pp. 19–20.
[169] Goure, *Soviet Civil Defense Revisited* . . . , p. 10.
[170] Ibid., p. 12.
[171] Chugkov, *Civil Defense in Nuclear Missile War*, p. 30.
[172] Goure, *Soviet Civil Defense Revisited* . . . , op. cit., p. 15.

all adult males between 16 and 60 years old and females between 16 and 55 years old was still directed by DOSAAF, with added assistance from the Red Cross, the Komsomol (Communist Youth Organization), and other organizations.[173]

It was not until 1966, however, at the 23rd Congress of the CPSU, that civil defense got its highest public endorsement thus far. General Secretary Leonid Brezhnev said, "We must perfect civil defense . . ."[174] and was subsequently backed in this announcement by Minister of Defense Malinovskiy who declared: "The interests of strengthening the defense capability of the country demand continuous attention to the military-patriotic education of the Soviet people, especially the youth, to a wide dissemination of military knowledge among the population of the country, attracting it to active participation in the entire system of civil defense."[175]

The Congress ordered a resolution stating: "The perfecting of civil defense, improving military-patriotic work among workers, especially the youth . . . must be the constant concern of the entire Party and of the whole Soviet society."[176]

The coverage by the media of these developments further indicated the impact of such a high-level endorsement. The principal national Soviet press organs, *Pravda*, *Izvestiya*, and *Red Star* devoted considerable space to publicizing this new concern of the Communist Party.[177]

Although civil defense organization has heavily relied on the endorsement and the Resolution in promoting their programs and in justifying further development in the passive defense area, the exact reason for the support rendered civil defense by the Party is not known.[178] A number of reasons stand out, not the least of which was the desire to stimulate morale and patriotism.[179] However, with the knowledge of the great efforts expended on civil defense and the expanded budget it had to receive in order to function, it is likely that it is much more than a "morale booster."[180]

Alternative explanations include (1) the fallout problems generated by ballistic missile defense systems; (2) the combined effects of limited confrontations such as the Berlin Crisis, Vietnam, Cuba, and China; (3) actual perceptions of the Western nuclear threat as compared to their own military capabilities; and (4) the psychological-ideological benefits of a civil defense program.

4. Civil Defense and the ABM

There have been no Soviet public statements connecting civil defense and ballistic missile defense, as in the United States when Secretary of Defense Robert McNamara argued that an ABM program would be illogical without an extensive shelter program.[181] It is believed that the Moscow ABM system intercepts its target outside the atmosphere and, therefore, does not pose the problem of fallout in the defended area. There is also speculation that the shelter programs have remained relatively unchanged because the ABM system is not yet sufficiently reliable nor widespread to warrant a massive change in urban evacuation

[173] Ibid., p. 28.
[174] *Pravda*, 30 March 1966.
[175] *Red Star*, 2 April 1966.
[176] *Eto Dolzhen Znat Kazhdyi*, p. 3.
[177] Goure, *Soviet Civil Defense Revisited . . .* , op. cit., p. 7.
[178] Ibid., p. 8.
[179] See Goure, *Soviet Civil Defense Revisited . . .* ; Scott, *Survival in the Nuclear Age* and *New Trends in Kremlin Policy*, Georgetown University, for a discussion of this theory.
[180] Goure, *The Soviet Civil Defense Program*, op. cit.
[181] *Voennye Znaniya*, No. 1.

plans.[182] It should also be kept in mind that the Soviets have the potential for evacuating approximately 70 percent of the urban population whereas the U.S. has no such plans.[183]

Therefore, the civil defense program and the ABM program appear to be relatively independent of each other, perhaps because Brezhnev and other top leaders feel that ABM and antiaircraft systems have limited effectiveness, and thus promote measures to strengthen other Soviet defensive capabilities.[184]

Of course, the internal propaganda aspect cannot be neglected. Just as in the late 1950's when the U.S.S.R. did not wish to alarm the population with the knowledge of the effects of thermonuclear weapon, they may have again wished to avoid the controversy which could arise when active defense threatens passive defense. Khrushchev's earlier exaggerations on Soviet ABM capabilities may have had a detrimental effect on civil defense training,[185] and they did not want to negate their civil defense efforts thus far.

5. Civil Defense and Limited Conflicts

Enough of disputes, limited conflicts, and other crises have occurred since the early sixties to give the Soviets the impression that their civil defense program was a worthwhile "venture." Among these were the 1961 Berlin Crisis and a demonstration of NATO's strength and determination; the Cuban Missile Crisis at which time the Soviets were forced to back down; the threat of atomic weapons in NATO countries, especially the possibility of such weapons in West Germany; the growing Vietnamese war which enabled both the U.S.S.R. and the U.S. to examine each other's latest weapons technology; growing tensions in the Mid-East; and the Sino-Soviet border disputes. Other than the major threat imposed by the U.S., China, with its acquisition of a nuclear capability in 1963 coupled with the Sino-Soviet split in 1958–1960 on Communist ideologies, probably posed the greatest threat to national security. This was indicated in the statement, by a Soviet civil defense spokesman, that civil defense efforts are put "within a framework of imperialist aggression . . . the threat from Communist China notwithstanding."[186]

Not only did Vietnam serve to split the world into a number of destabilizing alliances, it offered the Soviets a propaganda tool with which to lash out at the "imperialist aggressors." They were able to experience a period of internal growth and development, not the least of which was the development of new technology and defense programs, while observing the turmoil and unrest occurring in the U.S. as a result of the war. The Soviets were also able to gain some insight into U.S. evolving strategies and existing tactical defense power—aircraft, chemical and bacteriological weapons, and tactical missiles, to name a few. Such knowledge gave the Soviets a better grasp on methods of protecting their population from modern weapons.

6. Perceptions of the Western Threat

After the 22nd Congress of the CPSU in 1961, the U.S. came to realize that they were superior in ICBM technology and that the Khrushchev claims to a perfected Soviet ICBM force were a bluff. Thus, the Soviets were faced with the problem of their own missile gap[187] and the fear that the U.S. possessed a first-strike

[182] CIA, "Soviet Civil Defense: Policies and Priorities," op. cit., p. 8.
[183] Suta, *Evaluation of U.S. Capabilities* . . . .
[184] Goure, *Soviet Civil Defense Revisited* . . . , op. cit., p. 6.
[185] CIA, *Civil Defense in the Soviet Union*, op. cit.
[186] Akimov, et al., "Civil Defense—Moscow 1969."
[187] SRI, *An Analysis of the U.S.-Soviet Strategic Interaction Process*.

capability. The theory, expounded by Khrushchev in the early 1960's, that the "Soviet Union would suffer less damage than the West because of its greater territorial size and lower concentration of population and industry" soon changed to the awareness that no part of the country was immune to attack.[188] Since 1966, most civil defense writing has included the statement, ". . . there is no guarantee that some of the enemy's weapons will not reach their targets. . . ."[189] Hence, the need for an effective civil defense program was reinforced.

The *Soviet Civil Defense Manual*, 1966, in explaining the role and place of civil defense, stressed "imperialist aggression." The idea that the U.S. was inclined towards "unleashing a new war to restore capitalism over the world" was the predominant theme. As the U.S. and U.S.S.R. were strengthening their nuclear capabilities, civil defense in the U.S.S.R. was to play the role of strengthening the defense of the country.[190]

Especially significant in the Manual was the Soviet concept that the U.S. relied on surprise attack.[191] It is the contention of a number of analysts that this theory played the greatest role in Soviet evacuation procedures and the philosophy around which a successful civil defense program was built, more specifically the plans to blunt attacks by preventive or preemptive strikes and an effective air defense.[192] Though this philosophy does not appear in Soviet literature, it is a feasible method of ensuring sufficient warning time for urban evacuation, estimated to require at least three days.[193]

Obviously there are deficiencies in these procedures. For example, if the Soviets began evacuation preparations in accordance with plans for attack, the activity would most likely be observed by the opponent, thus nullifying the preemptive value.[194] If nuclear attack is to be inevitable, the ideal situation, enabling last-minute evacuation measures to be carried out would be a scenario in which tensions between the two countries precipitated a slowly escalating situation.[195]

Though public announcements focus on the threat from the "imperialist" countries, this is evolving into more of an ideological threat than an actual attack. As previously mentioned, Vietnam did much to weaken the position of the United States. The American attitudes toward the military and subsequent cuts in defense spending somewhat limited the ability of the U.S. to pose a credible threat as in the early 1960's. In contrast, Soviet defense budgets grew by as much as four to five percent after the 1965 Five-Year Plan.[196] By 1967, Moscow had its own ABM system.[197] Soviet ICBM capabilities soon filled the "gap" of the early 1960's—the SS-9 and the SS-11, both reactions to the U.S. Minuteman, both hardened and dispersed, and both targeted on urban centers and key military industries, reached IOC in 1965 and 1966, respectively. The IRBMs and MRBMs geared towards Western Europe in the late fifties were superseded by the ICBMs targeted on the United States in the mid-1960's.

Although the Soviets continued to emphasize the need to protect the industrial and economic sectors of the country, there is evidence that dispersal of new facilities alleviated part of the problem: "In discussing

[188] Goure, *Soviet Civil Defense Revisited . . .* , op. cit., p. 5.
[189] CIA, *Civil Defense in the Soviet Union*, op. cit.
[190] CIA, "Soviet Civil Defense: Policies and Priorities," op. cit., p. 28.
[191] Ibid., p. 29.
[192] Goure, *The Soviet Civil Defense Program*, op. cit.
[193] Suta, *Evaluation of U.S. Capabilities . . .* , op. cit.
[194] Goure, *The Soviet Civil Defense Program*, op. cit.
[195] CIA, "Soviet Civil Defense: Policies and Priorities," op. cit., p. 13.
[196] SRI, *An Analysis of the U.S.-Soviet Strategic Interaction Process*.
[197] DIA, *The Moscow ABM System*.

the dispersal of industry, it must be kept in mind that historically many industrial installations were established and located at a time when no one thought of nuclear attack. Therefore, we are now speaking primarily of the proper distribution of newly built installations and the partial and gradual dispersion of existing ones."[198] Other attempts at post-attack recovery, such as the provision of hard shelters for the industrial workers,[199] and the hardening of industrial plants,[200] also lessened the threat of economic collapse.

Regardless of these military and non-military improvements, the Soviets continued to promote their civil defense programs, and neither the impending detente nor the lessened U.S. threat altered their objectives.

7. Psychological/Ideological Implications

There should be no doubt as to the effectiveness of civil defense as a morale builder. After all, a country cannot be expected to recover from an attack without first convincing the population that survival, and thus recovery, is possible. According to one report relating military considerations to civil defense, the principal motives and objectives behind Soviet civil defense are to "prevent a complete collapse of public *morale*, government control, and economic output in wartime . . . the military's ability to continue would depend on popular support and a continuous flow of resources."[201]

The significance of the morale of the people and their will to survive was contrasted between the socialist and capitalist camps: "The imperialist states will not be able to bear the hardships of modern war against the countries of the socialist commonwealth. . . . In the event of war the morale-political potential of the world socialist system will be vastly superior to the morale capabilities of the imperialist aggressor. This will determine to a considerable extent the outcome of the struggle in favor of socialism."[202]

Here, of course, the ideological differences are made to play a part. It was pertinent that the Soviet population felt that they, as a Communist people, were superior to all other societies and that the Communist doctrine of "guiding history in its course" could only be attained by ultimate survival over the opponent.

Psychology directed at the opponent also plays a role in "perfecting civil defense." If the population and economy of the Soviet Union were as adequately protected as claimed, then there was no way to predict to what extent the Soviets would use this state of readiness to "blackmail" or threaten Western powers with war.[203] In any case, civil defense has significantly reduced the capability of the United States to provide deterrence, especially if the number of fatalities is considered an element of assured destruction.[204] Deterrence, essentially a matter of psychological manipulation in that it depends entirely on convincing the opponent that one possesses adequate military strength with which to destroy him, does not afford much bargaining power if the opponent is convinced that he could not only withstand an attack but maintain sufficient cohesiveness so as to retaliate in force. Granted, this retaliation relies on a second-strike capability, but it also depends heavily on the desire and ability of the population to recover quickly and initiate such a response.

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[198] Goure, *The Role of Civil Defense in Soviet Strategy*, p. 20.
[199] CIA, "Changing Soviet Civil Defense Concept," op. cit.
[200] Goure, *The Role of Civil Defense* . . . , op. cit., p. 19.
[201] CIA, "Civil Defense in the Soviet Union," op. cit.
[202] Goure, *The Role of Civil Defense* . . . , op. cit., p. 22.
[203] Goure, *The Soviet Civil Defense Program: a trip report*, op. cit.
[204] Suta, *Evaluation of U.S. Capabilities* . . . , op. cit.

8. 1968–1972

The basic organizational structure of civil defense did not change again after the 1961 reorganization. However, the October 1972 appointment of Colonel General A. Altunin to succeed Chuykov as Chief of Civil Defense indicated a more prestigious position for the organization since Altunin was a Deputy Minister of Defense of the U.S.S.R., a position Chuykov did not hold.[205] Civil defense appeared to have taken a secure position alongside the other defense elements, and a greater emphasis was placed on military control within the programs. In addition, a series of forest fires, floods, and other natural disasters motivated the decision to place the responsibility for handling such disasters among the existing missions of military civil defense units.[206]

Although civil defense continued to receive recognition and support, this is not to say that deficiencies in the system did not exist. These shortcomings appeared to be mainly attributed to a combination of "competing needs and public apathy,"[207] this disinterest being a special concern of the Soviet leadership following the detente and greater harmony with the United States in the early 1970's.

Civil defense budgetary estimates are difficult to make because of the numerous activities involved and their close interaction. Overlaps and indirect costs, such as those which go for shelter modifications, civilian administration, or time off for training, further complicate the procedure. However, a number of reports have cited budgetary and economic constraints are a major problem within the civil defense administration, especially regarding shelter programs.[208] This theory is further advanced by the Soviet dependence on evacuation for the greater part of the urban population. It is a fact that basic shelter designs have not been altered significantly since 1950,[209] disallowing sufficient blast protection in most areas. Comments by civil defense personnel further substantiate the resource problem: "At present, there are required shelters and cover with better protective factors (than was the case in World War II). To create them for the entire population of the country requires enormous resources and many years of intensive work. As yet, this is not within the capability of any, even the most developed country, to do."[210]

Therefore, it is reasonable to assume that the Soviets are still relying on evacuation procedures as an adequate defense for the population, as evidenced in a 1969 statement: "To evacuate the people as quickly and as orderly as possible from the zone of immediate attack and to save them from destruction is the most important task of civil defense under conditions of war."[211]

Training programs continued—a new 21-hour course which began in 1967 was completed in 1969.[212] Compulsory training was introduced into the 5th–7th grades in 1967 and extended to the 2nd grade in 1970.[213] There were indications in 1968 that three divisions of civil defense troops had been created, probably a product of the recently established civil defense school which trained junior officer candidates for future command of civil defense units.[214] Training duties had already changed after Brezhnev's 23rd

[205] Goure, *The Current State of the Soviet Civil Defense Program*, p. 7.
[206] Ibid., p. 7.
[207] *Voennye Znaniya*, No. 1, op. cit.
[208] See *Voennye Znaniya*, No. 1, January 1969; CIA, "Soviet Civil Defense: Policies and Priorities" 1967; CIA, "Civil Defense in the Soviet Union," 1969; and Goure, *The Current State of the Soviet Civil Defense Program*, pp. 8 and 25; for a discussion of budgetary constraints and shelter facilities.
[209] Goure, *Soviet Civil Defense Revisited . . .* , op. cit., p. 24.
[210] Beliavskil, *Brazhdanskaia Oborona-Vsenarodnoe Delo*, p. 9.
[211] *Pravda Ukrainy*, 13 May 1969, quote from Lt. Gen. Ikachenko.
[212] Goure, *Soviet Civil Defense Revisited . . .* , op. cit., p. 25.
[213] *New Trends in Kremlin Policy*, p. 79.
[214] CIA, "Civil Defense in the Soviet Union," op. cit.

Congress speech in 1967, shifting responsibility for technical expertise, coordination, and direction from DOSAAF to the military.[215]

However, an interview[216] with Chuykov in 1968 revealed several failures within the system and left the impression that they were not as successful as they seemed on paper. Although he implied that key civil defense personnel had received adequate training, he was less enthusiastic about the training of manual and office workers and considerably less optimistic about the results of the 1967 21-hour course. The fact that the article appeared in a civil defense journal and not a Communist party publication suggests that civil defense may have suffered a decline in prestige, at least during this time. However, it is the opinion of at least one analyst that civil defense training "may at least in part serve to stimulate discipline and patriotism, whose decline, and that of the martial spirit among the postwar generation, has become a concern to the leadership."[217] It would seem that as the 1970's approached, bringing with them a greater sense of urgency for maintaining peaceful relations between the two super-powers, civil defense would become subordinated, if only as reassurance to the U.S. that the Soviets planned to "abide by the rules." This was not the case, however. The formal proclamation of detente issued at the May 1972 Moscow Summit did not lessen the interest in civil defense. Although detente may diminish the possibility of war, in Soviet eyes it does not negate war.[218] According to a U.S. publication which appeared prior to the detente: "It appears quite possible that, if the Soviet leaders reach or negotiate a detente with the United States, the Kremlin may wish to control or minimize the internal impact that a relaxation of international tensions may have in dulling the vigilance of the general populace and encouraging the disruptive impulses of the intelligentsia."[219] Although this theory was related to the rehabilitation of Stalin and the Chinese threat, it could apply most readily to promoting a renewed interest in civil defense.

Attempting to associate Communist ideology and detente, one civil defense analyst asserts that Soviet views on the concept of detente differ from those of the West. According to his hypothesis, the Soviets see this period as one of "peaceful coexistence," a result of the *historical* necessity for opposing systems to experience phases of peace and resistance—eventually leading to a shift of East-West forces in favor of the Soviet Union.[220] Just how much this rather dogmatic approach applies to Soviet thought today is not known.

The same analyst stated two years earlier that it was "not possible to ascertain how serious Soviet leaders actually believe the threat of war to be." It was assumed that the leadership certainly realized political benefits by claiming a threat existed, if only to justify massive defense spending. If these expenditures motivated the West to "follow suit" then it also served to "confirm" the threat of U.S. aggression.[221]

Civil defense interacted closely with the SALT I agreements signed in 1972. The limitations placed on ballistic missile defense leave the cities of both countries vulnerable to offensive forces. However, the Soviets maintain the capability to evacuate the majority of the urban population which the U.S. cannot do.[222] Therefore, civil defense offers the Soviets some advantage in the SALT talks. Perhaps this provides

[215] *Soviet Civil Defense Programs Continued*.
[216] *Voennye Znaniya*, No. 1, op. cit.
[217] Goure, *Soviet Civil Defense Revisited* . . . , op. cit., p. 8.
[218] Goure, *The Current State* . . . , op. cit., p. 2.
[219] Goure, *The Military Indoctrination of Soviet Youth*, p. 19.
[220] Goure, "The Soviet View: We are Realists."
[221] Goure, *Recent Developments in Soviet Civil Defense*.
[222] Suta, *Evaluation of U.S. Capabilities* . . . , op. cit.

part of the explanation for Altunin's appointment as Chief of Civil Defense several months after the SALT I decision.

Some analysts, however, see the ABM limitations imposed by SALT I, added to the capability provided by the MIRVed nuclear warheads in the possession of the super-powers, as negating civil defense preparations. Others consider civil defense programs instituted by either of the super-powers as a threat to detente. The Soviet response to this theory is unequivocal:

> Soviet civil defense does not incite, does not promote and does not provide impetus to war. Its substance is influenced in a decisive manner by the peaceful foreign policy of the socialist state. For this reason, there is no basis for the "forecasts" of Western experts that a strengthening of Soviet civil defense will lead to greater "inflexibility" of Soviet foreign policy and even to serious aggravation of international tensions. Improvement of Soviet civil defense and an increase in its effectiveness constitutes one more major obstacle in the way of the unleashing of a new world war by the imperialists. Consequently, Soviet civil defense intensifies the peaceful actions taken by our state and strengthens international security as a whole. Herein lies one of the most important features of its socio-political essence.[223]

Thus, the era of "assured destruction," which precipitated the need for detente and the SALT talks, has given way to the era of "assured survival," in the Soviet Union, through an ever-expanding civil defense program. Chuykov, in emphasizing the need for a well-organized civil defense system which could reach the entire population, best explained the objectives: ". . . mass weapons . . . with modern defense measures, . . . will not injure the masses . . . only those who neglect the study, mastery, and use of these measures."[224]

[223] Scott, *Survival in the Nuclear Age*, quote from A. S. Milovidov.
[224] "Civil Defense as a Common Concern," *Nauka i Zhizn*, pp. 43–47.

Table 30—Estimated APVO Aircraft Mid-Year

Aircraft	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
MiG-15/MiG-17 FAGOT/FRESCO	3725	3450	3100	3200	3579	3275	3040	2965	2675	2200	1920	1715	1572	1488	1284	1104	912	756
Farmer/MiG-19	50	225	450	600	700	750	750	750	750	750	675	600	534	438	390	378	366	348
Flashlight/YAK-25	25	125	250	400	400	400	380	350	325	300	300	215	190	202	202	178	154	84
Fishpot/SU-9/11						175	230	300	415	675	755	775	780	768	768	768	768	768
Fitter/SU-7								15	15	35	35	35	20	20	15	12		
Firebar/YAK-28P										74	100	235	360	360	360	360	360	360
Fiddler/TU-128P												5	20	60	81	108	162	162
Flagon/SU-15												s		70	250	370	470	530
Foxbat/MiG-25																	21	63
Total	3800	3800	3800	4200	4675	4600	4400	4380	4180	4054	3785	3580	3476	3406	3350	3278	3213	3071

Source: DI-3 Working Papers.

Table 31—Soviet Strategic Defensive Missile Deployment (Number of Sites)

	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
SA-1	5	30	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56
SA-2						30	160	370	620	720	775	775	775	775	775	775	775	740	725
SA-3								2	38	75	88	96	96	96	101	143	190	210	227
SA-5													4	13	30	96	180	208	227
MOSCOW ABM															1	3	4	4	4

Sources: DIA: Defensive Missile Order of Battle AP-1-240-2-1C-64 (65,66,67) NT Pre-1967 CIA Notes Pst-1967.

Table 32—Fighter Aircraft Production, 1955–1972

Designation \ Year	Pre-1955 Production	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	Total Production
MiG-17 Fresco*	9800	2000	1050																12850
MiG-19 Farmer*	260	550	600	450															1860
YAK-25 Flashlight*	250	300	30																580
SU-9/11 Fishpot*			5	130	240	240	240	15											1110
SU-7 Fitter*			5	45	85	95	130	185	200	105	85	160	190	190	100	75	70	70	1790
SU-20 Fitter B															10	30	85	65	190
MiG-21 Fishbed				5	80	240	285	380	480	525	630	720	595	430	390	420	420	480	6080
YAK-28P Firebar*									40	147	159	180	75						601
Tu-128P Fiddler*											10	30	35	35	35	35	30		210
SU-15 Flagon*												5	90	175	180	150	75	80	755
MiG-25 Foxbat*														5	25	30	45	55	160
MiG-23 Flogger															5	30	75	150	260
SU-19 Fencer																		5	5
Total Per Year	10310	2850	1690	630	405	575	655	805	735	777	884	1095	985	835	745	770	800	905	26451

* AIRCRAFT DEPLOYED WITH PVO

Sources: DI-3 Working Papers

Table 33—Composite of Soviet Radar Systems

Radar	Function	Year Entered Service
Back Net	EW, GCI	1963
Bar Lock	EW, GCI (when used w/HF)	1958
Big Bar A	EW	1959
Big Bar B	EW	1960
Big Bar C	EW	1960
Big Mesh	EW	1957
Big Net	EW	1957
Cross Fork	EW	1950
Cross Out	EW/GCI	1958
Dumbo	EW	1946
Fish Net	IFF	1952
Flat Face	EW, acq. for SA-3 & AAA	1958
Flat Jack	Airborne EW	1968
Gage	EW	1952
Head Net A	EW, Surface Search	1959
Hen House	EW	1970
Knife Rest A	EW	1952
Knife Rest B	EW	1956
Krug	HF/DF	1952
Long Track	EW	1964
Moon Face	EW, may be GCI	1959
Odd Pair	HF	1972
Pagmatit	EW	1942
Part Time	EW	1963
Patty Cake	HF	1953
Rock Cake	HF	1955
RUS-2	EW	1943
Scan Odd	AI	1954
Scan Can	AI	1954
Score Board A	IFF	1958
Score Board B	IFF	1962
Side Net	HF	1962
Slant Mesh	GCI	1957
Sponge Cake	HF	1958
Spoon Rest A	EW	1959
Spoon Rest B	EW	1960
Spoon Rest C	EW	1960
Squat Eye	EW & Acq. SA-3 & AAA	1960
Stone Cake	HF	1958
Strike Out	EW	1957
Tall King	EW	1959
Thin Skin	HF	1965
Token	EW, GCI	1951
Top Sail	EW, GCI	1968
Top Trough	EW	1960
Witch Four	IFF	1958
Witch Five	IFF	1957
Witch Eight	IFF	1953

[1] Deployment of Hawk will be addressed in the following paragraph, *Operational Problems*.
[2] Reduction of generally eight missiles per year was programmed, rather than reduction in the number of squadrons.
[3] Gap filler radars would be retained for the Florida area only.
[4] Programmed Hawk reductions were not implemented because of a subsequent requirement for air defense of the southern United States.
[5] Advanced Airborne Command Post, a NORAD/CONAD concept comparable to the National and SAC airborne command posts.

Appendix A

A Chronology of American Air Defense Systems[1] (1956–1972)

1956

3 January	Navy lighter-than-air blimp squadron (ZW-1) commissioned.
11 January	The Department of the Army assigned ARAACOM responsibility for supervising the training of Army National Guard AAA units of the Special Security Force which have specific CONUS defense missions.
22 January	JCS approved in principle a recommendation of USAF Chief of Staff that there was a need for peacetime integration of the operational control of the Canadian-U.S. air defense forces.
February	The USAF approved both extensions to the DEW Line: Western, from Alaska to Midway, and Eastern, from Greenland to the Azores.
March	Initial version of the radar-controlled air-to-air missile (GAR-1) became operational with 445th FIS.
2 March	The Assistant Secretary of Defense for Research and Development approved a program to integrate the U.S. Marine Corps ground-based Sparrow III program with the Hawk program.
8 March	First airborne test firing (from F-89D) of MB-1 nuclear rocket took place at Holloman AFB, New Mexico.
April	First F-102A received by ADC FIS. This was the initial supersonic, century-series aircraft.
9 April	Seven squadrons of RC-121 (AEW&C) aircraft deleted from USAF program because of aircraft problems. Seven squadrons remain in the program.
18 April	Bell Telephone Laboratories requested to initiate studies to determine the feasibility of improvements to enable the Nike Hercules system to have a greater capability against small high-speed targets and in an ECM environment.
7 May	Texas Tower No. 2 began limited operations with FPS-3L (later converted to FPS-20A) search radar and two FPS-6 height finder radars. This was the first Texas Tower to become operational.

[1] This chronology has been prepared by selection of occurrences listed in the following documents. Classification of entries has, in all cases, been taken from the source document.

(1) "Aerospace Defense Chronology of Events, 1946–1968," Headquarters NORAD, 1 June 1968,

(2) "A Chronology of Air Defense, 1914–1972," Historical Study No. 19, ADCHO 73-1-4, Headquarters Aerospace Defense Command, March 1973.

(3) "Historical Data Book" Headquarters U.S. Army Air Defense Command, 26 September 1969, with changes through 11 October 1973.

21 May	The first airborne H-bomb was dropped. A B-52 bomber released the bomb at 50,000 feet over Bikini Atoll.
13 June	The Chief of Staff, Army, informed Senator Chavez, in connection with testimony given 11 June, that his position on Nike was as follows: (a) Nike I provides the most effective air defense for the United States in the period 1956–1958 and the only defense at the maximum altitudes at which Soviet bombers are capable of operating. (b) Nike B will provide a better and cheaper antiaircraft defense two years earlier than any other surface-to-air missile. (c) The Nike program is the only program which naturally leads to an antimissile capability. (d) Any delay to the Nike program will lessen the protection from air attack of the people, cities, and vital installations of the United States.
20 June	The Special Assistant for Guided Missiles to the Secretary of Defense constituted a committee to investigate the relative merits of the Nike Ajax, Nike Hercules, and Talos weapons.
22 June	In its first fully guided flight against a drone target (F-80), the Hawk missile scored a direct hit.
1 July	For the first time, an Air Force Reserve unit having an M-day assignment with ADC began standing five-minute alerts with two aircraft for 14 hours per day. Limited operations on the Newfoundland-Azores extension of the DEW Line began. Five Navy picket ships on station off West Coast.
3 July	JCS revised unified command plan issued; provided for abolition of the U.S. Northeast Command and assignment of responsibility for air defense of the Northeast and of Alaska to CINCONAD, effective 1 September 1956.
26 July	The first firing test of the Nike B was conducted in a demonstration. A Nike B missile under complete system control was fired at a 650-knot moving space point at a range of 50 nautical miles and an altitude of 50,000 feet. The missile and ground equipment performance was excellent, and the test objectives were completely realized.
August	USAF recommended removal of USA Skysweeper battalions from defenses of SAC bases as too expensive for defense achieved, unless conversion to Nike was programmed.
7 August	Texas Tower No. 3 launched and subsequently turned to Nantucket Shoal, approximately 100 miles southeast of Rhode Island.
9 August	GAR-2A (infrared guidance) Falcon missile successfully fired at Holloman AFB, New Mexico.
23 August	The Department of Defense directed the Army to proceed with construction of Nike sites at Thule AB, Greenland.
1 September	CINCONAD assumed responsibility for air defense of Alaska and Northeast area.
4 September	The JCS published new terms of reference for CONAD, authorizing separation of headquarters and staffs from those of ADC. CINCONAD's authority was strengthened and clarified to include centralized operational control of forces, including assignment of individual antiaircraft batteries to designated targets. CINCONAD was assigned responsibility for the air defense of Alaska and the Northeast area.
10 September	ADC submitted to USAF a plan for deployment of 40 Bomarc squadrons.

13 September	The Air Defense Command was informed by USAF that "the present . . . Bomarc program cannot be funded." From September 1955 to September 1956, the estimated cost of 40 squadrons less shelters had risen from $2 billion to nearly $3.5 billion. 22 squadrons suggested.
17 September	A new staff structure was established for Hq, CONAD, leading to its physical and functional separation from Hq, Air Defense Command, on 1 October.
	CONAD and Air Defense Command were formally separated.
19 September	The Army stated a requirement for an atomic warhead for Hawk.
	CINCONAD recommended to JCS the collocation at 10 locations of Army Missile Master and AF ADDC.
21 September	Twenty-three Special Security Force Army National Guard gun battalions were on-site as of this date.
October	First F-86L delivered to ADC FIS.
30 October	Office of the Secretary of Defense concurred in CINCONAD's recommendation to collocate the Army Missile Masters and Air Force direction centers.
November	USAF ruled out development of a Medium Range Interceptor (MRIX) for air defense use.
8 November	The Secretary of the Army proposed a memorandum to the Secretary of Defense asking for a revision to the surface-to-air assignment. The limitation of 50 nautical miles was established in 1954 when the Nike had a range of 25 miles. The Nike B, with a range of 80 miles, was to be initiated in 1958. He proposed to request that the range limitation be removed.
26 November	An Army element is established within Hq, CONAD.
	The Secretary of Defense transferred responsibility for the Talos land-based system from the USAF to the Army and issued a directive clarifying the roles and missions of the Services.
December	*[Exempt from declassification under Executive Order 12958, as amended, section 3.3(b)(4)&(5)]*
14 December	In its final report, the committee appointed to investigate the relative merits of the Nike and TALOS weapons recommended that further development work be carried out by the Army on both the Nike Hercules and Talos systems, that more permanent installations be developed for the Nike Hercules, and that development work on applying a seeker to the Nike Hercules be carried out.
19 December	The Canada-U.S. Military Study Group recommended to the JCS and the Canadian Chiefs of Staff Committee the integration of operational control of Canada-U.S. air defense forces.

1957

15 January	CONAD replaced its joint air defense forces and joint air divisions with three CONAD regions and 16 CONAD divisions. In the absence of manning authorization, CONAD directed ADC to assign its defense force and division commanders the additional duty of commanding CONAD regions and divisions.
February	The contractor completed the Nike Hercules prototype installation at White Sands Proving Ground and began testing ground guidance and control equipment.

4 February	A request was forwarded to the Assistant Secretary of Defense (Research and Development) for $6.2 million for initiation of the Nike Hercules improvement program. This request was never approved or returned to the Army.
	The Commandant, U.S. Marine Corps, requested Department of Defense approval for termination of the Hawk-Sparrow project and combined participation with the Army in the Hawk program.
5 February	The final plan for a training program to support the Nike Hercules program approved, which will allow the first converted Hercules units to be operational on-site by June 1958.
13 February	The first fully automatic tactical launching of the Bomarc was successful.
26 February	A Hawk missile physically intercepted an F-80 Jet drone flying at 500 feet above the terrain at a range of eight nautical miles.
27 February	A JCS requirement for an atomic warhead for Hawk was established.
4 March	Troop tests of Nike Ajax initiated to determine the suitability of the system to accomplish its tactical mission with a field army, the adequacy of TOE, and the validity of current operational and tactical doctrine.
7 March	ARAACOM reaffirmed the validity of the 1 August 1950 Collins-Vandenberg Agreement under the 4 September 1956 CINCONAD Terms of Reference.
13 March	A Nike Hercules missile with solid-propellant sustainer motor was flight-tested at White Sands. Performance was satisfactory.
17 March	The Department of the Army directed on-site deployment in 1959 of an Army National Guard antiaircraft battalion with Nike Ajax equipment for the purpose of evaluating the National Guard capability to man Nike units in the on-site air defense program.
21 March	Army Antiaircraft Command redesignated the U.S. Army Air Defense Command (USARADCOM).
27 March	The U.S. Marine Corps Informed the Army of the military characteristics it desires in the Hawk system.
3 April	At a Nike Hercules Coordinating Committee meeting, Picatinny Arsenal and Douglas Aircraft indicated that all production of liquid-sustainer motors has ceased and all future missiles produced at the Douglas Santa Monica plant would use solid propellants as fuels.
9 April	The Department of the Army approved a cellular concept for a fixed on-shore Hawk battery installation.
15 April	ADC assigned operational control of DEW Line with inactivation of NEAC.
24 April	The Department of the Army published a plan that established the concept, organization and responsibilities for the support of atomic warheads employed with *[Exempt from declassification under Executive Order 12958, as amended, section 3.3(b)(4)&(5)]* missiles in CONUS.
26 April	California National Guard accepted the mission of testing the Army National Guard capability for full-time manning of Nike Ajax battalions.
16 May	Bomarc IM-99B ordered into production.
28 June	The contractor authorized to proceed with development of a cellular launching system for Nike Hercules on an 18-month schedule.
	Texas Tower No. 4 towed to New York Shoal and subsequently erected.

July	First FPS-20 for ADC became operational at Palermo, New Jersey.
1 July	The Atlantic DEW Line sea barrier became fully operational.
15 July	The DEW Line from Cape Dyer, Baffin Island, to Cape Lisburne, Alaska, became technically ready for operations.
25 July	A Hawk missile without warhead scores a direct hit at a range of 7.5 miles on an F-80 jet drone flying at 410 feet above the terrain.
1 August	East and west portions of DEW Line placed under operational control of ADC and AAC, respectively.
	The Canadian Minister of National Defense and the U.S. Secretary of Defense jointly announced the agreement of their governments to establish integrated operational control of the air defense forces of the two countries.
13 August	DEW Line received formally by USAF from prior contractor, Western Electric.
26 August	The U.S.S.R. announced the successful testing of a missile capable of hitting any target "in any part of the world."
September	The last Nike Ajax tactical ground set came off the production line. A total of 350 Nike Ajax ground sets had been produced.
5 September	*[Exempt from declassification under Executive Order 12958, as amended, section 3.3(b)(4)&(5)]*
12 September	The North American Air Defense Command (NORAD) was established at Ent AFB, Colorado Springs, Colorado, with General Earle E. Partridge as Commander in Chief, following agreement by the Canadian Chiefs of Staff Committee and the JCS to General Partridge's recommendation that an integrated command be established and that, effective 12 September 1957, operational control of the Royal Canadian Air Force Air Defense Command (RCAF ADC) be assumed by the integrated headquarters.
16 September	First launching of Bomarc IM-99A missile at a AF-80 target was successful.
4 October	Sputnik I, the first man-made earth satellite, launched by U.S.S.R.
8 October	The Department of the Army terminated the Army National Guard AAA gun mission.
23 October	A USAF Bomarc missile, in two minutes from the beginning of an alert, successfully intercepted and knocked down a B-17 drone at a distance of 100 miles over the Atlantic.
28 October	The Department of Defense Comptroller released to the Army an FY 1958 procurement and production appropriations apportionment increment which includes funds applicable to the Nike Hercules program. He directed that Nike Hercules funds not be obligated pending resolution of the point-defense versus area-defense problem, and the problem of supporting the Talos industrial program.
31 October	All eight sections of Mid-Canada line reached a limited operational status.
13 November	As of this date, 91 Nike Hercules missiles had been fired in the system evaluation program at White Sands Proving Ground. Of these, 20 have been solid propellant missiles. No failures had been attributed to the propulsion system itself. The percentage of successes to-date approximately 62 percent. The Nike Hercules evaluation program to be completed in June 1958.
20 November	*[Exempt from declassification under Executive Order 12958, as amended, section 3.3(b)(4)&(5)]*

5 December	The Army's first AN/FSG-1 Fire Distribution System (Missile Master)—a prototype—became operational in the Washington-Baltimore defense, at Fort Meade, Maryland.
20 December	The last (thirteen) 90-mm and (four) 120-mm gun units assigned to active air defense in CONUS inactivated. USARADCOM retained one 90-mm battalion at Thule AB, Greenland.
26 December	Department of the Army published a policy directive on the full-time participation of Army National Guard Nike Ajax units in the air defense of CONUS. The CG, USARADCOM was directed to "negotiate mutual agreements (with the states) . . . for the alerting, assembling, manning, and ordering to fire" of ARNG on-site missile units pending orders into federal service.
31 December	*[Exempt from declassification under Executive Order 12958, as amended, section 3.3(b)(4)&(5)]*
Late 1957	The JCS approved Nike Hercules deployments for Dallas, Fort Worth, Kansas City, St. Louis, Cleveland, Minneapolis, and St. Paul.

1958

1 January	The Mid-Canada Line declared fully operational.
	U.S. Ground Observer Corps reduced from 24-hour to ready-reserve status.
3 January	Office of the Deputy Chief of Staff for Military operations recommended that, in view of the Army's requirement to provide the earliest maximum air defense capability, the Army should concentrate its currently available dollar resources on Nike Hercules and Hawk. Continuance of the Talos program under existing Department of Defense directives would require reprogramming of Nike Hercules funds.
9 January	Agreement reached between the Department of Defense and the Department of Commerce on integration of air traffic control and air defense radar facilities.
	The Chief of Research and Development noted that analysis of air defense systems in the Nike Zeus era indicated that a companion surface-to-air missile may be required. It should have a high rate of fire, low altitude capability, improved homing-on-jamming techniques, extended ranges and altitudes. On 2 January 1958, the Raytheon Corporation, in a feasibility study, proposed a Superhawk system with those capabilities, including ranges to 100 miles and altitudes to 80,000 feet.
26 January	First F-104 delivered to ADC FIS.
31 January	Explorer I, first U.S. earth satellite, launched by Jupiter-C missile.
15 February	The Air Defense Command given operational control and contract administration of all of the DEW Line, except the Aleutian extension.
19 March	The DEW Line East (Greenland) extension approved by Denmark.
20 March	NORAD assigned the Air Defense Command primary responsibility for furnishing surveillance radars in the U.S. and also designated the ADC as coordinating agency responsible to NORAD for the U.S. portion of the surveillance system.
April	F-86D interceptors phased out of ADC inventory.
23 Apri1	The Director of Research and Development, Department of the Army, informed the Director of Guided Missiles, Department of Defense, that, since assuming responsibility for development, procurement, and manning of the land-based Talos on 26 November 1956, the Army had been attempting to develop a program for establishing approximately 25 operational units of the missile. Because of funding limitations, the

	Army was unable to support the program beyond a minimum industrial effort and a limited evaluation at White Sands Proving Ground. Available funds were being expended at a rate which would require termination of the industrial effort on 1 May 1958.
12 May	An exchange of notes between Canada and the United States constituted formal agreement for the establishment of NORAD, which has been in existence since 12 September 1957.
15 May	The first NORAD Control Center, located at Geiger Field, Washington, became operational.
10 June	Agreed terms of reference for CINCNORAD became effective. NORAD was an integrated command, including as component commands the RCAF ADC, USARADCOM, NAVFORCONAD, and the USAF ADC, having the mission of defending CONUS, Canada, and Alaska against air attack. CINCNORAD was responsible to the JCS and the Canadian Chiefs of Staff Committee. NORAD was to operate within an agreed Canadian-U.S. concept of air defense and in accordance with agreed joint intelligence. Operational control was defined as the power of directing, coordinating, aid controlling the operational activities of available forces.
23 June	*[Exempt from declassification under Executive Order 12958, as amended, section 3.3(b)(4)&(5)]*
	F-89D interceptors phased out of ADC inventory.
26 June	The SAGE (Semiautomatic Ground Environment) System became operational for the first time, in the New York NORAD Sector direction center, McGuire AFB, New Jersey.
30 June	The first USARADCOM Nike Hercules unit became operational in the Chicago Defense.
July	Construction of four Greenland DEW Line sites along 67th parallel began.
1 July	The Pacific sea barrier became fully operational, with an initial force of four radar-equipped destroyer escorts (DER) and four AEW&C aircraft (WV-2) patrolling from Midway Island to Kodiak, Alaska.
7–30 July	In "Operation [Brig. Gen. John T.] Snodgrass," two Nike Hercules batteries, following their movement from Fort Bliss to Eglin AFB, Florida, completed six successful firings in six attempts, to demonstrate the system's reliability, accuracy, and suitability for deployment.
1 August	The USAF approved inactivation of the Ground Observer Corps, effective l January 1959.
6 August	The Department of Defense Reorganization Act signed by the President. This act changed the status of joint commands to that of unified commands, eliminating the "executive agency" channel together with other single service prerogatives.
7 August	For the first time, a Bomarc missile was launched from Cape Canaveral on a signal sent by a SAGE control center, located in Kingston, New York.
8 August	The Air Defense Command designated its first SAGE division, the 26th at Syracuse Air Force Station, New York.
15 August	The first successful SAGE control of Bomarc results in a direct hit on a QB-17 drone at 78 miles range and 30,000 feet altitude.
17 August	Texas Tower No. 2 became fully operational.

8 September	The JCS published a new unified command plan with new terms of reference for CONAD, to become effective 1 January 1959. As a unified command, CONAD is to be under JCS rather than USAF executive agency control.
14 September	The Los Angeles defense sites of the active Army's 4th Missile Battalion (Nike Ajax), 62d Artillery, were turned over to the 720th Missile Battalion, the first Army National Guard unit to assume full-time manning responsibility for air defense missile sites.
18 September	A Nike Ajax missile launched by Battery C, 1st Missile Battalion, 56th Artillery, successfully intercepted a rocket-powered RP-76 drone target in the first such engagement.
October	Texas Tower No. 3 became operational.
November	The Department of Defense proposed legislation to solve the problem of command and control of Army National Guard air defense units, empowering CINCONAD to order to active duty involuntarily those units assigned to air defense, when waiting for Presidential declaration of emergency would seriously limit operations.
6 November	A Nike Hercules successfully engaged a "Pogo-Hi" balloon target at an altitude greater than 150,000 feet.
10 December	A Nike Hercules destroyed a rocket drone flying 2,100 miles per hour at an altitude of 73,000 feet.

1959

1 January	The first SAGE division, the 26th, became operational, at Syracuse AFS, New York.
	New terms of reference for CINCONAD as commander of a unified command became effective, marking the termination of USAF executive agency control of CONAD and the assumption of control by the JCS.
5 January	Canada and the United States agree in principle to a cost-sharing arrangement for a joint air defense program in Canada: the Continental Air Defense Integration North (CADIN) program.
31 January	U.S. Ground Observer Corps units inactivated.
February	F-94C interceptors phased out of ADC inventory.
1 February	The Mark X IFF, with SIF, became operational in the U.S.
	The Royal Canadian Air Force assumed responsibility for manning operational positions in the DEW Line.
12 March	The first Nike fire unit in Alaska, one-half of Battery A, 4th Missile Battalion (Nike Hercules), 43d Artillery, became operational near Elmendorf AFB.
18 March	The JCS approved locating a new NORAD Combat Operations Center (COC) in Cheyenne Mountain, south of Colorado Springs, Colorado.
28 March	The last 90-mm battery in USARADCOM was inactivated at Thule AB, Greenland.
April	Texas Tower No. 4 became operational, competing the Texas Tower program.
	The DEW Line West (Aleutian extension) became operational.
May	First F-106A delivered to FIS of ADC.
June	DOD Master Air Defense Plan reduced manned interceptor units to 44 squadrons and Bomarc sites to 18.

19 June	SECDEF provided new air defense program, Continental Air Defense Program, which included cuts in Bomarc (to 18 sites) and SAGE program.
1 July	USAF cancelled requirement for DEW Line radar improvement.
1 August	The Eastern NORAD/CONAD Region discontinued, and the 26th, 30th, and 32d Air Divisions designated regions, a start toward replacing geographically designated regions with numerically designated regions under the SAGE reorganization.
September	F-89H phased out of ADC inventory.
	SAGE Combat Center No. 2 became operational.
1 September	The first Bomarc squadron became operational at McGuire AFB, New Jersey.
3 September	Bomarc IM-99A made its first successful interception of a supersonic target—a Regulus rocket.
17 September	USAF cancelled requirement for a follow-on AEW&C aircraft.
23 September	USAF stopped development of the F-108 long-range interceptor.
11 December	The Department of Defense initiates action to procure the Battery Integration and Radar Display Equipment (BIRDIE) for small air defense artillery (ADA) defenses not equipped with Missile Master, thus permitting integration with SAGE.

1960

6 January	President Eisenhower issued rules for the safe handling of the MB-1.
12 January	ADC commanders authorized to scramble one aircraft, instead of two, to perform identification intercept of unknown.
21 January	The first production model AN/FSG-1 (Missile Master) dedicated at Fort Lawton, Washington.
29 January	A Hawk destroyed an Honest John in flight.
21 March	The Martin Company contracted with the Department of the Army to produce Birdie systems for 18 ADA defenses. The first system was scheduled for completion in April 1961.
26 March	Navy picket ships withdrawn from the Atlantic DEW Line barrier.
30 March	USAF announced extensive cuts in the program for air defense equipment to meet the manned bomber threat, including reduction of Bomarc squadrons, and cancellation of hardened SAGE combat center program (Super Combat Center).
1 April	Navy Picket ships withdrawn from the Pacific DEW Line barrier.
13 April	The first successful test of a Bomarc B missile (IM-99B) is conducted at Santa Rosa Island.
June	Congress restored Bomarc B program.
	F-86L interceptors phased out of ADC inventory.
3 June	A Nike Hercules destroyed a Corporal missile. This is the first known instance in which one guided missile has intercepted another.
15 June	The last gun battalion in USARADCOM, the 2d Gun Battalion (Skysweeper), 68th Artillery, inactivated at Camp Lucas, Michigan. Of the 262 operational fire units within USARADCOM, 88 were Nike Hercules and 174 Nike Ajax. Of the latter, 52 were manned by Army National Guard organizations.

20 June	The Office of the Secretary of Defense approved a NORAD recommendation to relocate programmed Nike Hercules units from Strategic Air Command bases in the interior of CONUS to important populated areas.
1 July	The last NORAD/CONAD Region discontinued. This established a seven-region structure in CONUS—the original goal of reorganization for SAGE.
	The Air Defense Command reached a seven SAGE division structure, completing the SAGE region reorganization.
	Navy blimp squadron ZW-1 stopped manning a station in the Atlantic and dropped air defense as a primary mission.
8 July	Bomarc IM-99B intercepted a supersonic target (Regulus); first time IM-99B had been launched at any target.
26 July	USARADCOM added a sixth region to its structure. Department of the Army approval of the redeployment of 15 Nike Hercules fire units to metropolitan defenses instead of Strategic Air Command bases and the Hanford AEC installation obviated an earlier requirement for a seventh region. This would have produced conformity with the NORAD seven-region structure.
September	F-104 interceptor withdrawn from ADC inventory, rejoined in 1963.
30 September	An improved Nike Hercules destroyed another Nike Hercules in an interception approximately 19 miles above the earth and at a closing speed in excess of Mach 7.
22 September	The Strategic Air Command and USARADCOM signed a Joint Training Agreement to provide increased training opportunities for both SAC and USARADCOM units through electronic scoring of SAC simulated bomb runs, exercising Nike fire units and SAC bombers on a mutually agreeable basis.
December	F-89J phased out of ADC inventory.
1 December	Air National Guard squadrons selected by NORAD and ADC for Category I (24-hour ready) role approved by JCS.
14 December	The last of ten planned Missile Master sites dedicated at Fort MacArthur, California.
	The first above-ground Nike Hercules site became operational at Byron, Georgia, near Robins AFB.

1961

Early 1961	ADC's regular fighter-interceptor force completed transaction to century-series all-weather interceptors (F-101B, F-102A, and F-106A).
15 January	Texas Tower No. 4, located on a shoal 80 miles southeast of New York City, collapsed with a loss of 28 lives.
1 March	Conversion of Army National Guard units from guns to Nike Ajax completed. 76 Nike Ajax N6 batteries in CONUS, plus six in Hawaii.
8 March	President Kennedy directed the Administrator of the FAA to review air traffic control in the U.S.
20 March	Bomarc IM-99B intercepted a subsonic QB-47 at a range of 205 miles.
17 April	Bay of Pigs invasion of Cuba by anti-Castro forces began.
18 May	Excavation of NORAD COC in Cheyenne Mountain began.
23 May	First completely successful triple launching of Bomarc IM-99B made.

	[Exempt from declassification under Executive Order 12958, as amended, section 3.3(b)(4)&(5)]
1 June	First squadron equipped with Bomarc IM-99B became operational.
5 June	SECDEF directed that further SAGE air battle augmentation be stopped and the money saved and subsequent funding be used to provide a survivable backup control system (BUIC-Back-Up Interceptor Control).
26 June	Initial surveys conducted at various airfields for purpose of selecting bases for ADC regular interceptor force.
1 July	Twenty-five of 29 ANG fighter-interceptor squadrons assigned M-day mission with ADC began standing constant 24-hour, 5-minute alert vigils.
	Basic Mark X IFF was discontinued in the continental aircraft control and warning system.
1 July	Installation of the first Nike Hercules improvement kit completed at Barksdale AFB.
9 July	U.S.S.R. unveiled bombers in the Mach 2 class at air show, Moscow.
1 August	Greenland-Iceland-UK Line became operational.
September	*[Exempt from declassification under Executive Order 12958, as amended, section 3.3(b)(4)&(5)]*
November	ARADCOM achieved its program of 139 Nike Hercules RA fire units.
15 December	The last of 22 programmed SAGE Direction Centers became operational at Sioux City, Iowa, completing the SAGE program in CONUS.
	The last active Army Nike Ajax units inactivated.

1962

5 March	The Department of the Army published a policy directive regarding full-time participation in the air defense of CONUS by Nike Hercules units of the Army National Guard.
13 March	SECDEF approved two-phased BUIC implementation plan.
16 March	The Maryland Army National Guard became the first ARNG organization in CONUS to sign an agreement with ARADCOM concerning the assumption of operational control of Nike Hercules sites.
10 April	30th NORAD region, Truax Field, Wisconsin designated as secondary NORAD ALCOP.
30 June	The Nike Ajax elements of all Nike universal batteries relieved of their operational mission.
9 July	Operation Fish Bowl, a high altitude nuclear test shot series, began aver Johnston Island.
	[Exempt from declassification under Executive Order 12958, as amended, section 3.3(b)(4)&(5)]
3 August	SECDEF approved a limiting of military requirements for CONELRAD.
22 October	CONAD increased its weapons readiness status and declared DEFCON 3 because of Cuban crisis. Increased alert remained in effect until 27 November.

	CONAD increased radar and weapon forces in Florida area and dispersed part of interceptor force in U.S.
25 October	Battery B, 1st Battalion (AW), 59th Artillery, armed with 40-mm SP guns, air-lifted from Fort Bliss, Texas, to Homestead AFB, Florida. This was the first ADA unit moved during the Cuban missile crisis. By 14 November, two Hawk battalions, one Nike Hercules battalion, and one group headquarters had been deployed from other CONUS stations to Homestead AFB.
31 October	First radar station in U.S. powered by a nuclear sector turned over to ADC at Sundance, Wyoming.
23 November	Cuban crisis, which began on 22 October, 1962, ended.
1 December	Ten squadron NORAD Bomarc program completed.
11 December	Battery A, 1st Missile Battalion (Nike Hercules), 70th Artillery, Army National Guard, Maryland, became operational in the Washington-Baltimore defense. This marks the beginning of implementation of the Army National Guard Nike Hercules program.

1963

8 January	USAF announced decision to decommission Texas Towers.
22 March	NORAD revised its readiness and alert requirements (Regulation 55-3).
24 March	The Department of Defense decided to establish permanent defenses on the Florida peninsula.
25 March	Last of Texas Towers (Tower No. 3) shut down.
March–April	F-104 rejoined ADC (two FIS). Remained until November 1969.
1 April	NORAD Voice Alerting System went into operation replacing Readiness and Warning Network Number 1.
5 April	USAF announced dispersal plans for more than 100 ADC jet interceptors to reduce their vulnerability to missile attack.
19 April	JCS approved implementation of Mark XII IFF System.
May	BUIC-I, first phase of SAGE decentralization program, completed.
1 May	Fourteen long-range radars and ten gap-filler radars closed down in CONUS as part of OSD-directive 416L phase-down.
10 May	Continental Air Defense Study, 1966–1975, prepared by Air Force, issued.
15 May	First two (San Francisco and Minot) of six direction center closed down as part of OSD-directed 416L phase-down.
	Three Alaskan Air Command radars ceased operations.
11 June	CINCONAD directed continuous all-weather interceptor alert capability at Key West, Florida.
26 June	Last of 11 AF-manned sites of Pinetree radar system turned over to RCAF.
5 July	CINCONAD suspended “pop-up” criteria for Hawk fire units pending equipment modification to permit greater accuracy in determination of target altitude.
8 July	USAF informed ADC that OSD had recommended phase out of Bomarc IM-99A missiles.

21 July	Twenty-eight DEW Line intermediate stations closed down.
28 August	Last of four ALRI stations (Station 8) became operational.
26 September	Two ARADCOM Missile Masters phased out, leaving eight in the system.
3 October	NORAD/SHAPE Early Warning Voice Circuit became fully operational.
26 October	SECDEC memorandum issued providing for increased authority for unified and specified commanders over their command and control systems.
1 November	ARADCOM realigned region boundaries in keeping with the NORAD/CONAD regional boundary adjustment resulting from the OSD-directed 416L phase-down.
27 November	OSD directed that four SAGE direction centers and two SAGE combat centers be deleted in FY 1968.
December	DOD approved replacement of Missile Master with ten AN/TSQ-51 by FY 1966.

1964

12 January	Five of eight Mid-Canada Line Section Control Stations closed.
24 January	USAF cancelled AN/FPS-74 gap-filler radar program which had been intended to replace older radars.
20 April	SCAN and NORAD/ADC switched communications network combined into CONUS AUTOVON.
18 May	Nike-Ajax withdrawn from the ARADCOM missile inventory as the 4th Battalion, 111th Artillery, Army National Guide, at Churchland, Virginia, is relieved of its Nike-Ajax mission.
22 June	ADC submitted proposal for PAGE (Primary Automated Ground Environment) to USAF.
July	Last FPS-3 long-range radar phased out of ADC radar network.
23 July	Phase out of Bomarc A missiles and two Bomarc squadrons completed.
August	First U.S. bombing of North Vietnam occurred.
1 September	NORAD Automatic Attack Warning System became operational.
15 September	OSD directed establishment of DOD-FAA unit to resolve problems associated with the establishment of a National Surveillance and Control System.
22 September	First BUIC II installed, to be operational 1 September 1965.
October	The AADS-70 Project is redesignated SAM-D.
16 October	Chinese exploded an atomic device in western regions of China.
30 October	NORAD began manning the COC in Cheyenne Mountain.
2 December	SECDEF approved a plan for provision of BUOC III.
8 December	CINCNORAD advised JCS that he favored F-12A to fill the IMI requirement.
15 December	First of a number of long-range radars (LRR) scheduled for deletion as excess closed down.
December	OSD set USAF interceptor force level at 20 squadrons by FY 1970.

1965

January	Navy began phase-down of operations of its Pacific barrier to two aircraft and to eliminate three picket ship stations off the East Coast.
7 January	USAF approved 17 CONUS bases for use as dispersal bases and agreed to negotiate requirements in Canada.
26 January	CINCNORAD directed continuous all-weather interceptor alert capability at Key West, Florida.
27 January–3 February	Atlantic Sea Barrier cut to three picket ship stations.
February	OSD Announced the phase out of East and West Coast picket ship operations.
4 February	ADC fighter pilots scored first interception of Bomarc drone target (1,500 miles per hour at 50,000 feet).
7 February	President Johnson ordered air strike on North Vietnam. CONAD went to DEFCON 4.
1 March	Five of 16 long-range radars, scheduled for deletion from SAGE system as excess, closed down.
10 March	ADC and TAC concurred in near-term AWACS, but expressed disapproval of radar characteristics.
1 April	Nine gap filler radar closed—associated with LRR earlier closed as excess.
	First FIS relieved from alert in anticipation of OSD-directed reduction from 30 to 20 squadrons by FY 1970.
2 April	The Mid-Canada Line ceased operations.
14 April	Transfer of 48 RA Nike-Hercules fire units to Army National Guard completed, marking completion of ARNG Nike-Hercules program.
24 April	SECDEF ordered withdrawal by 1 June of four Nike-Hercules batteries from Thule AB. Ceased operations on 18 May.
May	YF-12A set four world speed and altitude records at Edwards AFB.
	DOD authorized prototype aircraft and overland radar AWACS programs. Airframe study contracts to Douglas, Lockheed, and Boeing.
	ADC deployed F-104 squadron and support contingency operation in Dominican Republic.
1 May	Pacific aircraft DEW extension flight operations ceased.
27–30 June	Pacific sea barrier picket ship stations vacated.
30 June	Last three Atlantic sea barrier picket ship stations vacated.
1 August	Last F-86 aircraft left Air National Guard; conversion of squadrons to F-102.
26 August	OSD authorized a total of 19 BUIC III facilities.
1 September	First BUIC site accepted by ADC at North Truro, Massachusetts.
	Flight operations on Greenland-Iceland-IK barrier ceased.
	NAVFORCONAD disestablished with phase out of DEW Line extensions and the sea barriers. Navy participation at HQ, NORAD, and regions, and the sectors was continued.

24 September	Initial withdrawal of FIS from ADC for move to SEA.
3 November	Radar site G-32, Thule AB, Greenland, closed.
9 November	Power failure in northeast U.S. caused only minor communication outages and did not affect ADC tactical air posture.
8 December	The Secretary of Defense announced Department of Defense action to "consolidate, reduce, or discontinue" 149 military installations in CONUS and overseas, including 18 Nike-Hercules batteries defending SAC bases. In addition, four Hercules batteries of Thule, Greenland, were to be inactivated.
15 December	Satisfactory performance test of basic NORAD COC in Cheyenne Mountain completed.
22 December	Nike-Hercules defenses of SAC bases at Barksdale, Robins, Turner, and Fairchild Air Force Bases declared nonoperational with the concurrence of NORAD.

1966

January	ARADCOM instituted Tests Against Targets Taking Evasive Maneuvers (TATTEM) in order to evaluate results of evasive tactics where employed against the Nike-Hercules. This effort was a result of the relative success of U.S. aircraft in evading Soviet-made missiles in North Vietnam, which had raised questions regarding capabilities and limitations of the Nike-Hercules system. The tests were initially a part of the Short Notice Annual Service Practice (SNAP) program.
1 January	425L portion of NCOC achieved initial operational capability and transferred from AFSC to NORAD. Manual NORAD NBC Warning and Reporting System went into operation
1 February	System of succession to NORAD command among region commanders established.
8 February	Final acceptance of NORAD Cheyenne Mountain Complex (NCMC).
1 March	Nike-Hercules defenses of the SAC bases at Loring, Lincoln-Offutt, Dyess, and Bergstrom Air Force Bases declared "nonoperational" with the concurrence of NORAD.
9 March–1 April	Four radars closed; portion of sites identified as excess.
25 March	The Barksdale, Robins, Turner, and Fairchild Air Force Base defenses inactivated.
31 March	Third Philco 212 computer became operational in Cheyenne Mountain.
1 April	The Air Defense Command restored its earlier (1951) structure of three field commands at the original headquarters sites of Stewart AFB, New York; Richards-Gebaur AFB, Missouri; and Hamilton AFB, California. Reconstituted as the 1st, 10th, and 4th Air Forces, they superseded the 26th, 29th, and 28th Air Divisions (SAGE). A fourth field command, the 14th Air Force, was added with headquarters at Gunter AFB, Alabama. CONAD discontinued its 25th and 30th Regions. The resulting four-regional structure paralleled the ADC four-air-force structure. Numerical designations were replaced by geographical regional designations. The 7th ARADCOM Region, McChord AFB, Washington, discontinued. ARADCOM redefined areas of responsibility for its 1st, 2d, 5th, and 6th Regions, coincident with discontinuance of the 7th Region. First Region was reconfigured to correspond to the Eastern CONAD Region, less the Washington-Baltimore and Hampton Roads defenses. Fifth Region was assigned a geographical area corresponding to

	the Southern CONAD Region, plus the Washington-Baltimore and Hampton Roads defenses. Second and 6th Regions were reconfigured to correspond to the Central and Western CONAD Regions.
	Last four BUIC II sites became operational.
	Two combat centers and two direction centers were closed.
20 April	The 425L system portion of the NORAD Cheyenne Mountain Complex (NCMC) became fully operational.
	NORAD COC moved from Ent AFB to Cheyenne Mountain.
	425L system portion of NORAD COC became fully operational.
20 May	NORAD Attack Warning System (NAWS) became operational.
25 June	Loring, Dyess, Bergstrom, and Lincoln-Offutt Air Force Base defenses inactivated.
1 July	One radar closed; part of sites identified as excess.
1 September	Revised NORAD interceptor alert requirements went into effect.
14 September	The Secretary of Defense instructed the Department of the Army to reexamine the role of the Nike-Hercules in the "overall continental air defense posture," particularly in the light of the "declining bomber threat" and "recent changes in the force levels to fulfill this role more efficiently." Air Force participation was to be confined to "assistance in evaluating the interactions with area air defense."
7 October	JCS approved a plan for the VLF/LF Minimum Essential Emergency Communications Net (487L).
17 November	The Department of the Army assigned study of the "Role of the Nike-Hercules in Continental Air Defense" to ARADCOM, projecting the missile's role in the 1968–1974 timeframe for purposes of the study. The study was titled Nike-Hera Study.
20 November	DOD reduced USAF interceptor squadrons programmed for FY 1969 from 20 to 18.
30 November	The AN/TSQ-51 Fire Distribution System (Missile Mentor) became operational in the New York-Philadelphia Defense.

1967

4 January	ARADCOM personnel commenced participation in the deliberations of the SAM-D Source Selection Board and SAM-D Source Selection Advisory Council, which will evaluate three contractor proposals concerning SAM-D.
8 February	The last AN/FSG-1 Fire Distribution System (Missile Master), at the Pittsburgh Defense, ceased operations. Pittsburgh converted to AN/TSQ-51.
28 February	Construction at ADC Dispersed Operating Bases (DOB) completed. Cost of program $30,000,000.
1 March	Final ARADCOM AN/TSQ-51 became operational (New England Defense).
17 March	OSD released $43,000,000 in development funds for YF-12A program.
15 April	Phase I of the Nike Hera Study, which examined the role of Nike Hercules in defense of CONUS at the end of FY 1969, submitted to the Department of the Army.
May	Last of 15 dispersed operating bases in the CONUS developed to a Phase III (m) capability, thus completing the program.

18 May	As a result of the SAM-D source selection evaluation of January–March 1967, the Raytheon Corporation was awarded an advanced development contract for SAM-D.
17 June	JCS granted authority to CINCONAD to designate CONAD regions as subordinate unified commands.
1 August	The SAM-D Weapons Family Cost Effectiveness Study (SAMWEPS) completed by the Air Defense Agency, USACDC, with CONUS input provided by ARADCOM.
3 August	In a supplement to Draft Memorandum for the President on Strategic Forces, the Office of the Secretary of Defense proposed that Department of the Army eliminate 15 Nike Hercules sites.
21 August	ARADCOM submitted a proposal to the Department of the Army for the use of Army National Guard technicians in the AADCP operations of six defenses.
5 September	The Department of the Army added to the requirements of the Nike Hera Study a further requirement to identify, from a suggested list of Nike Hercules batteries prepared by the Office of the Secretary of Defense, 15 sites for elimination in FY 1970.
6 September	Formal negotiations started for renewal of NORAD agreement.
16 October	Phase II of the Nike Hera Study, which examined the role of Nike Hercules in the FY 1970–FY 1977 period or until the Nike Hercules was replaced by a follow-on SAM system, submitted to the Department of the Army. In a Supplement to Phase II of the Nike Hera Study, responding to the additional DA requirement of 5 September 1967, ARADCOM recommended redeployment rather than elimination of units. It concluded that resiting of ten batteries in eight defenses would make redeployment of 13 batteries feasible, that further reduction of Nike Hercules sites beyond these 13 batteries would result in an unacceptable lowering of defense capability, and that any such further reduction should be accomplished by elimination of small interior defenses.
November	Twenty gap filler radars closed to meet USAF operating fund cut.
6 November	Last of 19 Air National Guard squadrons completed conversion to F-102.
18 November	Two direction centers closed. Last two of four as directed by DOD in November 1963.
11 December	The Department of the Army tasked the U.S. Army Combat Developments Command, assisted by ARADCOM and the U.S. Army Materiel Command, with preparation of a SAM-D Deployment Analysis (SAMDEP).
16 December	PCD approval by DOD provided for modernized manned bomber defense system and phasing down of current system.

1968

3 January	OSD approved ADC proposal to reconfigure bomber alarm system as an Attack Assessment System.
15 January	The Air Defense Command redesignated as Aerospace Defense Command.
22 January	The Department of the Army approved the ARADCOM proposal of 21 August 1967 concerning the use of Army National Guard technicians in AADCP's, but manning requirements were to be deferred pending approval of a program change affecting the FY 1970–FY 1973 ARNG budget.
28 February	In Program Change Request A-8-006, the Department of the Army presented a counter-proposal to the OSD proposal to eliminate 15 Nike Hercules sites. On the basis of the results of Phase II of the Nike Hera Study, this PCR proposed elimination of

	13 sites and resiting of ten batteries to compensate for consequent losses in defense effectiveness.
1 March	Guidance for preparation of SAM-D Deployment Analysis modified to respond to four requirements contained in DOD Development Concept Paper No. 50.
30 March	U.S.-Canada agreement to extend NORAD Agreement for five years from 12 May 1968.
1 April	Eight LRR deleted as part of DOD-directed phase down of current system for transition to a new system.
	As part of phase down, all gap filler radars, except 17 in southeast corner of the United States, phased out.
12 May	The formal agreement of 12 May 1968 between Canada and the United States concerning establishment of NORAD renewed for five years, with provision that either party may terminate it upon one year's notice.
14 May	Only active nuclear reaction power plant in AF, Sundance, Wyoming, closed.
1 June	In Program Change Decision A-8-006, the Department of Defense directed inactivation of six Nike-Hercules fire units by 30 November 1968 and seven more by 31 December 1968. The Army proposal to resite ten batteries was disapproved for seven sites and deferred for three others. Site improvement approved for three batteries.
1 July	Federal Electric Corporation awarded $22,342,357 contract to operate and maintain DEW Line during FY 1969.
	One FPS-7, two FPS-77, three FPS-67, and two FPS-91-A radars removed from service.
10 August	In Program Change Decision A-8-314, the Department of Defense directed discontinuance of the three interior defenses of Dallas-Fort Worth, Kansas City, and St. Louis by 31 March 1969. The action required inactivation of 14 Nike-Hercules fire units by the same date, as well as seven headquarters installations, in addition to the 13 fire units required to be inactivated by PCD A-8-006.
13 August	PL 90-486, National Guard Technicians Act of 1968 signed. Under this law, which became effective 1 January 1969, all national Guard technicians acquired status and benefits equivalent to those of civil servants of the Federal Government.
28 August	In response to Draft Memorandum for the President on Strategic Forces, Department of the Army submitted a reclama to PCD A-8-006, proposing to resite nine batteries and the fire control area of another in connection with the elimination of 25 batteries required by PCDs A-8-006 and A-8-314.
23 September	Radar at Kubusak Island off east cost of Greenland, destroyed by wind.
27 September	JCS approved use of ADC EC-121H aircraft to cover gap in radar coverage resulting from loss of Greenland radar.
11 October	In PCD RA-8-006, the Department of the Army's proposal to resite nine batteries and the fire control area of another disapproved.
1 December	First BUIC III site became operational.
9 December	Program Budget Decision 364 proposed elimination of Central NORAD Region and 2d ARADCOM Region. ARADCOM had previously submitted its reclama.
11 December	Program Budget Decision 436 required a further reduction in ARADCOM strength of five Nike-Hercules batteries effective in the first quarter of FY 1970. ARADCOM submitted a reclama.

Request for proposal for AWACS procurement issued to Boeing and McDonnell-Douglas.

18 December — ARADCOM's reclama to PBD 436 unsuccessful; PBD 436R maintained the five-battery reduction of PBD 436.

In PBD 364R, the earlier, tentative decision to eliminate 2d ARADCOM Region reversed.

1969

15 January — The St. Louis Defense discontinued.

10 February — The Kansas City and Dallas–Fort Worth Defenses discontinued.

1 April — Ten U.S.S.R. aircraft in four flights entered Alaskan NORAD Region radar coverage at low altitude at 0550Z.

2 April — Twenty more U.S.S.R. aircraft entered Alaskan NORAD Region radar coverage.

15 April — Navy EC-121M reconnaissance aircraft shot down by North Korea fighters over Sea of Japan. F-106A interceptors on combat air patrol in area from 15 April to 24 May, 1969.

30 April — The ARADCOM proposal concerning use of Army National Guard Technicians in AACDP operations, approved by the Department of the Army in January 1968, dropped as no longer desirable.

18 June — Four of five Nike Hercules batteries required to be inactivated by Program Budget Decision 436 assumed nonoperational status.

1 July — Twenty-seven ADC prime radar sites reduced from dual to single height finder status.

1 August — The last of five Nike Hercules batteries required to be inactivated by Program Budget Decision 436 assumed nonoperational status.

12 August — Regarding to OSD-directed FY 1970 budget cuts, ADC recommended systems be deleted in following order:

SLBM D&W

F-102 at Key West

F-104 squadron at Homestead AFB

SAGE DCs

Three F-101B squadrons

Bomarc

East Coast EC-121s

21 August — The Secretary of Defense announced that expenditures for national defense in FY 1970 will be cut $3 billion.

15 September — Central NORAD/CONAD Region discontinued. ARADCOM adjusted 6th Region/2d Region boundary to conform with new NORAD/CONAD regional boundary. Headquarters, Western NORAD/CONAD Region, transferred from Hamilton AFB, California, to Richards-Gebaur AFB, Missouri.

5 October — After an undetected and unchallenged flight from Cuba, a Cuban pilot landed a MiG-17 at Homestead AFB.

14 October — Program Change Decision Z-9-105-2 directed the reduction of Active Army Nike Hercules batteries in CONUS and Alaska to 43 in FY 1970 and 40 in FY 1971, Army

National Guard Nike Hercules batteries in CONUS and Hawaii to 41 in FY 1970 and 39 in FY 1971, and Hawk batteries to zero in 1970.

29 October — ADC required to inactivate units/facilities to meet budget cuts: First and Tenth Air Forces and their ADCCs; three air divisions and their ADCCs; six radar squadrons; three F-101B squadrons.

14 November — NORAD adopted an eight-region (including Alaska) configuration and eliminated NORAD divisions. ARADCOM adjusted regional areas of responsibility in partial conformity to the reconfiguration.

Final AEW&C mission flown off East Coast.

15 November — CINCLANT/CINCSTRIKE assumed responsibility for air defense of southern Florida.

5 December — The Department of the Army directed ARADCOM to discontinue its Niagara Falls/Buffalo and Cincinnati/Dayton Defenses by 31 March 1970.

10 December — The two group headquarters, two battalion headquarters, and six Nike Hercules batteries comprising the Niagara Falls/Buffalo and Cincinnati/Dayton Defenses assumed nonoperational status. AN-24 transport from Havana, Cuba, undetected, landed at New Orleans. This prompted reestablishment of air defense capability across southern United States.

1970

5 January — BUIC III radar system became fully operational.

31 January — The 2d Battalion (Nike-Hercules), 52d Artillery, reorganized as a mobile unit and assigned a dual STRAF/CONUS air defense mission.

31 March — ARADCOM forces, this date, included 76 Nike-Hercules fire units, representing a decline of more than 44 percent from the 1963 peak of 134 fire units.

16 April — The Strategic Arms Limitation Talks (SALT) opened in Vienna.

13 May — Task force of U.S.S.R. TU-95 bomber aircraft arrived in Cuba flying nonstop from bases in northern U.S.S.R.

1 July — Headquarters, 31st Artillery Brigade, reorganized as a mobile unit and assumes the dual STRAF/CONUS air defense mission.

5 July — First contract for AWACS awarded to Boeing.

4 September — CINCNORAD approved a recommendation to relocated the NORAD alternate command post and also those of ADC and ARADCOM to Malmstrom AFB.

1971

20 April — In a memorandum directing that there be no further reduction in the capabilities of the air defense system, the Deputy Secretary of Defense approved the following objectives of CONUS air defense:

(a) Contribute to maintaining realistic deterrence against Soviet attack by:
(1) Defending strategic retaliatory forces.
(2) Defending the National Command Authorities and key command and control centers.
(3) Defending deployed ballistic missile defenses against air-supported threats.

(b) Restrict unauthorized overflight of U.S. air space.
(c) Limit damage from deliberate or unauthorized small air attacks against any U.S. target.
(d) Deter Soviet air attacks by defending key military and urban/industrial targets.

30 June — ARADCOM forces reduced by 24 Nike-Hercules fire units and 11 headquarters units. The remaining Nike-Hercules force of 52 missile batteries—more than half (27) of them ARNG units—represented 39 percent of Nike-Hercules strength at its 1963 peak. As a consequence of this reduction, which was expected to cut annual operating costs by $31 million, ARADCOM closed the Minneapolis/St. Paul, Cleveland, and Milwaukee defenses, eliminated the 2d Region, and combined the Norfolk and Washington/Baltimore defenses.

3 August — ARADCOM initiated a second-phase Nike-Hercules Overhaul/Exchange Program made necessary by excessive deterioration in those systems having longest service since initial overhaul.

AN-24 transport from Havana, Cuba, undetected, landed at New Orleans. This prompted reestablishment of air defense capability across southern United States.

1972

21 March — AWACS test program began to determine technical capability under operational conditions.

1 April — Four Bomarc squadrons ceased operations.

15 April — Test squadron at Edwards AFB inactivated in view of ending F-12 test effort.

26 May — The President of the United States and the Secretary General, Central Committee of the Communist Party of the U.S.S.R. signed a Treaty on the limitation of Antiballistic Missile (ABM) Systems and an interim Agreement on the Limitation of Strategic Offensive Arms.

August — A new class of Russian submarine detected which resembles the Yankee class but is characterized by its larger size and higher missile bay area. The new class is given the designation Delta.

6 September — Four Soviet TU-95 Naval Bear aircraft deployed to Cuba.

15 September — Two F-102 aircraft from 57th FIS, Iceland, made 100th intercept of Soviet aircraft since F-102 deployment to Iceland in 1963.

6 October — Initial increment of Southern Air Defense System became operational.

31 October — Final Bomarc interceptor squadron deactivated.

Appendix B

A Chronology of Ballistic Missile and Space Defense (1955–1972)

1955

February	After the Army concluded that the state of missile technology had advanced sufficiently to warrant a feasibility study for a system to combat the ICBM, Bell Telephone Laboratories undertook such a study. When the study was concluded, the Army decided that the anti-ICBM missile was economically and technically feasible.
March	The Bell Telephone Laboratories initiated a feasibility study for a weapon system to replace Nike I and Nike B in about 1965. Emphasis was placed on defense against long-range ballistic missiles.
June	WECo and BTL began l8-month study of a "new forward looking ground-to-air guided missile system capable of effectively engaging the target threats within CONUS during the period 1960–70." Primary emphasis in the Nike II study was to be on defense against ICBM. The 18-month study was under Contract No. DA-30-069-ORD-1082. ("Nike Zeus Guided Missile System," Volume I, System Study Report prepared by BTL and Douglas Aircraft Co. on behalf of Western Electric Co. Inc., l March 1957, Page vii, Foreword.)
5 July	The Chief of Research and Development directed the Chief of Ordnance to modify the requirement of the feasibility study so as to consider the ICBM as the prime target of the Nike Zeus.
16 November	The Chief of Ordnance informed the Chief of Research and Development that Ordnance Corps studies having reference to ICBM defense were the following: Nike II by Bell Telephone and Douglas Aircraft and Plato by Cornell Aeronautical Laboratories and Sylvania Corporation. The Bell-Douglas idea was that strategic points should be defended in depth so as to engage incoming missiles at several points. It would be the logical outgrowth of the Nike rings currently being installed. Fan-beam radars would be used to track the missiles, and computers would automatically command the launching of the missile or missiles closest to the incoming missile. *[Exempt from declassification under Executive Order 12958, as amended, section 3.3(b)(4)&(5)]* Intercepts could be started at 300,000 feet altitude and continue down the line of descent until the last resort missile was fired from the area of the target.

1956

27 January	As a result of the recommendations of the Killian Committee (Technological Capabilities Panel), Department of Defense approved release of $4 million of FY 1956 appropriated research and development funds for component development and experimental work on antimissile missiles. These funds were made available from a larger amount temporarily withheld by Bureau of Budget pending results of Killian Committee reports.

31 January — The Chief of Research and Development informed the Chief of Ordnance that of the supplementary funds recently released by the Department of Defense for support of the Army antimissile missile program $3.4 million would go to Ordnance for system development and component design. While it was realized that the money involved would not fund an ideal antimissile program, the Chief of Research and Development desired that it be used to initiate studies and development for an aggressive program that would lead to the earliest practicable availability date of an Army antimissile missile capability.

February — Component hardware development on Nike Zeus was begun.

2 March — The Chief of Research and Development directed the Chief of Ordnance to include in the Nike Zeus studies a study of the feasibility of obtaining an early anti-ICBM capability, in 1960 or 1961, with a modified Nike Hercules system.

13 June — The final report of the Skifter Committee (Department of Defense Ad Hoc Group on Anti-ICBM) concluded that an anti-ICBM system was feasible of development. The committee recommended that research and development on acquisition radars should be conducted and that quick fixes should not be further considered.

5 July — The Assistant Secretary of Defense (Research and Engineering), authorized the obligation of FY 1957 Army research and development funds in the amount of $9 million for project Nike Zeus. The program execution was to be in accordance with recommendations of the Skifter Committee. The study on the feasibility of attaining an early capability with Nike Hercules was to be conducted as a part of the Nike Zeus project.

28 August — The Special Assistant for Guided Missiles to the Secretary of Defense constituted a committee to review the overall anti-ICBM program. The Army representative was the Director of Research and Development. The first meeting was held on 17 September 1956, at which time the Army and the Air Force summarized their programs.

30 September — The Nike Zeus feasibility study completed. The study concluded that it was feasible to provide an anti-ICBM defense with the Nike Zeus system. If development of system were funded at maximum rate the first operational capability could be obtained in late CY 1962 under a normal production program.

2 October — The Special Assistant for Guided Missiles to the Secretary of Defense informed the Secretaries of the Army and the Air Force that in the antimissile field the Air Force would have responsibility for developing the early warning system and the Army would have responsibility for the active defense system.

The assignment to the Army was justified on the grounds that:

(1) Major targets were already defended by Nike sites.
(2) The Nike II appeared to be the only project beyond the study stage which was capable of accomplishing the mission.
(3) There was a basic similarity between the anti-ICBM problem and the antimissile missile for field army use.

25 October — The Department of Defense Anti-ICBM Committee was notified of the following possible schedules for Nike Zeus.

Operational Availability Date	Maximum Rate Funding	Budget Limited Funding
(1) Early anti-ICBM Capability (75 mm range, 130,000 ft altitude).	4th Qtr CY 62	3d Qtr CY 65
(2) Full high altitude anti-ICBM capability. (75 mm range, 130,000 ft altitude).	4th Qtr CY 63	2d Qtr CY 67
(3) Extended range antiaircraft (manned and unmanned) capability.	4th Qtr CY 64	1stQtr CY 69

1 November — As a result of the successful completion of the feasibility studies and of the successful component and experimental work conducted on Nike Zeus the decision was made to initiate system development. Accordingly, the Army directed full system development of Nike Zeus in a phased program. This program was to have three objectives:

(1) To develop an anti-ICBM capability to 30,000 feet altitude and 75 nautical miles range.
(2) To develop a full anti-ICBM capability to 500,000 feet attitude and 75 nautical miles range, and
(3) To develop an extended range capability against aircraft, manned or unmanned, to 200 nautical miles range.

The study on the feasibility of attaining an early anti-ICBM capability with Nike Hercules was terminated, since under contemplated budgets the attainment of a Nike Hercules capability would interfere with the attainment of a much greater capability in nearly the same time with Nike Zeus.

13 November — The following popular names were assigned to the Nike family of weapons:

Nike Ajax—Nike I
Nike Hercules—Nike B
Nike Zeus—Nike II

December — Contract DA-30-069-ORD-1082 was supplemented to include active development of the Nike Zeus System by WECo. This marks the beginning of the actual development work.

20 December — The Air Defense Branch, Office, Chief of Research and Development, interpreted the Secretary of Defense memorandum of 26 November as appearing to assign responsibility for the forward acquisition radar for Nike Zeus to the Air Force and as clearly assigning the missiles, launchers, battery control with necessary radars, and local defense center and local acquisition radars to the Army.

1957

4 February — The Army requested the apportionment of $10.7 million dollars FY 1957, Department of Defense emergency funds to raise the FY 1957 Nike Zeus effort to maximum rate. This level of funding was required to assure a 4th quarter CY 1962 operational availability date, provided maximum rate funding could be provided in the following years. The request for emergency funds was not honored.

19 February — The Department of Defense Anti-ICBM Committee was notified that planned funding for Nike Zeus would provide for operational availability in 1965. Planned FY 1958 funding, as of this date, was $26 million ($12 million R&D, and $14, million P&P, A.) (NOTE: Although $14 million P&P,A, in support of R&D was planned at the time of the briefing, the Deputy Chief of Staff, Logistics, on 1 February had unilaterally programmed $25 million of P&P, A funds for procurement of Zeus items. The $25 million is the money now in the FY 1958 Zeus program.)

April — Secretary of Defense (Charles E. Wilson) detailed areas of responsibility for the major services regarding antimissile missile and system development. He approved recommendations that the Air Force develop the early warning system and communications; that the Army carry out research and development on Local Acquisition Radar (LAR), Target Track Radar (TRR), and the missile for ICBM defense and that a joint Army-Air Force Committee be established (Skifter Committee) to monitor development.

6 April — *[Exempt from declassification under Executive Order 12958, as amended, section 3.3(b)(4)&(5)]*

25 April — The Department of Defense Anti-ICBM Committee recommended, with Secretary of Defense approval, that the Army continue anti-ICBM missile system development at a level about that planned.

Secretary of Defense approval of this Committee action required that the Secretary of the Army specifically approve the planned FY 1958 program. In addition this committee report provided that:

(a) The Air Force develop the anti-ICBM early warning system.
(b) The Air Force carry out research and development on the advanced acquisition radars required by the active anti-ICBM system and study the communications between these radars and the active portion of the system.
(c) That the Army develop the local acquisition and target tracking radars required by the active portion of the anti-ICBM defense system and the defensive missile itself, and
(d) That an anti-ICBM Coordinating Agency be established to coordinate Army and Air Force efforts in this field.

16 August — The Secretary of the Army approved the planned FY 1958 Nike Zeus program. This program required the obligation of $12 million FY 1958 R&D and $25 million FY 1958 P&P, A funds. This FY 1958 program was consistent with third quarter CY 1963 operational availability of Nike Zeus.

September — *[Exempt from declassification under Executive Order 12958, as amended, section 3.3(b)(4)&(5)]*

5 September — The Secretary of the Army recommended that the Secretary of Defense support a national priority for the anti-ICBM development program equivalent to the priority accorded the ICBM development, and that additional funds be made available to the Army to accelerate research and development of Nike Zeus.

16 September — *[Exempt from declassification under Executive Order 12958, as amended, section 3.3(b)(4)&(5)]*

4 October — Office Chief of Ordnance directed Picatinny Arsenal to begin development *[Exempt from declassification under Executive Order 12958, as amended, section 3.3(b)(4)&(5)]*

10 October — The Army studies indicated that under an accelerated program wherein the production of tactical Zeus equipment would be undertaken concurrently with the manufacture and test of the prototype that an operational on-site defense of CONUS could be provided on the following schedule:

	Estimate Cumulative Cost
Early Capability:	
3 batteries by end CY 1961. 30 batteries by end CY 1962.	$2.0 billion
Full Capability:	
100 batteries by end CY 1965.	$4.0 billion
Extended Range Capability:	
100 batteries by mid-CY 1966.	$6.0 billion

28 October — The Department of Defense apportioned to the Army $660 million of FY 1958 P&P, A funds. $25 million of these funds were for support of the Nike Zeus development, however, obligation of these funds was subject to the specific approval of the Special Assistant for Guided Missiles.

6 November — The Army requested that the Special Assistant for Guided Missiles authorize the obligation of $25 million FY 1958 procurement and production funds for support of the Nike Zeus development.

15 November — The Special Assistant for Guided Missiles authorized the obligation of $25 million procurement and production funds. At this time the Army was able to obligate the total $37 million required for the FY 1958 Nike Zeus program.

26 November — Dr. H. R. Skifter, Chairman of the Department of Defense Anti-ICBM Coordinating Agency, was notified of the schedules and costs of the accelerated Nike Zeus program.

27 November — The Chief of Research and Development informed the Assistant Secretary of Defense (Research and Engineering) of Army FY 1959 funding requirements for Research and Development. Included was a statement of FY 1958 and 1959 required Research and Development funding for the Nike Zeus accelerated program.

29 November — The Chief of Research and Development informed Dr. Killian, Special Assistant to the President for Science and Technology, of the Army FY 1959 funding requirements. This included a statement of the FY 1958 and FY 1959 required research and development funding for the Nike Zeus accelerated program.

Note:

(1) Budgetary limitations adversely affected Nike Zeus in FY 1957. $9 million of a required $19.7 million were expended in this development. This reduced rate effort delayed the operational availability of Nike Zeus, under a normal development and procurement program one year, from 4th quarter CY 62 to 4th quarter CY 63. A maximum rate effort in 1957 could have effected an advance in the proposed accelerated availability date.
(2) Overtime restrictions had no effect on Nike Zeus. The budgetary limitation in FY 1957 precluded effective use of overtime.

15 December — The Army informed the Weapons System Evaluation Group of the accelerated Zeus program schedule and costs for use by Weapons System Evaluation Group in their study of the Continental Air Defense objectives plan. These schedules and costs were later published in Weapons System Evaluation Group Report No. 33.

1958

9 January — The Chief of Research and Development noted that analysis of air defense systems in the Nike Zeus time era indicated that a companion surface-to-air missile might be required. It should have a high rate of fire, low altitude capability, improved homing-on-jamming techniques, extended ranges and altitudes. On 2 January 1958 the Raytheon Corporation in a feasibility study proposed a Superhawk system with those capabilities, including ranges to 100 miles and altitudes to 80,000 feet.

14 January — The Secretary of Defense authorizes the USAF to proceed immediately with development of a Ballistic Missile Early Warning System (BMEWS).

16 January — To insure coordination between the Army and Air Force in matters relating to the anti-ICBM program, pending the moment when the new Advanced Research Projects Agency would assume direction of this effort, the Secretary of Defense directed the Army to continue its development effort in the Nike Zeus program as a matter of urgency, concentrating on system development that would demonstrate the feasibility of achieving an effective, active anti-ICBM system in an electric countermeasure and decoy environment. The work was to be limited to the missile and launch system and

acquisition, tracking and computer components required for an integrated missile system.

By separate memorandum the Air Force was directed to continue that portion of its Nike Zeus program pertaining to early warning and acquisition and tracking radars and was also further directed not to continue its effort on the missile system proper.

22 January — The National Security Council assigned a national priority to the anti-ICBM effort equivalent to the priority assigned to the ICBM and IRBM effort.

27 January — By letter, the Chairman of the House of Representatives Armed Services Committee, was informed of the fund requirements for the Nike Zeus accelerated program. The funds included $136 million additional FY 1958 funds required and a total of $613 million FY 1959 funds.

28 January — The Director of Guided Missiles, OCRD, forwarded to the Director of Guided Missiles, Army, recommendations with regard to attaining an early defense against ballistic missiles. They were the following:

(1) Drop from further consideration for accelerated development and deployment for defense all of the active ballistic missile defense systems except Nike Zeus and the land-based TALOS.
(2) As first priority fund the Nike Zeus program.
(3) As second priority fund the TALOS program for procurement of 25 detachments.

29 January — The Chairman of the House Armed Services Committee, Repr. Carl Vinson, recommended to the Secretary of Defense that he:

(a) Assign to the Army operational responsibility for Nike Zeus, and
(b) Make available to the Army $136 million FY 1958 funds for the accelerated deployment of Nike Zeus.

3 February — The Deputy Secretary of Defense and the Director of Guided Missiles, Office, Secretary of Defense, were briefed on the FY 1958 fund requirements for the accelerated program. A recommendation that $136 million of FY 1958 funds be made available to the Army for the acceleration of Nike Zeus was made to the Deputy Secretary of Defense.

7 February — The Secretary of Defense established the Department of Defense Advanced Research Projects Agency for the direction and performance of certain advanced research and development projects. Mr. Roy W. Johnson, a vice-president of General Electric Company, was appointed as Director. The agency was to be activated 1 April 1958.

12 February — The Director of Guided Missiles dissolved the anti-ICBM Coordinating Agency since the Army, by the 16 January Sec/Def memorandum, had been given development responsibility for the active portion of the anti-ICBM defense system.

14 February — The Secretary of Defense; the Director of Guided Missiles, Office, Secretary of Defense; the Secretary of the Army; and the Vice Chief of Staff of the Army had a conference with the Chairman of the House of Representatives, Armed Services Committee, with respect to his recommendation for the accelerated deployment of Nike Zeus. At this conference the Secretary of Defense promised Chairman Vinson that he would give an answer to his recommendation by 15 April 1958.

20 February — The Director of Guided Missiles constituted an Ad Hoc Anti-ICBM Study Group under the chairmanship of Dr. H. R. Skifter, Special Assistant to the Assistant Secretary of Defense, R&E. This group was to study means to attain an early defense against ballistic missiles. The Army briefed this group on the accelerated Nike Zeus program and on the TALOS Anti-ICBM program. The Army recommended that as first priority the Nike Zeus deployment should be accelerated, and as second priority, an early limited capability with TALOS should be provided.

26 February	Army Ordnance and contractor personnel briefed the Department of Defense Decoy Discrimination Group on the anti-decoy capability of Nike Zeus and on Army supporting research projects in the decoy discrimination field.

1959

2 January	The U.S. Army Air Defense Command was assigned responsibility for preliminary selection of site for the Nike Zeus System.
12 February	The Ballistic Missile Committee of the Department of Defense approved a test plan for conducting Nike Zeus tests in the Kwajalein-Johnston Island complex using intermediate range ballistic missile (IRBM) targets.
1 March	The Army Ballistic Missile Agency (ABMA) was delegated responsibility for development of ballistic targets for the Nike Zeus test program. ABMA developed the criteria for the facilities at Johnston Island.
July	A new missile configuration was approved. The missile airframe was simplified and strengthened by removing the large wings from the sustainer section (small wings were later added for stability). This design increased range and maneuverability and simplified handling, maintenance, and launching. Initial flights of this design were to begin in mid-1960.
26 August	The first Nike Zeus missile was fired at WSMR. The results were partially successful.
14 October	The second Nike Zeus missile was fired at WSMR. Lift-off, boost phase, separation, sustainer ignition, and sustainer operation were successful. Missile fail-safe and loss of telemetry occurred at 35.3 seconds.
November	The Deputy Secretary of Defense approved use of 30 Jupiter missiles for IRBM-type targets to be fired from Johnston Island in the Nike Zeus test program. A contract was let by ABMA for fabrication of 15 of these targets. (This decision was later reversed.)
16 December	The third fixed fin winged Nike Zeus missile was fired at WSMR. Complete success was not achieved in that the sustainer did not ignite.

1960

25–26 May	An Ad Hoc Panel was appointed by the Special Assistant to the President for Science and Technology to resolve the controversy over which target missiles should be used to test the Nike Zeus System. The Army proposed use of the Jupiter IRBM targets launched from Johnston Island for intercept by Nike Zeus launched from Kwajalein Atoll. The Director of Defense Research and Engineering (DDR&E) advocated the substitution of Atlas ICBMs to be launched from Vandenberg AFB. After two days of hearings, the Panel ruled in favor of the latter.
29 June	A memorandum from the Secretary of Defense to the Secretaries of the Army, Navy, and Air Force directed that all Nike Zeus ICBM targets would be delivered by Atlas missiles launched from VAFB. Plans for development of launch facilities at Johnston Island, and production of all Jupiter missiles for use in the Nike Zeus testing were cancelled.
10 October	Ballistic Missile Early Warning System (BMEWS) Site No. 1, at Thule Air Base, reaches an initial operational capability.
21 November	The Nike Zeus Ad Hoc Advisory Committee, chaired by Mr. Richard S. Morse, transmitted to the Chief of Staff Army, the report of the committee relating to early production and deployment of the Nike Zeus System. The recommendations were:

(1) That a production of Nike Zeus batteries at a rate of four per year be immediately initiated.
(2) That the units produced be deployed in the defense of the North American Continent in consonance with antimissile defense plans of the North American Air Defense Command (NORAD).
(3) That present Nike Zeus research and development program be continued with the primary objectives of determining the system effectiveness against various types of threats and for improving this effectiveness consistent with the state of the art.

1 December — The JCS give NORAD operational control and CONAD operational command of the Space Detection and Tracking System (SPADATS).

4 December — Secretary of the Army recommended to the Secretary of Defense that:

(1) An interim program for production and deployment of Nike Zeus at the rate of four batteries, two defense centers, and 200 missiles per year be initiated without delay.
(2) FY 1961 funds in the amount of $73.3 million be provided to permit initiation of a production contract by 31 March 1961.
(3) Units produced be deployed as recommended by the Commander-in-Chief NORAD.

1961

January — The Army Rocket and Guided Missile Agency (ARGMA) submitted the "Nike Zeus Defense Production Plan" to the Chief of Ordnance. The plan provided for the production and deployment over a period of eight years, of 29 defense centers, 70 batteries and supporting equipment and 3,610 missiles. The Secretary of the Army approved the plan and it was forwarded to the Secretary of Defense for approval.

1 February — BMEWS Site No. 1, Thule AB, achieves an automatic capability.

June — The Zeus prime contract was extended to cover work on the Zeus Multifunctional Array Radar (ZMAR) System. This was an advanced radar study for determining the feasibility of having an electronically scanned radar perform the functions of acquisition, discrimination, and tracking in an ICBM defense system. The proposed system would feature a phased array arrangement with no moving parts and no necessity for a rotating antenna. Four faces at 90 degree intervals would be required to cover 360 degrees in azimuth. A feasibility model was to be installed at WSMR.

1 July — The National Space Surveillance and Control Center (NSSCC) is discontinued and the new SPADATS Center begins operation at Ent AFB, Colorado. This marks the beginning of aerospace defense operations by the Air Defense Command.

22 September — Nike Zeus R&D continued/deployment approved. The Secretary of Defense approved the first two phases of a three phase Nike Zeus deployment in defense of 12 metropolitan areas: Washington/Baltimore, New York, Los Angeles, Chicago, Philadelphia, Detroit, Ottawa/Montreal, Boston, San Francisco, Pittsburgh, St. Louis and Toronto/Buffalo. In January 1962 the Secretary of Defense informed Congress that only development funds, at a top priority level, would be expended during FY 1963. This decision resulted in continuation of R&D rather than deployment of an ABM system.

30 September — BMEWS Site No. 2, at Clear, Alaska, achieves full operational capability.

December — Unofficial reports circulated in the press implied that President John F. Kennedy and Secretary of Defense McNamara had decided to ask for production funds for Zeus in the new military budget. In presenting the FY 1963 budget to Congress in January

1962, however, President Kennedy indicated his decision to delay the production decision pending final Zeus firings against Atlas targets later in 1962.

December 1961–64 Zeus test program firings. Forty-eight Zeus missiles fired at Kwajalein Test Site (KTS).

1962

1962–65 Phased array radars. The ZMAR, Zeus Multifunction Array Radar, was conceived. As R&D continued, the ZMAR became the MAR I, to be built at WSMR. The MAR II was to be built at KTS. The various possible versions of the MAR were the LOMAR, HIMAR, and TACMAR. The latter was chosen and became the Missile Site Radar (MSR) and a decision was also made to deploy a Perimeter Acquisition Radar (PAR). These two radars, at considerably less cost than the much more powerful MAR, would be deployed. At first the PAR was to be in the VHF band; this was later changed to UHF. A MAR-type building was constructed at KTS, but (as of 16 April 1970, no radar had been installed).

24 January The Kwajalein Zeus Acquisition Radar (ZAR) received its first signal returns from an ICBM, the initial test of the ZAR against a real target.

17 February This same ZAR successfully acquired and transmitted the position of an Atlas missile to the TTR. This marked the first transfer of an ICBM target from one radar to the other.

30 March A feasibility study was completed on a fast reaction surface-to-air missile which by its rapid acceleration, would maximize the time available to a defense for discrimination between warheads and decoys. This missile, designated Sprint, would become a subsystem of the Nike X System.

18 April The ZAR at Kwajalein participated in a satellite tracking exercise—track was initiated and maintained on SPUTNIK 12. On 19 April 1962 the ZAR again tracked SPUTNIK 12 and successfully transferred the target to the TTR.

First satellite acquisition and tracking. The Nike Zeus Acquisition Radar (ZAR) and Target Tracking Radar (TTR), similar to but larger than the equivalent Nike Hercules radars at Kwajalein successfully acquired and tracked a U.S.S.R. satellite.

27 April The Secretary of Defense placed a requirement on the Nike Zeus program to provide the capability, by May 1963, for a satellite interception demonstration at Kwajalein. The project was assigned the code name MUDFLAP.

June The Deputy Commanding General, Guided Missiles, the Army Ordnance Missile Command, approved a staff study utilizing WECo/BTL as prime contractor for the Zeus and Hardsite Defense Systems* with the Government directing the selection of subcontractors. A pre-award survey of possible subcontractors would begin 11 June 1962, for the development and production of the Sprint missile.

*The Hardsite Defense System was defined at this time as, "a hardened system consisting of a Multiple Array Radar Subsystem, a Data Processing and Control Subsystem, a Sprint Missile Subsystem, and associated support equipment." Experimental models of the Multiple Array Radar (MAR) (or ZMAR, as it was known until January 1963) were to supply the basic technology for a multifunction radar to replace the current Zeus radars.

19 June First successful ICBM/Zeus intercept. First successful intercept by Nike Zeus of an ICBM ballistic nose cone flown at true speed and trajectory over Kwajalein. The target was an Atlas launched from Vandenberg AFB.

1 October	The government let four contracts for four-month studies of the program definition phase of the Sprint missile. Lockheed Aircraft Corporation dropped out, leaving North American Aviation, Douglas Aircraft Company, and the Martin Company as participants.
12 December	Nike Zeus Test K–6 involved two missiles in an attempt at salvo firing. The first missile (20066) successfully intercepted an actual ICBM and achieved all test objectives.
19 December	Zeus activity at Point Mugu ended, and the system equipment was moved to other Zeus sites and all buildings were returned to control of the Pacific Missile Range.
22 December	Zeus intercept of target vehicle and decoys. Zeus successfully intercepted an Atlas ICBM carrying a target vehicle and two decoys.

1963

January	Nike X system initiation. Nike Zeus System changed to Nike X. Program was reoriented from mechanical to phased array radar and second missile added (Sprint) (Gilpatrick Memo). See 1962–1965 entry on Phased Array Radars.
5 January	A memorandum dated 5 January from the Secretary of Defense for the Secretary of the Army stated that: (1) There would be no deployment; current or future, of the existing Nike Zeus System and (2) That no decision had been made as to whether or not the Nike X System would eventually be deployed. The memorandum directed the Army to reorient the Nike Zeus effort toward a new system approach, to be called Nike X. The Nike X System now consisted of the following components: the Multifunction Array Radar (MAR), Missile Site Radar (MSR), Sprint missile, Zeus missile, and data processing equipment. The Nike Zeus testing program at Kwajalein and Ascension Islands and at the WSMR were to be continued with reorientation to support the Nike X System.
30 January	NXPO. Nike Zeus Project Office redesignated as the Nike X Project Office and established as a separate Class II activity at RSA, Ala. Colonel Ivey Drewry designated Nike X Project Manager, reporting directly to CG AMC, and not through CG USAMICOM.
16 March	Sprint development. Martin Company, Orlando, Florida Division, given initial funding by Bell Telephone Laboratories (BTL) and directed to proceed with full development of Sprint. (See January 1963 entry on Nike X System Initiation.)
21 March	MAR I construction initiated. Construction began on MAR I at WSMR. (See 1962–1965 entry on Phased Array Radars.) The first MUDFLAP (satellite intercept) test at Kwajalein was conducted, with performance of the missile and ground equipment not as planned. There was limited achievement of objectives.
30 March	Nike Zeus Test K-17 (20114) was fired against an ICBM target from VAFB, the first successful ICBM intercept in which reaction controlled steering was employed. Intercept occurred at the highest altitude (261,000 feet) to date in the Kwajalein test series. No major equipment malfunction was noted during this test.
April	The Department of the Army directed the Army Materiel Command to plan for the first Nike X site to become operational in the first quarter CY 69.
13 May	Satellite intercept. First intercept of satellite from Kwajalein Test Site (KTS).

23 May	A satellite intercept was successfully accomplished at Kwajalein when Nike Zeus ZK-20 (20138) was launched against an AGENA D satellite. This demonstrated the Mudflap capability, as directed by the Secretary of Defense in April 1962. ZK-20 was the 100th missile to be fired in the Zeus research and development program.
5 June	The President of the United States witnessed a successful Nike Zeus missile firing conducted at WSMR. This was a non-jet-head firing from a cell. All test objectives were met.
December	Design and development of the MSR (the phased array radar for combined missile and target tracking) began.

1964

March	Site selection for antiballistic missile sites was started. No definitive deployment had been announced.
15 June	Test began on MAR I (power on date).
18 June	The Zeus radars at Kwajalein participated in the advanced ballistic re-entry system, low observable re-entry vehicle (ABRES-LORV-1) test, a part of the Air Force penetration aids program. Good radar and optical data were obtained. The discrimination radar accepted ZAR designation, identified the reentry vehicle, then transferred the target to the TTRs. This sequence of events was a notable first at Kwajalein.
September	Balloon successfully tracked by MAR I.
11 September	MAR I successfully tracked a real target for the first time. A balloon was tracked for 50 minutes with track being intentionally dropped and reestablished automatically several times. This balloon was successfully handed over in the automatic mode, which included transfer from search to verification, to acquisition track, and target lock-on.
30 September	MAR I continued to demonstrate its multifunction capability by successfully demonstrating “automatic search,” “verification track,” and “precision track” of real targets. Highball and Speedball type targets were automatically acquired on the upward leg and precision tracked on both track channels.
October	Threat analysis study for Secretary of Defense headed by CH, OCRD, LTG Betts, completed.
19 November	The MAR I at WSMR participated in a Pershing missile firing. Approximately 71 seconds of tracking data were obtained. This was a significant first for the MAR.
10 December	Secretary of Defense Robert McNamara was briefed on threat, strategic, and system analyses, and the status of discrimination techniques. Principal attendees were Deputy Secretary of Defense, Cyrus Vance; Mr. W. M. Hawkins, Jr., Assistant Secretary of the Army, R&D; Dr. Harold Brown, Director of Defense Research and Engineering; LTG W. W. Dick, Jr., Chief of Research and Development, DA; MG A. W. Betts, Deputy Chief of Research and Development, DA; and the Nike X Project Manager, Colonel I. O. Drewry. It was later learned from documentation signed by Secretary McNamara that the deployment decision was to be postponed for another year, and the Initial Operating Capability extended for an additional year, to October. 1970. The FY 1966 RDT&E program was recommended at $390 million, which included $20 million for the follow-on reentry measurement program and $10 million for production planning/engineering.

1965

30 January — Nike Zeus missiles ZK-50 and 51 (20155 and 20162) were launched on Kwajalein in a salvo-of-two mode against a simulated submarine launched ballistic missile. The test was the first completely successful salvo firing, with miss distances of both missiles well within the blast radius.

1 February — A Director of Defense Research and Engineering (DDR&E) memo of this date, subject, "Nike X Development" indicated that no change of plans was contemplated for the Missile Site Radar (MSR) and Sprint missile installations at Kwajalein. The Multifunction Array Radar (MAR) II plans, however, might require modification. Large procurement funds for the MAR II were to be delayed pending completion of a study to determine possible alternatives to the MAR and possible augmentation of the MSR capabilities and growth potential.

23 April — A meeting with Dr. Harold Brown, DDR&E, resulted in several decisions affecting the Nike X reorientation effort. The Army was directed to:

(1) Install a tactical MAR on Kwajalein;
(2) Proceed with the development of an augmented MSR;
(3) Conduct cost and schedule studies on installing the originally planned MSR and then the augmented MSR, or only the augmented MSR on Kwajalein;
(4) Proceed with a new long-range interceptor missile; and
(5) Continue design studies of a very high frequency radar.

May — New long-range interceptor missile. *[Exempt from declassification under Executive Order 12958, as amended, section 3.3(b)(4)&(5)]*

15 June — A Secretary of Defense briefing was given to Dr. Harold Brown, DDR&E. Dr. Brown requested that the Army prepare a paper on sole source justification for the modified Zeus missile to be utilized in the barrage defense role. He stated that it was permissible to call the modified Zeus missile a DM15X2 with the understanding that a new name would be chosen later.

8 October — DEPEX 11 Study. DCSOPS DA presented results of Nike X (DEPEX) Study to Secretary of Defense, DEPEX II (25 city defense was recommended).

17 November — Sprint firing. First guided Sprint flight at WSMR.

December — The Secretary of Defense decided to defer production activities for at least a year. The Nike X Project Office issued new production/deployment planning guidance to all agencies concerned.

Setting of stage for ARADCOM CDC role in BMD. Nike X Command and Control and Firing Doctrine briefing for CG CDC (LTG Ben Harrell) by ARADCOM (BG Persons) and ESTO (Bob Williams). GEN Harrell informed GEN Persons after the briefing that CDC should not become involved in doctrinal development, etc., for Nike X.

1966

17 January — CDC requests relief from BMD role. CDC letter to C/S Army requested relief from responsibility for development of doctrine for BMD. (Ltr CDCCG, 17 January 1966, subject: USACDC Participation in Nike X Planning, signed by LTG Harrell, and personal letter, same date, on same subject from GEN Harrell to GEN Duff, CG ARADCOM.

22 January	Nike X manning decision. The CDC Maintenance Study for Nike X was briefed to V C/S Army, GEN Abrams, on 4 January 1966 by DCSLOG, DA. The CDC Study recommended mixed civilian/military manning for Nike X. ARADCOM also briefed V C/S on 4 January 1966 and recommended entirely military manning for Nike X. Supplemental supporting data for the ARADCOM position was provided to DCSLOG DA for further review and comment by DA Staff (reference AD CCD letter to DCSLOG, DA, subject: Nike X Manning, signed by LTG Duff). Vice C/S Army was not convinced and directed mixed military/civilian manning for Nike X on 26 January 1966.
18 May	Firing doctrine (ARADCOM CDC role). ARADCOM responsibility for firing doctrine defined in letter DA OCRD. ARADCOM had been actively involved in developing an adaptive preferential defense for over four years. (Letter CRD-S, OCRR, 18 May 1966, subject: Responsibility for Developing Nike X Firing Doctrine, signed by GEN Betts, FOUO.)
20 May	The Multifunction Array Radar (MAR)/WSMR Vas successful in its first attempt to track a satellite. U.S.S.R. Polynot II satellite was detected and verification tracked over the entire sector of expected track. This test was the first of a series of planned tracking missions to gain experience and knowledge with satellite traffic and high performance targets.
26 May	U.S. Continental Air Defense Command (CONAD) established a joint Nike X Impact Task Force, with Army Air Defense Command (ARADCOM) representation, to assess the effect of Nike X deployment on existing and programmed military systems.
June	*[Exempt from declassification under Executive Order 12958, as amended, section 3.3(b)(4)&(5)]*
20 June	CONAD COEC 1-66 published. From January–June 1966, CONAD prepared the "CONAD Operational Employment Concept for the Nike X Terminal BMD System"
28 September	Department of Army Chief of Staff—Memo No. 66-436 established the Nike X System Office as a DA Class, II Activity. LTG A. W. Betts was appointed Nike X System Manager (acting) in addition to his primary assignment as Army Chief of Research and Development. The Nike X Project Office was designated as an Army Materiel Command Class II. Activity, under the operational control of the Nike X. System Manager.
15 October	NXSO established. LTG Betts appointed acting Nike X System Manager (in addition to duties of Chief, R&D/DA) and system office established.
15 November	The U.S. Army Nike X Engineering/Service Test Office (ESTO) with station at WSMR, was established as a Class II Activity under the command of the U.S. Army Materiel Command and was concurrently placed under the operational control of the Nike X System Manager. This action was directed by DA General Order. No. 44, dated 10 November 1966.
25 November	ARADCOM Nike X missions established (ARADCOM CDC role). NXSM assigned Nike X system missions, functions, procedural relationships (via Letter of Instruction [LOI]) to ARADCOM. Functions and responsibilities include: Firing doctrine and system operating logic, Communications doctrine, Logistics doctrine, site selection, operational security doctrine, on-site training, TOE, TA, TDA, and OAT. Letter 25 November 1966, subject: Mission, Functions and Procedural Relationships Relative to Nike X System Development Planning, signed by LTG Betts, Nike X System Manager. Letter filed as Tab J, Nike X Management Plan, 13 September 1967 (FOUO).
5 December	A briefing was given Dr. O'Neal, Assistant Secretary of the Army, on aspects relating to the Low Frequency Radar and how the Nike X System would comply with the intent of the DDR&E memo, subject: "VHF/UHF Radar for Nike X." The Project Manager

requested authority to proceed with the program. Dr. O'Neal gave verbal approval and the system contractor was advised to proceed, with General Electric as the subcontractor for design and development.

20 December — Department of the Army presented Nike X Deployment Model 1-67 (DEMOD 1-67) to meet certain defense objectives specified by the Secretary of Defense. Defense objectives of this deployment model were directed against the potential threat from both the Chinese People's Republic and the U.S.S.R. through the 1970's. Major objectives were a defense against a deliberate Chinese Communist (CHICOM) ICBM attack against U.S. industrial and urban centers—a counter-value attack; and a defense against a deliberate attack on U.S. offensive forces—a counterforce attack. An additional objective was the protection of Continental United States against an inadvertent or unauthorized ICBM launching by a foreign nuclear power. Deployment Model 1-67 was approved by the Secretary of Defense for planning purposes and with minor modifications would become the Model 1-68, or Sentinel, Deployment.

1967

1 January — Zeus renamed Spartan. On 1 January 1967 the Zeus DM15X2 was renamed Spartan.

6 January — LTG A. W. Betts, Nike X System Manager, requested the CG, U.S. Army Air Defense Command (ARADCOM) to conduct preliminary site selection for the Model 1-67 deployment.

8 January — ARADCOM Nike X tasks. In response to a letter from LTG Betts, NXSM, ARADCOM initiated action to prepare the Command and Control Concept, the Command and Control Supplement to the Nike X. QMR, Firing Doctrine documentation, site selection for a thin defense and communications requirements. (Reference personal letter LTG Betts, Nike X System Manager, to LTG Hackett, CG ARADCOM, dated 6 January 1967, on file in Safeguard Library.)

February — CONAD, Nike X Study. Nike X Operational Impact Task Force submits recommendations to JCS (8 Volume study). (June 1966–February 1967.) Study concluded that Nike X System can be deployed into CONUS without serious impact (interference) with other DOD systems such as SAC bombers and ICBM's 30 problems recommended for additional study. (Copy on file Safeguard Library.)

March — Site selection team formed by ARADCOM comprised of representatives of ARADCOM, Office Chief of Engineers, NXPO, WSC, Mobile District (now HND) to select sites for DEMOD 1-67 deployment.

2 March — The first full test of the WSMR Multifunction Array Radar (MAR) Athena tracking mode was accomplished during the Athena mission. This mode provided autonomous target acquisition and handover to precision track to be maintained on the object closest in range through target separation.

27 April — In a multiplex tracking demonstration conducted at WSMR, the MAR successfully tracked five objects ejected from a Highball rocket. The test completed an operational demonstration milestone.

5 July — Secretary of Defense Robert McNamara was briefed on several different deployment concepts. The topics covered were the 1-67 deployment, expanded Hardsite Defense deployments, modifications to the 1-67 deployment to counter the Fractional Orbital Bombardment System threat, and an anti-Soviet defense deployment (2-67). Mr. McNamara directed that a 30-day study be performed of the evolving Chinese People's Republic threat and the modular growth of the 1-67 deployment to counter that threat. This study is to be made by a DOD appointed committee.

11 July	The Montgomery Committee, established by the Department of Defense to consider questions concerning the Chinese threat, held its first meeting.
18 September	Secretary of Defense deployment decision. Secretary of Defense announces his decision to deploy a "thin" antiballistic missile defense against the CPR threat that could materialize within a decade; and to include an option for further defense of Minuteman sites against a U.S.S.R. threat. (On 17 November 1967, Secretary of Defense McNamara announced the Sentinel deployment.)
20 September	C&C concept. Nike X Command and Control Concept DEMOD 1-67 completed by ARADCOM. Work on the concept was started in January 1967 (CONAD represented by LTC Evans J-5); draft concurred in by CINCONAD in a letter dated 14 April 1967. Based on this concept, the Nike X Command and Control Plan DEMOD 1-67 was prepared by a working group at SENSO (ARADCOM participated heavily), approved by DA, and submitted to JCS.
October	Sentinel design review. Fink Committee—DOD Design Review of Sentinel. Decisions made in 26 areas, e.g., site moved from Anchorage to Fairbanks, Alaska; Minot AFB deleted and equipment used to defend Washington, D.C.
November	On-site effort began on the Sentinel program. The Corps of Engineers obtained rights of entry for core drilling and radio frequency interference (RFI) testing at Boston, Detroit, Grand Forks and Chicago.
1 November	The Department of Defense announced the locations of the first ten Sentinel sites: Boston Perimeter Acquisition Radar (PAR) and Missile Site Radar (MSR); Chicago-MSR; Grand Forks-PAR and MSR; Salt Lake City-MSR; Detroit-PAR and MSR; Seattle-PAR and MSR; Hawaii-MSR; Dallas-MSR; New York-MSR; and Albany, Georgia-MSR.
3 November	Sentinel System established. DOD announces Nike X is designated Sentinel; Sentinel System Charter approved by Secretary of Army. The Department of Defense announced that Nike X was redesignated the Sentinel System. The Sentinel System consisted of the Sprint and Spartan missiles, a long-range detection radar designated the PAR, the MSR, and the data processing equipment.
15 November	DA General Order No. 48 was published, creating the Sentinel System Organization. The Sentinel System Manager (SENSM) was established within the Office of the Chief of Staff as Principal Assistant and Staff Advisor to the Chief of Staff and Secretary of the Army for all matters pertaining to Sentinel. Under the SENSM were: The Sentinel System Office (SENSO) at Washington, D.C.; the Sentinel System Command (SENSCOM) at Huntsville, Alabama; the Sentinel System Evaluation Agency (SENSEA) at WSMR, New Mexico. The personnel and resources of the NXPO were transferred to SENSCOM. The jurisdiction of Kwajalein Test Site was transferred from the Army Materiel Command to become a subordinate element of SENSCOM, but the test site was to be operated under the guidance and direction of the Office, Chief of Research and Development with respect to national range matters.
20–24 November	Affected communities briefed on proposed Sentinel sites. Briefings were held on 20 November in Boston (MG Coburn/LTC Doughtie), Chicago (BG Lilly/LTC Hutchinson), Dallas (MG Darnell/MAJ Boren), Salt Lake City (MG Winn/LTC McLaughlin); on 22 November in New York (MG Coburn/LTC Hutchinson), Grand Forks (BG Lilly/MAJ Boren), Albany, Ga. (MG Darnell/LTC Doughtie), Seattle (MG Winn/LTC McLaughlin; and on 24 November in Detroit (MG Coburn/LTC Doughtie) and Hawaii (COL Semmens/LTC McLaughlin).

1968

January — The budget message of the Secretary of Defense to Congress for FY 1968 contained the following recommendations in regard to Nike X:

(1) Vigorously pursue the development, test, and evaluation of the system (for which $386 million was included in the 1968 budget) but take no action now to deploy the system;
(2) Initiate negotiations with the Soviet Union to limit the deployment of the Antiballistic Missile System; and
(3) Reconsider the deployment decision in the event these discussions proved unsuccessful.

March — The Boeing Company, Seattle, was named to carry out a l4-month study of certain antiballistic missile sites.

April — An Ad Hoc Committee, under the Chairmanship of Dr. H. W. Augustadt of BTL, was appointed to investigate the Sprint program and make recommendations for improvements. The committee's recommendations were accepted in late May, and the CG, SAFSCOM, directed the contractor to begin implementation immediately. An estimated three to four week slip in the firing schedule was anticipated.

JCS approves BMD C&C levels. JCS approves three levels of control for BMD (BMDC, ACC, MDC), and establishment of subordinate unified command, and tasks CINCONAD to recommend specific arrangements and resource requirements. (This was JCS reaction to Nike X Command and Control Plan DEMOD 1-67. See entry, 20 September 1967.)

May — The Secretary of the Navy signed the Memorandum of Agreement between the Army and the Navy for the Sentinel System Test Target Program.

DOD disclosed three additional general areas to be surveyed as possible site locations for the Sentinel System: San Francisco and Los Angeles, California and Sedalia, Missouri.

Three contractors (the Boeing Company, Martin-Marietta Corporation, and McDonnell-Douglas Corporation) were selected by the Advanced Ballistic Missile Defense Agency (ABMDA) to conduct analytical studies to establish promising methods for upgrading Sentinel System performance by modifications to, or a new design of, the third-stage of the Spartan missile to meet evolving threats. The selection by ABMDA represented a consensus of the evaluators from both ABMDA and SENSCOM.

6 May — BTL authorized General Electric to proceed with Phase II of Perimeter Acquisition Radar (PAR) development. Phase II was the design and manufacture of a prototype PAR to be installed at a tactical site (Boston was scheduled to be the first site).

27 May — DOD announces additional areas for Sentinel sites. DOD announced areas for deployment of Sentinel at San Francisco, Los Angeles and Whiteman AFB. Briefings were conducted at Sedalia, Mo., on 4 June 1968 (BG Lilly/LTC Roan), LA on 17 June 1968 (AMG Winn/LTC McLaughlin), on 21 June 1968. The first briefing scheduled for Los Angeles on 5–6 June was cancelled due to Senator Kennedy's assassination. A second briefing for San Francisco was held on 2 August because of nonattendance of high-level officials at first briefing. Planned locations never publicly announced were Washington, D.C. and Fairbanks, Alaska.

30 August — CONAD submits study to JCS recommending data be remoted from ACC (FCC) to appropriate RCC (SAGE building)—Option 1. (See April 1968 JCS entry.) ("CONAD Report of Recommended Arrangements and Resource Requirements for CONAD Subordinate Unified Commands," dated 30 August 1968.)

5 September	Acquisition of the first Sentinel sites—Camp Curtis Guild (MSR) and Sharpner's Pond (PAR) at Boston—was approved by the Real Estate Subcommittee of the House Armed Services Committee.
13 September	Authorization for Boston land acquisition. Congressional authorization to acquire land in the vicinity of Boston for construction of the first Sentinel site was announced.
24 September	The advanced contract for construction of a portion of the Boston PAR was awarded to George T. Brox, Inc., Dracut, Mass., on 24 September. Notice to proceed was issued concurrently, effective 25 September. The contractor's bid of $727,242 exceeded the Government estimate by $4,467.
13 November	DOD announced additional Sentinel sites. DOD announced sites at Warren AFB and Malmstrom AFB as Sentinel sites. Briefings were conducted at Warren on 18 November 1968 (MG Lilly/LTC Roan), and Malmstrom on 19 November 1968 (MG Lilly/LTC Roan).
20 November	DOD announced the location of two additional Sentinel sites: Warren Air Force Base, Wyoming and Malmstrom Air Force Base, Montana. In response to JCS questions, CONAD submits letter to JCS delineating the functions of the Subordinate Unified Commander and the ACC (FCC) Commander. Reference letter CONAD (CPAP) 20 November 1968, to JCS, subject: Sentinel Command and Control (located in P&CD Administration Office, Tab M, CONAD Subordinate Unified Command/RCC-ACC Interface) Secret.
3 December	JCS asks CINCONAD to answer certain technical questions relating to placing ACC (FCC) in the SAGE Building with the RCC—Option 4. Reference memo JCS to JSIPS, 3 December 1968, Sentinel Command and Control (located in P&CD Administration Office, Tab J, Folder CONAD Subordinate Unified Command/RCC-ACC Interface) Secret.

1969

29 January	CONAD replies to JCS, further refuting Option 4, and again recommending Option 1. Remoting data from FCC to RCC in SAGE building. (Letter CONAD to JCS, 29 January 1969, subject: Nike X (Sentinel) Command and Control Plan (located in P&CD Administration Office, Tab A, CONAD Subordinate Unified Command/RCC-ACC Interface) Secret.
6 February	Sentinel System land acquisition and construction suspended. By order of Secretary of Defense, all site acquisition and construction was suspended, pending a review of the Sentinel System as ordered by President Nixon.
26 February	Packard Memo. ADCC to be in C-135 aircraft. RCC (less ADCC) to be in MSR building.
14 March	Safeguard System announced. President's announcement of Safeguard. The Sentinel System Manager directed SENSCOM to proceed with preparations to accomplish Phase I of the revised deployment plan and modify contracts as required (not announced during the Sentinel era were Washington, D.C., and Fairbanks, Alaska). (Reference Msg SENSM, DA 172312269, "Modified Sentinel Deployment Analysis" Unclassified.
6 August	After months of intense debate, the Senate endorsed President Nixon's proposal to deploy the Safeguard System, by two-votes. A bipartisan amendment, sponsored by Senators John Sherman Cooper (R-Ky) and Phillip A. Hart (D-Mich) to permit continued research and development of the Safeguard System but to bar deployment or site acquisition, was defeated by a 51 to 49 vote.

8 October	A field office was opened at Grand Forks, under the jurisdiction of the Safeguard System Command. On 7 November, responsibility for the field office transferred to U.S. Army Engineer District, Huntsville.
20 October	A field office was opened at Great Falls, Montana, under the jurisdiction of the Safeguard System Command. On 15 January 1970, responsibility for the field office transferred to U.S. Army Engineer District, Huntsville.
November	A community impact study was conducted by representatives of the Omaha District, Corps of Engineers, in the Grand Forks and Malmstrom areas. The survey included all towns within a 50-mile radius of planned Safeguard sites, and all cities of 10,000 or more population within a 100-mile radius. The two objectives of the study were to: evaluate the impact of Safeguard on the local scene; and identify programs available to assist in community planning.
20–25 November	A significant milestone was reached when satellite "targets of opportunity" were acquired and tracked by the MSR. This is the first automatic acquisition and tracking of high velocity targets by the MSR using the Meck-Zero Test Track software for radar control.
8 December	The House of Representatives approved $69.9 billion in appropriation for the Defense Department, which included $359.5 million in deployment funds for the Safeguard System and $400.9 million for research and development. By a 78–25 vote, the House rejected an amendment that would have eliminated deployment funding. The Senate, on 16 December, approved by a vote of 85–4 the $69.9 billion appropriation. A move to delete almost all of the $760 million for the Safeguard System was defeated by a vote of 49 to 36.

1970

30 January	President Nixon announced his decision for further deployment of the Safeguard Ballistic Missile Defense System beyond the previously approved two-site, Phase I program. The recommended new deployment would consist of a third site (Whiteman Air Force Base, Missouri) and advance preparation for five additional sites (in the Northeast, Northwest, Washington, D.C., Warren Air Force Base, Wyoming and in the Michigan-Ohio area) although with no deployment commitment at these sites.
24 February	Appearing before a joint session of the Senate Armed Services Committee and Defense Appropriations Subcommittee, Secretary of Defense Melvin Laird presents the Administration's proposal for second-phase deployment consisting of an MSR with missile fields at Whiteman AFB and preliminary work without commitment to actual construction at locations in the Upper Northwest, Southern New England, Michigan or Ohio, the Washington, D.C., area, and Warren Air Force Base. He also recommends construction for increased Sprint fields at the Grand Forks and Malmstrom sites. He estimates the cost of the expanded program in FY 1971 at $920 million, or "less than $100 million more than that needed for Phase I work already approved by Congress."
16 April	The Strategic Arms Limitation Talks (SALT) open in Vienna. The House Armed Services Committee approves funds requested by the Secretary of Defense on 24 February for second-phase Safeguard deployment.
11 June	The House of Representatives approves, 307 to 57, the FY 1971 Defense Procurement Authorization Bill (HR 17123). It defeats, 92 to 26, an attempt to block appropriations for Safeguard construction.
16 June	Role of Subordinate Unified Commanders. CINCONAD letter to JCS outlining his concept (agreed to by CG ARADCOM) for role of Subordinate Unified Commanders

in BMD, and recommending revision to Annex A, Volume III, NORAD 76, to realign functions states therein in accordance with the concept. (Reference letter CONAD—16 January 1970 (to JCS-J-5), "Ballistic Missile Defense Role of the CONAD Subordinate Unified Command" with one enclosure. Enclosure—Section 1, Subordinate Unified Commander's Functions.)

17 June — By a vote of 11 to 6, the Senate Armed Services Committee approves funds for Safeguard construction at Whiteman Air Force Base and preliminary work at Warren Air Force Base but refuses appropriation of funds for preliminary work related to sites in the Upper Northwest, Southern New England, Michigan or Ohio, and Washington, D.C. area.

11 August — The Senate rejects two amendments to the FY 1971 Defense Procurement Authorization Bill. The first, offered by Senator Hughes, would have eliminated all funds for Safeguard. The second, offered by Senators Cooper and Hart, would have denied funds for construction at Whiteman and preliminary work at Warren AFB. Votes are 62–33 and 52–47.

19 August — The Senate rejects an amendment to the FY 1971 Defense Procurement Authorization Bill. Sponsored by Senator Brooke, this amendment would have deferred all work on the Whiteman and Warren Safeguard sites and diverted $320 million to strengthening the two sites already under construction. Vote is 53–45.

28 August — First Spartan intercept of ICBM nose cone, over Kwajalein.

7 October — The President signs the FY 1971 Defense Procurement Authorization Bill following reconciliation of differences between the Senate and the House of Representatives. The agreed version authorizes $1.3 billion for work on the Whiteman and Warren sites but restricts expansion to those sites only.

1971

29 January — The FY 1972 Federal budget is presented to the Congress. Proposed funding for Safeguard, at $1.267 billion, is $60 million less than in 1970.

22 October — General Orders 354 and 355, Headquarters ARADCOM, direct organization of a Safeguard command and a Safeguard surveillance battalion, effective 1 September at Grand Forks, North Dakota.

6 November — An underground nuclear test, identified by the code name Cannikin and reportedly an essential step in developing a warhead for the Spartan missile, is successfully completed on Amchitka Island in the Aleutians. The widespread destruction predicted in unsuccessful legal actions aimed at preventing the test fails to occur.

10 November — The Defense Procurement Authorization Bill is approved in Congressional conference. Included are Safeguard funds in the amount of $1.106 billion. Construction is limited to that already authorized for the Malmstrom and Grand Forks sites. Activities at the Whiteman and Warren sites are limited to advanced site preparation.

1972

26 May — The President of the United States and the Secretary General, Central Committee of the Communist Party of the U.S.S.R. sign a Treaty on the limitation of Antiballistic Missile (ABM) Systems and an Interim Agreement on the Limitation of Strategic Offensive Arms. The treaty limits ABM deployment to two sites, one for defense of an ICBM site and one for defense of the national capital. The immediate effect is to limit Safeguard

	deployment to the Grand Forks site now under construction, with an option to defend the National Command Authority.
2 August	The U.S. Senate ratifies the ABM Treaty by a vote of 88 to 2.
13 September	Congress approves the FY 1973 defense appropriations bill but bans the use of funds in connection with a ballistic missile defense of the National Command Authority.

Appendix C

A Chronology of Soviet Air Defense Systems (1956–1972)

1956

July	MiG-21 (Flashlight), Su-7 (Fitter), Su-9 (Fishpot) and Faceplate prototypes shown during Tushino air show.
	Formation of the Military Command Academy of Air Defense which began to train command cadres for all branches of the National Air Defense Forces.
	A 22-hour compulsory program of civil defense training instituted; the nationwide program was to be completed by 1958.
	Civil Defense interest turns to evacuation as alternative to shelters.
	Myachora Test Center Operational—foremost world jet engine testing facility.
	Deployment of RS-lU (Alkali) air-to-air missile begun
	Rock Cake (HF) and Knife Rest B&C (EW) radars first observed.
	MiG-17 PFU (Fresco E) first observed.

1957

March	Production of YAK-25 stopped. Approximately 500 built.
May	Campaign begun to decentralize Soviet Industry.
August	First successful ICBM launch.
October	Soviets launch artificial earth satellite
14 December	Ministry of Aviation Industry reorganized as State Committee on Aviation Technology.
	IRBM firings from Kapustin Yar to Sary Shagan indicate preliminary ABM R&D.
	Su-7 and Su-9/11 enter production.
	Non-combat (transport and utility) aircraft production exceeds combat (fighter and bomber) aircraft production.
	The following radars reach operational status:
	Big Mesh-EW Big Net-EW Slant Mesh-GCI Strike Out-EW Witch Five-IFF
	SA-2 (Guideline) surface-to-air missile reaches operational status.

	An aircraft, identified by PVO units as a Canberra reconnaissance aircraft, penetrates U.S.S.R. as far as Voronezh.
1957–58	U.S. Sidewinder air-to-air missile technology comprised through Swedish attaché in New York.

1958

Khrushchev temporarily suspends shelter construction. Debates begin over effectiveness of civil defense.

MiG-21 enters production; MiG-19 ceases production.

First deployed SA-2 was observed.

The following radars operational:

Bar Lock-GCI
Cross Out-EW/GCI
Flat Face-SAM acquisition
Stone Cake-HF
Sponge Cake-HF
Score Board A-IFF
Witch Four-IFF

1959

January	Soviets launch first lunar probe.
January	Khrushchev states "Air Force has lost its previous importance."
May	E-66 aircraft with Tumansky engine establishes world speed record of 1290 knots.
September	Su-9 (Fishpot) first sighted at operational airfield.
17 December	Strategic Rocket Forces were formed.

SA-3 SAM system first tested.

The following radars were first operational:

Big Bar A-EW
Head Net-EW
Tall King-EW

Spin Scan AI radar in prototype.

1960

14 January	Khrushchev proposes to Supreme Soviet that armed forces be reduced by one-third. Proposal was adopted.
April	Reconnaissance of Sary Shagan Missile Test Center indicates Hen House BMEW type radar externally complete.
1 May	U-2 piloted by Gary Powers shot down in vicinity of Sverdlovsk.

Initiation of an 18-hour civil defense program.

The following radars became operational:

Big Bar B & C-EW
Spoon Rest B & C-EW
Top Trough-EW

1960–61	Construction on long-range SAM facilities (Griffon) began at Leningrad.

1961

April	E-66 aircraft achieves world altitude record of 113,800 feet.
July	MiG prototype (Flipper) observed at Tushino; armed with AWL missiles. System not produced. July Carpathian operational-rear area exercise conducted.
October	Marshal Malinousky declares to XXII Party Congress that "the problem of destroying missiles in flight has been successfully solved."
October	XXII Congress CPSU shifts responsibility for Civil Defense to Ministry of Defense from Ministry of Interior, Marshal V.I. Chuykov is Chief of Civil Defense, Col. Gen. of Aviation O.V. Tolstlkov is First Deputy.
December	Fifth Plenum of the Central Committee of DOSAAF meets in Moscow. Re-emphasizes civil defense.
	Effects of megaton weapons published. Initial Deployment of SA-3.

1962

May	Fifth All-Union Congress of DOSAAF meets. DOSAAF endorsed by Central Committee. Congress attended by V.A. Sudets, CINC PVO Strany and A.N. Shelepin, Secretary of Central Committee CPSU.
July	Khrushchev in interview with C.L. Sulzberger claimed that U.S.S.R. had a missile which could "hit a fly in outer space."
September	New 19-hour civil defense course announced for population.
28 October	Hen House R&D BMEW Signal received.

1963

November	Griffon displayed in October Revolution parade and claimed as having a ballistic missile defense role.
	YAK-28P enters production.
	U.S. Falcon air-to-air missile technology found to be compromised.
	The following radars become operational:
	Part Time-EW
	Sack Net-EW/GCI

1964

October	Death of Marshal Biryuzov, Chief of General Staff.
November	Galosh ABM system displayed in October Revolution parade.
	Dog House ABM associated radar first observed.
	Long Track (EW) radar operational.

1965

2 February	Revised Hen House signal received.
May	Soviet TV showing of Gaffer (predecessor of Galosh) ABM.
	Thin Skin (HF) radar operational.
	Tu 128P (Fiddler) enters production.

1966

April	Marshal Malinovskiy declares to XXIII Party Congress that Soviet air defenses guarantee certain destruction of all aircraft and "many" missiles.
April	Brezhnev endorses civil defense to XXIII Congress; highest level endorsement received.
19 May	Sary Shagan modified Hen House signal received.
July	Marshal P. F. Batitskiy named Commander-in-Chief of National Air Defense Forces to succeed Marshal Sudets.
26 August	Olenogorsk operational Hen House signal received.

1967

4 March	Skrunda operational Hen House signal received.
June	Middle East War
November	Su-15 (Flagon) and MiG-25 (Foxbat) displayed at Domodedovo air show.
	Civil defense training shifted from DOSAAF to military.
	A 21-hour compulsory civil defense training program instituted for grades 5 through 7.
	Renewal of SA-3 deployments in the Soviet Union and East Germany.

1968

June–July	Dog House ABM associated radar signals received.
August	Galosh ABM-IB signals received; last essential component of current Moscow ABM.
August	Invasion of Czechoslovakia.
	Operational testing of Moss Airborne Warning and Control System using Flat Jack EW radar.
	MiG 25 (Foxbat) enters production.
	Top Sail EW/GCI radar operational.
	School established to train junior officers as civil defense commanders.

1969

Mishelevka modified Hen House signal received.

1970

9 December	Artem Mikoyan, General Designer, dies.
	Civil defense training extended down to 2nd grade.

1971

20 October	Skrunda operational Hen House signal modification received.

1972

26 May	Signing of treaty on the Limitation of antiballistic missiles in Moscow.
	Col. Gen. A. Altunin succeeds Chuykov as chief of civil defense. Altunin also a Dep. Minister of Defense. Civil defense duties include natural disaster recovery.

Glossary

AABNCP	Advanced Airborne Command Post
AADCP	Army Air Defense Command Posts
AAF	Army Air Force
ABM	Antiballistic Missile
ABMDA	Advanced Ballistic Missile Defense Agency
ACQ	Acquisition Radar
ACW	Aircraft Control & Warning
ADA	Air Defense Artillery
ADC	Air Defense Command
ADDC	Air Defense Direction Centers
AEC	Atomic Energy Commission
AEW&C	Airborne Early Warning And Control
AGC	Automatic Gain Control
AGF	Army Ground Force
AI	Air Intercept
ANG	Air National Guard
APVO	Aviation of Anti-Air Defense
ARAACOM	Army Antiaircraft Command
ARADCOM	Army Air Defense Command
AWACS	Airborne Warning And Control System
BAMBI	Ballistic Missile Boost Intercept
BIRDIE	Battery Integration And Radar Display Equipment
BMEWS	Ballistic Missile Early
BMD	Ballistic Missile Defense
Bomarc	Boeing-Michigan Aeronautical Research Center
BUIC	Back Up Interceptor Control
CAA	Civil Aviation Administration
CADF	Central Air Defense Forces
CADIN	Continental Air Defense Integration North
CADS	Continental Air Defense Study
CINCLANT	Commander-In-Chief, Atlantic

CINCNORAD	Commander-In-Chief, North American Air Defense Command
CINCONAD	Commander-In-Chief, Continental Air Defense Command
CINCPAC	Commander-In-Chief, Pacific
COC	Combat Operations Center
CONAD	Continental Air Defense Command
CONUS	Continental United States
DC	Direction Center
DCSOPS	Deputy Chief Of Staff For Operations
DDR	Decoy Discrimination Radar
DEMOD	Deployment Model
DER	Destroyer Escort Radar
DEW	Distant Early Warning
DSP	Defense Support Program
EADF	Eastern Air Defense Forces
EASTARAACOM	Eastern Army Antiaircraft Command
ECCM	Electronic Counter Countermeasures
ECM	Electronic Counter Measures
EMP	Electro-Magnetic Pulse
EW	Early Warning
FAA	Federal Aviation Administration
FAR	Forward Acquisition Radar
FOBS	Fractional Orbit Bombardment System
FS	Frequency Shift
FTC	Fast Time Constant
GAPA	Ground-To-Air Pilotless Aircraft
GCI	Ground Controlled Intercept
G-I-UK	Greenland–Iceland–United Kingdom
GOC	Ground Observer Corps
HAPDAR	Hard-Point Defense Radar
HF	Height Finder
IAGC	Instant Automatic Gain Control
ICBM	Intercontinental Ballistic Missile
IFF	Identification Friend Or Foe
IMI	Improved Manned Interceptor
IRBM	Intermediate Range Ballistic Missile
IRF	Image Rejection Filter

JCS	Joint Chiefs Of Staff
JPRF	Jittered PRF
LAR	Local Acquisition Radar
LDC	Local Defense Center
LRR	Long Range Radar
MAD	Master Air Defense (Plan)
MAP	Ministry of Aviation Industry
MAR	Multifunctional Array Radar
MF	Multiple Frequencies
MIRV	Multiple Independent Reentry Vehicle
MRI	Medium Range Interceptor
MSR	Missile Site Radar
MTI	Moving Target Indicator
NAVFORCONAD	Naval Forces Continental Air Defense Command
NAWS	NORAD Attack Warning System
NCA	National Command Authority
NCMC	NORAD Cheyenne Mountain Complex
NG	National Guard
NM	Nautical Miles
NORAD	North American Air Defense Command
NSSCC	National Space Surveillance And Control Center
OKB	Experimental Design Bureau
OSD	Office of the Secretary of Defense
OTH-B	Over The Horizon—Backscatter
PAR	Perimeter Acquisition Radar
PRO	Antimissile Defense
PVO STRANY	National Air Defense
PVO VOYSK	Troop Air Defense
PWD	Pulse Width Discriminator
QMR	Qualitative Materiel Requirement
R&D	Research And Development
ROC	Required Operational Capability
ROR	Range Only Radar
RPD	Random Pulse Discriminator
RTV	Radio-Technical Troops
RV	Reentry Vehicle

SABMIS	Sea-Based Antiballistic Missile Intercept System
SAC	Strategic Air Command
SAGE	Semi-Automatic Ground Environment
SALT	Strategic Arms Limitations Talks
SAM	Surface-To-Air-Missile
SAM-D	Surface-To-Air-Missile Development
SAMDEP	SAM-D Deployment Analysis
SAMWEPS	SAM-D Weapons Family Cost Effectiveness Study
SCC	Super Combat Center
SIS	Satellite Intercept System
SLBM	Submarine Launched Ballistic Missile
SNAP	Short Notice Annual Service Practice
SPADATS	Space Detection And Tracking System
SPRF	Staggered PRF
TAC	Tactical Air Command
TATTEM	Test Against Target Taking Evasive Maneuvers
TACMAR	Tactical Multifunctional Array Radar
TRACE	Transportable Control Environment
TT	Tunable Transmitter
TTR	Target Tracking Radar
WADF	Western Air Defense Forces
WSMR	White Sands Missile Range
ZAR	Zeus Acquisition Radar
ZMAR	Zeus Multifunctional Array Radar
ZRV	Antiaircraft Missile Troops

Bibliography

Congressional Hearings and Reports
Government Contracts, U.S. Department of Defense Magazines and Periodicals

ACSFOR, DA. "Annual Historical Summary, Office of the Assistant Chief of Staff for Force Development 1 July 1963 to 30 June 1964," Washington, D.C.: Office of ACSFOR, DA.

"Air Warning System of the Soviet Union," *RCAF Intelligence Summary*, April 1955.

Aviation Week, 4 November 1957.

Basic Report of Civil Defense and Defense Mobilization, Roles, Organizations, and Programs for President John F. Kennedy by Frank B. Ellis, Director OCDM, February 1961.

"Bloc AAA Strength Drops as SAM's Phase In," *Aerospace Intelligence Digest*, May 1962.

"Bloc Air Defenses are Growing Stronger," *Air Intelligence Digest*, November 1959.

Central Intelligence Agency. *The Aircraft Industry of the U.S.S.R.*, CIA/RR 50, January 1953.

Central Intelligence Agency. "Changing Soviet Civil Defense Concepts," *Current Support Brief*, 11 September 1962.

Central Intelligence Agency. "Civil Defense in the Soviet Union," *CIA Intelligence Report*, 15 May 1969.

Central Intelligence Agency. "Estimated Floor Space of . . . Airborne Plant . . . ," RR RA-17, 23 August 1957.

Central Intelligence Agency. *Main Trends in Soviet Military Policy*, CIA/RR MP 66-1, April 1966.

Central Intelligence Agency. *National Intelligence Survey, Volume 26, Section 83, Soviet Air Forces*, Recurring—January 1949, January 1956, October 1951, May 1967, April 1961, January 1966.

Central Intelligence Agency. "Soviet Civil Defense Construction," *Current Intelligence Weekly Summary*, 6 October 1960.

Central Intelligence Agency. "Soviet Civil Defense: Policies and Priorities," *Intelligence Memorandum*, April 1967.

Central Intelligence Agency. *Soviet Spending for Defense: An Annual Review, Vol. I Trends in Public Expenditures*, SR-IR 73-11, August 1973.

Central Intelligence Agency. *Soviet Spending for Defense: An Annual Review, Volume II. A Monetary Comparison of Soviet and U.S. Defense Activity*, SR-IR 73-12, August 1973.

Central Intelligence Agency. *A Survey of Economic Planning in the U.S.S.R.*, RR RA-13, April 1957.

CHICKADEE Report. "Technical Data on a Soviet Surface-to-Air Missile Designated V-75," 21 February 1963.

"Civil Defense as a Common Concern," *Nauka i Zhizn* (Science and Life) No. 1, Moscow, 1969 (JPRS translation No. 47772, translation on U.S.S.R. Military Affairs No. 511) 2 April 1969.

CONAD. "CONAD Command History, 1971," Headquarters CONAD.

CONAD. "CONAD Command History, 1972," Headquarters CONAD.

CONAD. "CONAD Operational Employment Concept for the Nike X Terminal Ballistic Missile Defense System," Headquarters CONAD, 20 June 1966.

CONAD. "Continental Air Defense Command History, 1968," Headquarters CONAD, 1 May 1969.

CONAD. "Historical Summary, July 1956–June 1957," Continental Air Defense Command.

CONAD/ADC. "Continental Air Defense Command and Air Defense Command History, July–December 1955," Headquarters CONAD.

CONAD/ADC. "Continental Air Defense Command and Air Defense Command History, January–June 1956," Headquarters CONAD.

"Defense Budgets and Appropriations Fiscal Years 1952–1973," Washington, D.C.: *Congressional Quarterly*, October 28, 1972.

DCSOPS, DA. "Annual Historical Summary, FY 1964, Office of the Deputy Chief of Staff for Military Operations," Office of the Chief of Staff for Operations, DA. Washington, D.C.

DCSOPS, DA. "Office of the Deputy Chief of Staff for Military Operations, Summary of Major Events and Problems, FY 1960," Washington, D.C.

DCSOPS, DA. "Summary of Major Events and Problems, FY 1959, Deputy Chief of Staff for Operations," Washington, D.C.

DCSOPS, DA. "Summary of Major Events and Problems, Office of the Deputy Chief of Staff for Military Operations FY 1962," Washington, D.C.: Office of the Chief of Staff for Operations, D.A.

DCSOPS, DA. "Summary of Major Events and Problems, FY 1963, Office, Deputy Chief of Staff for Military Operations," Washington, D.C.: Office of the Deputy Chief of Staff for Military Operations, D.A.

DCPA. *The Development of Civil Preparedness in the United States*. A Chronological Summary, Region Four, Battle Creek, Michigan, 1972.

"A Decade of Soviet AC&W Height-Finder Radar Developments," *Defense Intelligence Digest*, November–December 1963.

Defense Intelligence Agency. *Aerospace Production Technology, Volume 2. Missile and Space Systems*, ST-CS-01-32-73, February 1973.

Defense Intelligence Agency. *Aerospace Weapons and Weapon Systems: Flagon A* RFB-22-5032-71, January 1971.

Defense Intelligence Agency. *Air-Breathing Propulsion Technology—Eurasian Communist Countries*, ST-CS-04-009-74, June 1974.

Defense Intelligence Agency. *Aircraft Armament Handbook (Characteristics and Performance)—Eurasian Communist Countries*, ST-HB-09-2-74, October 1967.

Defense Intelligence Agency. *Aircraft Armament (Trends) Eurasian Communist Countries*, ST-CS-09-46-73, October 1973.

Defense Intelligence Agency. *Anti Satellite Systems—U.S.S.R.* ST-CS-12-27-24, October 1972.

Defense Intelligence Agency. *Avionics Capabilities—Eurasian Communist Countries*, ST-CS-05-33-73, May 1973.

Defense Intelligence Agency. *A Decade of Soviet AC&W Height Finder (HF) Radar Development*, Defense Intelligence Digest. May–December 1963.

Defense Intelligence Agency. *Defensive Missile System (Trends)—U.S.S.R.* ST-CS-15-288-73, June 1973.

Defense Intelligence Agency. *ECM Capabilities Eurasian Communist Countries Supplement 1, Ground-Based Electronic Warfare Equipment*, ST-CS-05-18-74, Sup. 1. November 1973.

Defense Intelligence Agency. *ECM Capabilities—ECC*, ST-CS-05-18-74, April 1974.

Defense Intelligence Agency. *Electronics Associated with Antiballistic Missiles and Antisatellite Systems—U.S.S.R.*, ST-CS-05-236-7, December 1973.

Defense Intelligence Agency. *Electronics (Surface-to-Air Associated) Eurasian Communist Countries*, ST-HB-05-008-74, September 1974.

Defense Intelligence Agency. *Estimated Expenditures for Research and Development by the Soviet Ministry of Aviation Industry*, DIA-450-2-6-71 INT, July 1971.

Defense Intelligence Agency. *Fiddler Weapon Systems*, ST-CS-09-7-71, February 1971.

Defense Intelligence Agency. *Fighter Aircraft (Trends)—Eurasian Communist Countries*, ST-CS-09-006-75, 12 November 1974.

Defense Intelligence Agency. *Fighter-Launched Missiles (Current and Projected)—ECC*, 17 July 1974, ST-C8-09-20-74.

Defense Intelligence Agency. *Firebar Weapon System*, ST-CS-09-254-73, November 1972.

Defense Intelligence Agency. *Fishbed Weapon System*, ST-CS-09-27-73 April 1973.

Defense Intelligence Agency. *Fishpot Weapon System*, FTD-CS-09-3-65, December 1965.

Defense Intelligence Agency. *Fitter Weapon System*, ST-CS-09-26-72, August 1972.

Defense Intelligence Agency. *Flagon Weapon System*, ST-CS-09-133-72, March 1972.

Defense Intelligence Agency. *Former Weapon System*, ST-CS-09-58-71, December 1971.

Defense Intelligence Agency. *Foxbat Weapon System*, ST-CS-09-31-74.

Defense Intelligence Agency. *Fresco (MiG-17) Weapon System*, ST-CS-09-47-70, September 1970.

Defense Intelligence Agency. *The Moscow ABM System*, ST-CS-02-68-INT, July 1968.

Defense Intelligence Agency. *The Moscow ABM System*, ST-CS-11-308-74, March 1974.

Defense Intelligence Agency. *Soviet Military Procurement and the Military-Industrial Complex*, AP-450-2-5-70-INT, November 1970.

"Deployment of SAM's Increasing in Bloc," September 1961, *Air Intelligence Digest*.

"Dual Missile Defense Predicted," *Aviation Week and Space Technology*, 31 March 1958.

"Electronics Problems in Soviet Air Defense," *Air Intelligence Digest*, November 1956.

"Eisenhower Doubts 'Thin' Missile Plan Can Be Successful," *The New York Times*, 16 January 1968.

Eto Dolzhen Znat Kazhdyi (Everyone Must Know This), Miask, 1968 (main civil defense pamphlet published for mass distribution in the U.S.S.R.).

"European Satellites Have Impressive Radar Coverage," *Aerospace Intelligence Digest*, April 1962.

"Evolution Marks Design of Soviet Fighters," *Defense Intelligence Digest*, June 1964.

"Fighter Arm of Soviet Air Defense," *Air Intelligence Digest*, November 1958.

"Flashlights Producibility," *Air Intelligence Digest*, August 1955.

"Flaws in U.S.S.R.'s Air Defense," *Defense Intelligence Digest*, December 1964.

Foreign Broadcast Information Service. *Soviet Propaganda Treatment of Antimissile Defense Capability, 1970 to Date* RS. 303, 22 January 1971.

Foreign Broadcast Information Service. *Soviet Statements on Anti-Missile Defense Capability* RS. 83, 10 February 1967.

Foreign Broadcast Information Service. *Soviet Statements on Anti-Missile Defense Capability: 1967 to Date* RS. 93, 31 January 1969.

Foreign Broadcast Information Service. *Soviet Statements on Anti-Missile Defense Capability: 1969 to Date* RS. 299, 13 March 1970.

Foreign Broadcast Information Service. *U.S.S.R. and Eastern Europe*, October 16, 1961.

"Frisco D and E Have Full All Weather Capability," *Air Intelligence Digest*, April 1959.

"Gorkiy: Armament Production Center," *Air Intelligence Digest*, June 1967.

"Growth of Soviet TOKEN Radar," *USAFE Air Intelligence Summary*, August 1954.

"How Effective is Red's SA-2 Defense System," *Aerospace Intelligence Digest*, March 1963.

"How Efficient is Soviet Bloc GCI," *Air Intelligence Digest*, September–October 1957.

"How Reds Control Their Air Defenses," *Air Intelligence Digest*, March 1960.

"How Soviet Air Capability Has Progressed," *Air Intelligence Digest*, August 1957.

"How the Soviets Conduct Air-to-Air Fighter Tactics," *Defense Intelligence Digest*, January 1964.

"If Flashlight Attacks," *Air Intelligence Digest*, April 1956.

"If Frisco D. Attacks," *Air Intelligence Digest*, February 1956.

Information Report K-311/04142. *Subject: Aircraft in Soviet Air Force Inventory*, 31 October 1973.

Information Report CS-43014. *Subject: Arrest of Soviet General Officers*, 23 July 1954.

Information Report 00-K-211. *Subject: Dosarm's Role in Civil Defense*, 14 February 1952.

Information Report 00-K-323/10910-74. *Subject: Local Civil Defense*, 6 May 1974.

Information Report FIR-K-311/01649. *Subject: MiG-25 Development to PVO*, 16 April 1975.

Information Report TDCS-K-314/02278-73. *Subject: MiG-25 Interceptor*, 16 March 1973.

Information Report FIR K-311/03639. *Subject: . . . Missile System*, 6 September 1973.

Information Report 00-K-323/06763-74. *Subject: Naval Aviation*, 3 April 1974.

Information Report FIR K-311/03815. *Subject: Organization of the U.S.S.R. Air Defense System (PVO)*, 5 November 1973.

Information Report TDCS-K-3/438,544. *Subject: Overflights of U.S.S.R. . . .* , 25 May 1960.

Information Report 1502-0424-73. *Subject: SAF Assessment of Vietnam Air War*, 13 March 1974.

Information Report 00-K-323/10153-74. *Subject: SAF Background*, 6 May 1974.

Information Report 1-502-0511-73. *Subject: SAF Pilot Training*, 28 April 1974.

Information Report TDFIR K-314/05271-73. *Subject: Soviet Aircraft*, 21 June 1973.

Information Report K-311/03864-73. *Subject: Soviet Air Force Activities*, 5 October 1973.

Information Report CS-K-3/462,173. *Subject: . . . Soviet Air Forces and PVO Strany*, 19 January 1961.

Information Report CSLT-3/681,581. *Subject: Soviet Doctrine and Theory of Antiair defense*, 22 December 1958.

Information Report 00-K-323/06606-74. *Subject: Soviet SAM Officers*, 3 April 1974.

Information Report FIRK-311/03642. *Subject: Supplemental Pilot Training*, 6 September 1973.

Information Report CS-K-311/61288. *Subject: Various*, 30 March 1973.

Izvestiia, January 18–20, 1962.

"Jet Engines for Soviet Fighters Designed by Three Major Bureaus," *Aerospace Intelligence Digest*, March 1963.

Krasnaia Zvezda (Red Star), May 23, 1962.

Krasnaia Zvezda (Red Star), April 2, 1966.

Los Angeles Times, December 12, 1961.

"Major Reductions Underway in SAF," *Air Intelligence Digest*, June 1961.

Memorandum from the Secretary of Defense to the JCS. Subject: NSC Meeting and Discussion on 5 August 1954, 13 August 1954.

"Moscow Geared for Defense," *Air Intelligence Digest*, October 1956.

"New Radar-Equipped Interceptor May Become Operational in 1962," *Air Intelligence Digest*, November 1960.

New Trends in Kremlin Policy, Special Report Series #11, The Center for Strategic and International Studies, Georgetown University, Washington, D.C., August 1970.

The New York Times, 13 June 1956.

The New York Times, 20 May 1957.

The New York Times, 4 July 1957.

The New York Times, 28 August 1957.

The New York Times, 26 September 1957.

The New York Times, 3 October 1957.

The New York Times, 21 November 1957.

The New York Times, 20 March 1959.

The New York Times, 7 October 1961.

The New York Times, 18 August 1964.

"Newest Red Radar Represents U.S. GCI," *Air Intelligence Digest*, July 1953.

"Nike Zeus May be Inadequate, Top Defense Scientist Warns," *Aviation Week and Space Technology*, 10 November 1958.

NORAD. "NORAD/CONAD Historical Summary," January–June 1960. Directorate of Command History, Office of Information Headquarters, NORAD/CONAD.

NORAD. "NORAD/CONAD Historical Summary," July–December 1960. Directorate of Command History, Office of Information, Headquarters, NORAD/CONAD.

NORAD. "NORAD/CONAD Historical Summary," January–June 1964. Directorate of Command History, Office of Information, Headquarters, NORAD/CONAD.

NORAD. "NORAD/CONAD Historical Summary," January–June 1965. Directorate of Command History, Office of Information, Headquarters, NORAD/CONAD.

NORAD. "NORAD/CONAD Historical Summary," July–December 1964. Directorate of Command History, Office of Information, Headquarters, NORAD/CONAD.

NORAD. "Soviet Civil Defense," *Weekly Intelligence Review*, Issue No. 18/60, 6 May 1960.

NORAD/CONAD. "NORAD/CONAD Historical Summary, July–December 1957," Headquarters NORAD/CONAD.

NORAD/CONAD, "NORAD/CONAD Historical Summary, January–June 1958," Headquarters NORAD/CONAD.

NORAD/CONAD. "NORAD/CONAD Historical Summary, July–December 1958," Headquarters NORAD/CONAD.

NORAD/CONAD. "NORAD/CONAD Historical Summary, July–December 1960," Headquarters NORAD/CONAD.

NORAD/CONAD. "NORAD/CONAD Historical Summary, January–June 1963," Headquarters NORAD/CONAD.

NORAD/CONAD. "NORAD/CONAD Historical Summary, January–June 1964," Headquarters NORAD/CONAD.

NORAD/CONAD. "NORAD/CONAD Historical Summary, July–December 1964," Headquarters NORAD/CONAD.

NSC Action 1355, 17 March 1955, as cited in "Chronology of Significant Events and Decisions Relating to U.S. Missile and Earth Satellite Development Programs, May 1942 through October 1957," Historical Section, JCS, 22 November 1957.

OCMH. Manuscript, Office, Chief of Ordnance Light AA Development Program, 1957.

Office of the President. "President Johnson's State of the Union Message," Text, *New York Times*, 11 January 1967.

OSD. "Defense Management Summary CY 1973," Washington, D.C.: Directorate for Information Operations, Office of the Secretary of Defense.

OSD Historian's Office. *History of Strategic Arms Competition (1945–1960) Chronology, U.S.*, Vol. I, October 1974.

OSD Historian's Office. *History of Strategic Arms Competition (1945–1972) Chronology, U.S.S.R.*, Vol. III, December 1974.

OSI, *Soviet Advanced Radar Techniques Applicable to Ground Radar*, 24 October 1963, OSI, RS/62-29.

"Pair of 37MM Guns Gives Real Punch to Flashlight A," *Air Intelligence Digest*, April 1957.

Pravda, 25 October 1961.

Pravda, 24 January 1962.

Pravda, 23 May 1962.

Pravda, 30 March 1966.

Pravda Ukrainy, 13 May 1969.

"RD-9 Turbojet Engine," *Air Intelligence Digest*, September 1959.

Record Group No. 319. Records of Joint Actions, Department of the Army, Army Staff, DCSOPS, JCS Papers, 1954–1964.

"Reds Achieve Impressive AC&W Coverage," *Air Intelligence Digest*, September 1956.

"Reds Build Anti-Ballistic Missile Development Complex," *Air Intelligence Digest*, May 1961.

"Reds Face Problems in Anti-ICBM System," *Aerospace Intelligence Digest*, June 1962.

"Reds Stepping Up Civil Defense Program," *Aerospace Intelligence Digest*, May 1962.

Rockefeller Brothers Fund. *International Security—The Military Aspect*, Doubleday and Company, Garden City, N.J., 1958.

"Round-Up of Red Radars," *Air Intelligence Digest*, August 1954.

"SAF Tries 'Shift' System for Fighter Combat Training," *Aerospace Intelligence Digest*, April 1962.

"Six Typical Red Radar Stations," *Air Intelligence Digest*, July 1955.

"Soviet AI Radars: How Do They Rate?," *Aerospace Intelligence Digest*, January 1962.

"Soviet Aircraft Plants: How Are They Managed?," *Air Intelligence Digest*, June 1961.

"Soviet Air Defense Network Improved but Still Vulnerable," *Defense Intelligence Digest*, January 1965.

"The Soviet Air Defense System," *USAFE Air Intelligence Summary*, 1954.

"Soviet Air-to-Air Missile Capability," *Air Intelligence Digest*, May 1961.

"Soviet Air Weapons, Research-Development Philosophy," *Air Intelligence Digest*, June 1960.

"A Soviet Anti-ICBM System: How Close to Realization," *Air Intelligence Digest*, August 1960.

"Soviet B-200 Missile Guidance System," *Air Intelligence Digest*, July 1957.

"Soviet Bloc SAM Defenses—The Critical Period Begins," *Aerospace Intelligence Digest*, April 1962.

Soviet Civil Defense Programs Continue, DIA, DID, Vol. 8, August 1970.

"Soviets Claim Lead in World Air Records," *Air Intelligence Digest*, November 1960.

"Soviet Communications System: Weak Link in Aerospace Defense," *Aerospace Intelligence Digest*, March 1962.

"Soviets Continue to Expand SAM Air Defense System," *Defense Intelligence Digest*, April 1965.

"Soviets Continue Use of V-2 Guidance Unit," *Defense Intelligence Digest*, September 1964.

"Soviets Decentralize Government Control System," *Air Intelligence Digest*, March 1961.

"Soviet Defense Against ASM: How Effective?," *Air Intelligence Digest*, February 1960.

"Soviets Design Military Districts to be Self-Sufficient in Wartime," *Defense Intelligence Digest*, November–December 1963.

"Soviets Developing Air-to-Air Missile," *Air Intelligence Digest*, March 1960.

"Soviet Dumbo, Rus-2, and Pegmatit Radars," *Air Intelligence Digest*, November 1952.

"Soviet Fighter Aircraft: A 15-Year Development Sketch," *Defense Intelligence Digest*, February 1965.

"Soviets improve Anti-jamming Equipment," *Air Intelligence Digest*, May 1960.

"Soviets Improve, Extend Microwave Relay System," *Aerospace Intelligence Digest*, June 1962.

"Soviet Interceptor Performance," *Air Intelligence Digest*, April 1957.

"Soviet Jet Fighter Production Shows Sharp Decline," *Air Intelligence Digest*, April 1959.

"Soviet Low-Level Air Defense Capabilities: Marginal or Less," *Aerospace Intelligence Digest*, October 1962.

"Soviets May be Engaged in Anti-satellite Program," *Aerospace Intelligence Digest*, November 1962.

"Soviet Military Districts HQ's: Important Control Centers," *Air Intelligence Digest*, August 1961.

"Soviet Pilot Discusses Combat Tactics," *Air Intelligence Digest*, September 1959.

"Soviets Place Renewed Emphasis on AA Weapons," *Defense Intelligence Digest*, August 1963.

"Soviet SAM Support Facilities and Capability," *Defense Intelligence Digest*, February 1965.

"Soviet Strategic Air Doctrine Comes of Age," *Air Intelligence Digest*, June 1956.

SRI, *An Analysis of the U.S.-Soviet Strategic Interaction Process*, Project No. 5584, March 1967.

SRI. *Assessment of U.S.S.R. Historical Strategic Force Posture*, October 1970.

SRI. *Soviet Strategy, Objectives and Force Postures in Response to U.S. BMD 1968–1980*, March 1969.

"State Hits Post Story on SALT," *Washington Post*, 22 May 1970.

"Supersonic Aircraft in Zoom Climb Could Attack High Flying Targets," *Aerospace Intelligence Digest*, September 1962.

"Tall King Radar Improves Soviet Early Warning Net," *Air Intelligence Digest*, July 1961.

"Text of President Nixon's Announcement of Revised Proposal for Sentinel Anti-Ballistic Missile Program," *The New York Times*, 15 March 1969.

"Two New Red Fighters Limited to Clear Air," *Air Intelligence Digest*, May 1960.

"Unusual Design Features Revealed in Fishbed C," *Defense Intelligence Digest*, June 1964.

U.S. Air Force. *Standard Aircraft/Missile Characteristics (Green Book) Addenda* 53–55, January 1972–January 1973.

USAF Air Defense Command. "Air Defense and National Policy, 1958–1964," ADC Historical Study No. 26, Headquarters Air Defense Command.

USAF Air Defense Command. "The Fighter Interceptor Force, 1962–1964," ADC Historical Study No. 27, Headquarters Air Defense Command, November 1964.

USAF Air Defense Command. Historical Study No. 19.

USAF Air Defense Command. "An Overview of ADC Weapons, 1946–1972," Headquarters Aerospace Defense Command, April 1973.

U.S. Air Force/INAP. *Background Intelligence Data for Posture Statement on Strategic Initiatives*, 31 October 1973.

U.S. Air Force Special Communications Center. *Operational Review of Soviet Air-to-Air Fighter Tactics*, USAF Security Service, EB 4-74, February 1974.

U.S. Army Air Defense Command. *Argus*, U.S. Army Air Defense Command, June 1974.

U.S. Army Air Defense Command. *Chronology of Army Ballistic Missile Defense System Development and Deployment*, Headquarters U.S. Army Air Defense Command, 15 May 1970.

U.S. Army Air Defense Command. "The History of ARADCOM, Volume I, The Gun Era, 1950–1955," Historical Project Number 5M-1, Headquarters ARADCOM.

U.S. Army Chemical Corps Intelligence Agency. "Soviet Civil Defense Against CBR Attack," *Intelligence Research Project*, Washington, D.C., 30 September 1960.

U.S. Congressional Record, 90th Congress, 2nd Session, 1 November 1968.

U.S. Department of the Army. Air Defense Branch, Office, Chief of Research and Development, Memorandum, Subject: Antimissile Missile Statement of the Problem, 20 December 1956.

U.S. Department of the Army. Chief of Ordnance Memorandum to Chief of Research and Development, Office, Chief of Staff, Subject: ICBM Defense, 16 November 1955.

U.S. Department of the Army. Chief of Research and Development, Memorandum for Chief of Ordnance, Subject: Antimissile Missile Program, 31 January 1956.

U.S. Department of the Army. Chief of Research and Development Memorandum for the Chief of Staff, Subject: Antimissile Missile, 27 March 1958.

U.S. Department of the Army. *Chronological History of Army Activities in the Missile/Satellite Field, 1943–1958*, Department of the Army Pamphlet, September 1958.

U.S. Department of the Army. *Chronology of the Development of Ballistic Missile Defense (1955 to Present)*, U.S. Army Safeguard System Command, 14 July 1970.

U.S. Department of the Army. Director of Research and Development, Office, Secretary of the Army, Memorandum for the Assistant Secretary of Defense, Subject: Anti-Ballistic Missile Program, 1 April 1956.

U.S. Department of the Army. Director, Research and Development, Office, Secretary of the Army, Memorandum for Director of Guided Missiles, Office of the Secretary of Defense, Enclosure 1, Subject: Report on Nike Zeus, 24 April 1958.

U.S. Department of the Army. Nike X System Manager, Personal Letter from Lieutenant General A.W. Betts to Lieutenant General Robert Hackett, Commanding General ARADCOM, 6 January 1967.

U.S. Department of the Army. Office, Chief of Research and Development, Memorandum for the Record, 9 January 1958.

U.S. Department of the Army. Safeguard System Manager's Office, *Fact Sheet*, 1969.

U.S. Department of the Army. Western Electric Company, "Nike Zeus Guided Missile System," Volume I, System Study Report, Prepared by Bell Telephone Laboratories and Douglass Aircraft Corporation, 1 March 1957.

U.S. Department of Defense. Defense Report Before a Joint Session of the Senate Armed Services Committee and Appropriations Committee, *A Statement by Secretary of Defense Melvin R. Laird on Fiscal Year 1971 Defense Program and Budget*, 20 February 1970.

U.S. Department of Defense. News Release No. 868-67, *Address of Honorable Robert S. McNamara, Secretary of Defense before United Press International Editors and Publishers*, San Francisco, Monday, 18 September 1967.

U.S. Department of Defense. Office Secretary of Defense, Special Assistant for Guided Missiles, Memorandum for the Secretary of the Army and Secretary of the Air Force, Subject: Anti-ICBM Systems, 2 October 1956.

U.S. Department of Defense. Report RD 302/4, Subject: Report of the Ad Hoc Group on Low Altitude Antiaircraft Systems, July 1956.

U.S. Department of Defense. Secretary of Defense Memorandum for the Secretary of the Air Force, Subject: Program for Defense Against the Intercontinental Ballistic Missile, 16 January 1958.

U.S. Department of Defense. *Statement of Secretary of Defense Robert S. McNamara Before the House Armed Services Committee on the Fiscal Year 1966–1970 Defense Program and 1966 Defense Budget*, 1965.

U.S. Department of Defense. *Statement of Secretary of Defense Robert S. McNamara Before the House Armed Services Committee on the Fiscal Year 1967–1971 Defense Programs and 1967 Defense Budget*, 1966.

U.S. Department of Defense. *Statement of the Secretary of Defense Robert S. McNamara Before a Joint Session of the Senate Armed Services Committee and Senate Subcommittee on Department of Defense Appropriations on the Fiscal Year 1968–1972 Defense Program and 1968 Defense Budget*, 1967.

U.S. House of Representatives. Committee on Appropriations. Hearings, *DOD Appropriations for 1958*, U.S. Congress, 85th Congress, 1st Session.

U.S. House of Representatives. Committee on Appropriations, *Department of Defense Appropriations for Fiscal Year 1960*, Part 6, 86th Congress, 1st Session, 1959.

U.S. House of Representatives. Committee on Appropriations, *Department of Defense Appropriations for Fiscal Year 1960, Part 6*, 86th Congress, 1st Session, 1959.

U.S. House of Representatives. Committee on Armed Services. "Authorizing Appropriations for Aircraft, Missiles, and Naval Vessels for the Armed Forces; Hearings before the Committee on Armed Services, House of Representatives, Eighty-Seventh Congress, 1st Session, pursuant to H.R. 6151 to Authorize Appropriations for Aircraft, Missiles, and Naval Vessels for the Armed Forces, and for other purposes," 1961.

U.S. House of Representatives. Committee on Armed Services. "Hearings before and Special Reports made by Committee on Armed Services of the House of Representatives on Subjects Affecting the Naval and Military Establishments 1967," 90th Congress, 1st Session, 1968.

U.S. House of Representatives. Committee on Armed Services. "Hearings before Committee on Armed Services of the House of Representatives on Sundry Legislation Affecting the Naval and Military Establishments 1955," 84th Congress, 1st Session, 1955.

U.S. House of Representatives. Committee on Armed Services. "Hearings before Committee on Armed Services of the House of Representatives on Sundry Legislation Affecting the Naval and Military Establishments 1957," 85th Congress, 1st Session, 1957.

U.S. House of Representatives. Committee on Armed Services. "Hearings on before Committee on Armed Services of the House of Representatives on Sundry Legislation Affecting the Naval and Military Establishments 1958," 85th Congress, 2nd Session, 1958.

U.S. House of Representatives. Committee on Armed Services. "Hearings before Committee on Armed Services of the House of Representatives on Sundry Legislation Affecting the Naval and Military Establishments 1959," 86th Congress, 1st Session, 1959.

U.S. House of Representatives. Committee on Armed Services. "Hearings before Committee on Armed Services of the House of Representatives on Sundry Legislation Affecting the Naval and Military Establishments 1964," 88th Congress, 2nd Session, 1964.

U.S. House of Representatives. Committee on Armed Services. "Hearings before the Preparedness investigation Subcommittee of the Committee on Armed Services in Conjunction with the Committee on Aeronautical and Space Sciences, United States Senate, 86th Congress, 2nd Session, on Missiles, Space, and Other Major Defense Matters," 1960.

U.S. House of Representatives. Committee on Armed Services. "Hearings on Military Posture and H.R. 9751, to Authorize Appropriations During Fiscal Year 1963 for Aircraft, Missiles, and Naval Vessels for the Armed Forces, and for Other Purposes before the Committee on Armed Services, House of Representatives, Eighty-Seventh Congress, Second Session," 1962.

U.S. House of Representatives. Committee on Armed Services. "Hearings on Military Posture and H.R. 2440, to Authorize Appropriations During Fiscal Year 1964, for Procurement, Research Development, Test and Evaluation of Aircraft, Missiles, and Naval Vessels for the Armed Forces, and for other Purposes before the Committee on Armed Services House of Representatives," 88th Congress, 1st Session, 1964.

U.S. House of Representatives. Committee on Armed Services. "Hearings on Military Posture and H.R. 4016 to Authorize Appropriations During Fiscal Year 1966 for Procurement of Aircraft, Missiles, and Naval Vessels, and Research, Development, Test and Evaluation, for the Armed Forces, and for Other Purposes," 89th Congress, 1st Session, 1965.

U.S. House of Representatives. Committee on Armed Services. "Hearings on Military Posture and H.R. 13456 to Authorize Appropriations During the Fiscal Year 1967 for Procurement of Aircraft, Missiles, Naval Vessels, and Tracked Combat Vehicles, and Research, Development, Test and Evaluation for the Armed Forces, and to Maintain Parity between Military and Civilian Pay, and for other Purposes," 89th Congress, 2nd Session, 1966.

U.S. House of Representatives. Committee on Armed Services. "Hearings on Military Posture and S. 3293, An Act to Authorize Appropriations During the Fiscal Year 1969 for Procurement of Aircraft, Missiles, Naval Vessels, and Tracked Combat Vehicles, Research, Development, Test and Evaluation for the Armed Forces, and to Prescribe the Authorized Personnel Strength of the Selected Reserve of Each Reserve Component of the Armed Forces and for Other Purposes," 1968. 90th Congress, 2nd Session.

U.S. House of Representatives. Committee on Armed Services. "Hearings on Military Posture and H.R. 9637, No. 36," 88th Congress, 2nd Session, 1964.

U.S. House of Representatives. Committee on Armed Services. "Investigations of National Defense Missiles, Pursuant to House Resolution 67," 85th Congress, 2nd Session, 1958.

U.S. House of Representatives. "Hearing Before the Subcommittee of the Committee on Appropriations, Department of Defense Appropriations for 1961, Part 1," 86th Congress, 2nd Session, 1960.

U.S. House of Representatives. "Hearings Before the Subcommittee of the Committee on Appropriations, Department of Defense Appropriations for 1962, Part 3," 87th Congress, 1st Session, 1961.

U.S. House of Representatives. "Hearings Before the Subcommittee of the Committee on Appropriations, Department of Defense Appropriations for FY 1963," 87th Congress, 2nd Session, 1962.

U.S. House of Representatives. "Military Operations Subcommittee of the House Committee on Government Operations," 84th Congress, 1956.

U.S. House of Representatives. Committee on Armed Services. "Military Posture Briefings, Hearings before the Committee on Armed Services, House of Representatives," 87th Congress, 1st Session, 1961.

U.S. House of Representatives. Subcommittee No. 3, Committee on Armed Services, 88th Congress, 1st Session, Washington, D.C., May–June 1963.

U.S. House of Representatives. "United States Defense Policies in 1965," House Document No. 344, 89th Congress, 2nd Session, 1966.

U.S. Senate. Committee on Armed Services. "Inquiry into the Collapse of Texas Tower No. 4, Hearings before the Preparedness Investigating Subcommittee of the Committee on Armed Services, United States Senate," 87th Congress, 1st Session, 1961.

U.S. Senate, Committee on Armed Services. "Inquiry into Satellite and Missile Programs," 85th Congress, 1st and 2nd Sessions, 1958.

U.S. Senate. Committee on Armed Services, Preparedness Investigation Committee. "Major Defense Matters," Part 1, U.S. Congress, 86th Congress, 1st Session.

U.S. Senate. Committee on Armed Services and the Subcommittee on Department of Defense of the Committee of Appropriations. "Military Procurement Authorization for Fiscal Year 1968," 90th Congress, 1st Session, 1967.

U.S. Senate. Hearings Before the Committee on Armed Services. "Military Procurement Authorization, Fiscal 1962," 87th Congress, 1st Session, 1961.

U.S. Senate. Hearings Before the Committee on Armed Services. "Military Procurement Authorization FY 1963," 87th Congress, 2nd Session, 1962.

U.S. Senate. Hearings Before the Committee on Armed Services. "Military Procurement Authorizations Fiscal Year 1964," 88th Congress, 1st Session, 1963.

U.S. Senate. Hearings Before the Subcommittee on Disarmament of the Committee on Foreign Relations. "United States Armament and Disarmament Problems," 90th Congress, 1st Session, 1967.

U.S. Senate. Interim Report by the Preparedness Investigating Subcommittee of the Committee on Armed Services. "Military Implications of the Proposed Limited Nuclear Test Ban Treaty," 88th Congress, 1st Session, 1963.

U.S. Senate. Joint Hearings Before the Preparedness Subcommittee of the Committee on Armed Services and the Committee on Aeronautical and Space Sciences. "Missile and Space Activities," 86th Congress, 1st Session, 1959.

U.S. Senate. Report of the Committee on Foreign Relations. "The Nuclear Test Ban Treaty," 88th Congress, 1st Session, 1963.

U.S. Senate. Subcommittee on National Machinery. "Organizing for National Security, The National Security Council," Study submitted to Committee on Government Operations, Washington, D.C., 1960.

"U.S.S.R.'s Best-Defended Areas," *Air Intelligence Digest*, April 1957.

"U.S.S.R. Communications Inflexible, Vulnerable," *Air Intelligence Digest*, No Date.

"U.S.S.R. Radar Coverage: World's Largest," *Air Intelligence Digest*, March 1961.

"U.S.S.R. Research Planning Based on Tight Controls," *Air Intelligence Digest*, June 1960.

"View of Possible BMEW System in Soviet Union," *Defense Intelligence Digest*, August 1965.

Voyennye Znaniya (Military Knowledge) , No. 2, February 1962.

Voyennye Znaniya (Military Knowledge) , No. 1, January 1969.

"Warsaw Pact Air Elements Continue Modernization," *Defense Intelligence Digest*, April 1965.

Washington Post, 12 July 1957.

Washington Post, 14 July 1957.

Washington Post, 28 August 1957.

Washington Post, 29 August 1957.

Washington Post, 13 September 1957.

Washington Post, 5 October 1957.

Washington Post, 7 November 1957.

Washington Post, 8 November 1957.

Author and Title

Adams, Benson D. *Ballistic Missile Defense*, American Elsevier Publishing Company, Inc., New York , 1971.

Adams, Benson D. "McNamara's ABM Policy, 1961–1967," *Orbis* 12, Spring 1968.

Akimov, N. I., et a1. "Civi1 Defense—Moscow 1969," (Translated April 1971) Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Anderson, J.W. *Operations Research—Eurasian Communist Countries*, Defense Intelligence Agency, ST-5-3-3322, May 1973.

Andreyev, Red Admiral V. *Red Star*, 13 December 1967.

Andrianov, D.P. *Management, Planning and Economics of Aircraft Production* (Organizatsiya Planivovaniye I Ekonomika Aviatsionnogo Proizvodstva, Moscow, 1963) FTD Trans, AD 609900.

Beecher, William. "Soviet Criticism on Arms Dismays Top U.S. Aides," *The New York Times*, 9 March 1970.

Beliavskii, V.A. *Grazhdanskaia Oborona-Vsenarodnoe Delo* (Civil Defense is Everyone's Business) Atomizdat, Moscow, 1968.

Berganst, Erik. *Reaching for the Stars*, New York, 1960.

Braybrook, R. H. "Sukhoi's Fighters . . . The Fishpot and the Fitter," *Flying Review International*, 19 December 1968.

Brazier, Don R., Acting Assistant Secretary of Defense (Comptroller). "Statement Before the Defense Subcommittee of the House Committee on Appropriations in Connection With the FY 1974 Budget Estimates of the Department of Defense, May 31, 1973," Washington, D.C.: GPO, 1973.

Bridgman, Leonard, ed. *Janes—All the World's Aircraft 1962–1963*, McGraw-Hill, Inc., New York, 1963.

Brunner, E.D. *The Development of Soviet Force Structures: 1945–1953* unpublished DRAFT, 20 March 1975.

Brunner, E.D. *Soviet Air Armaments and Their Costs, 1946–1961*, RAND RM-3508-PR, May 1963.

Chapman, John L. *Atlas*, New York, 1960.

Chayes, Abram and Wiesner, Jerome B. et al. *ABM: An Evaluation of the Decision to Deploy an Antiballistic Missile System*, The New American Library, New York, 1969.

Chipman, Dr. William K., Deputy Assistant Director (Plans), Defense Civil Preparedness Agency. Interview, May 1975.

Chuykov, V.I. *Civil Defense in Nuclear Missile War*, Atomic Publishing House, Moscow 1968 (Soviet Military Translation No. 485) 22 October 1968.

Clifford, Clark M. *The 1970 Defense Budget and Defense Program for Fiscal Years 1970–197*4, Washington D.C.: U.S. Dept. of Defense, 15 January 1969.

Collins, John M. "Defense Trends in the United States 1952–1973," Washington, D.C.: Congressional Research Service, Library of Congress, October 26, 1973.

Cooling, B. Frank. *The Army Support of Civil Defense 1945–1966: Plans and Policy*, Histories Division, OCMH, DA, 1966.

Crankshaw, Edward. *Krushchev, A Career*, New York, 1966.

Davis, John E. *U.S. Strategic Defensive Concepts, part II—Passive Defense Measures*, lecture to NWC, Washington, D.C. 19 November 1970.

Dzhordzhadze, I. "Classical Military Art and Nuclear/Missile Warfare," *Voyennaya Mysl* (Military Thought), Top Secret, Fourth Issue, 1961.

Egorov, P.T., Shlyakov, I.A., Alabin, N.I. *Grazhdanskaya Oborono* (Civil Defense), 2nd Edition, Moscow, 1970.

Eisenhower, Dwight D. *Waging Peace*, Doubleday, New York, 1956.

English, Richard D. and Bolef, Dan. T. "Defense Against Bomber Threat," *Scientific American*, Vol. 229, No. 2, August 1973.

Enthoven, Alain C. and Smith, K. Wayne. *How Much is Enough? Shaping the Defense Program, 1961–1969*, Harper and Row Publishers, New York, 1971.

Finney, John W. "U.S. and Russia Push Arms Talks," *The New York Times*, 22 May 1970.

Fouquet, David. "NATO Studies Costly US Radar Plane," *The Washington Post*, April 25, 1975.

Futrell, Robert F. *Ideas, Concepts, Doctrine: A History of Basic Thinking in the United States Air Force, 1907–1964*, Vol. II, Aerospace Studies Institute, June 1971.

Gastilovich, A. I. "The Theory of Military Art Needs Review," *Voyennaya Mysl* (Military Thought). Top Secret First Issue, 1960.

Gessert, Robert A., Jordan, Nehemiah, Tashjean, John E. *Federal Civil Defense Organization, The Rationale of Its Development*, IDA, Economic and Political Studies Division, Study S-184, January 1965.

Gilpin, Robert. *American Scientists and Nuclear Weapons Policy*, Princeton University Press, New Jersey, paperback edition, 1965.

Goure, Leon. *Civil Defense in the Soviet Union*, Berkeley, California, University of California Press, 1962.

Goure, Leon. *The Current State of the Soviet Civil Defense Program*, A Semi-Annual Progress Report prepared for the Defense Civil Preparedness Agency, DAHC 20 70 C0809, Center for Advanced International Studies, University of Miami, November 1974.

Goure, Leon. *The Military Indoctrination of Soviet Youth*, National Strategy Information Center Inc., New York, 1973.

Goure, Leon. *Recent Developments in Soviet Civil Defense 1969–1970*, Center for Advanced International Studies, University of Miami, May 1971.

Goure, Leon. *The Resolution of the Soviet Controversy Over Civil Defense*, RAND, RM-3223-PR, June 1962.

Goure, Leon. *The Role of Civil Defense in Soviet Strategy*, RAND, RM-3703-PR, June 1963.

Goure, Leon. *The Soviet Civil Defense Program*, RAND, RM-2564, 1 August 1970.

Goure, Leon. *The Soviet Civil Defense Program: A Trip Report*, RAND, RM-2684, January 5, 1961.

Goure, Leon. *Soviet Civil Defense Revisited 1966–1969*, RAND, RM-6113-PR, November 1969.

Goure, Leon. "The Soviet View: 'We Are Realists'," *Foresight Magazine*, September–October 1974.

Green, W.F. "Report from Domodedovo," *Flying Review International*, September 1967.

Green, W.F., and Stroad, J. *Observer's Soviet Aircraft Directory*, London: Frederick Warne & Co. Ltd., (Pilot Press, Ltd), 1975.

Gregory, W.H. "Soviet Union Seeks Balance in Technology," *Aviation Week*, March 18, 1968.

Gwertzman, Bernard. "Nixon ABM Plans Arouse Soviet Press Critics," *The New York Times*, 28 March 1969.

Gwertzman, Bernard. "Pravda Voices Soviet Displeasure with U.S. Over Missile Policies and Delay on Arms Control Talks," *The New York Times*, 11 June 1969.

Gwertzman, Bernard. "Soviet Says Its ABM Can 'Reliably Hit' Attacking Missiles," *The New York Times*, 24 February 1970.

Haperin, Morton H. *Contemporary Military Strategy*, Boston: Little, Brown and Company, 1967.

Haperin, Morton H. "The Decision to Deploy the ABM: Bureaucratic and Domestic Politics in the Johnson Administration," In Head, Richard G. and Rokke, Ervin J., *American Defense Policy*, 3d ed. Baltimore, Maryland: The Johns Hopkins University Press, 1973.

Hammond, Paul Y. *The Cold War Years: American Foreign Policy Since 1945,* New York: Harcourt, Brace & World, Inc., 1969.

Hammond, Paul Y. *Organizing for Defense: The American Military Establishment in the Twentieth Century*, Princeton University Press, Princeton, New Jersey, 1961.

Hinterhoff, Eugene. *Disengagement*, Stevens and Sons, London, 1959.

Holder, W.G. *U.S.S.R. Aerospace R&D Overview*, Foreign Technology Division, AFSC, USAF, FTD-CW-01-05-74, June 1974.

Horelick, Arnold and Rush, Myron. *Strategic Power and Soviet Foreign Policy*, University of Chicago Press, Chicago, Illinois, 1965.

Huntington, Samuel P. *The Common Defense: Strategic Programs in National Politics*, New York: Columbia University Press, 1961.

Johnson, J.K., and Baldwin, M.M. *Aerodynamics (Research and Development) Eurasian Communist Countries*, Defense Intelligence Agency, ST-CS-01-70-72, May 1972.

Kahn, Herman. "How Many Lives Can Be Saved," *Bulletin of the Atomic Scientists*, January 1959.

Kahn, Herman. *Thinking About the Unthinkable*, New York: Horizon Press, 1962.

Kamm, Henry. "Moscow Scores Arms-Talk Foes," *The New York Times*, 20 April 1969.

Kaufmann, William W. *The McNamara Strategy*, New York: Harper and Row Publishers, 1964.

Kennedy, John F. *The Strategy of Peace*, Edited by Allan Nevins, Popular Library, New York, 1961.

Kilpatrick, Carroll. "U.S., Russia Plan Talks on Restricting Missile," *Washington Post*, 2 July 1968.

Killian, James R. Jr., and Hill, A.G. "For a Continental Defense," *Atlantic*, November, 1953.

Kintner, William R., et al. *Alternative U.S. Strategic and America's Future*, Philadelphia: University of Pennsylvania, Foreign Policy Research Institute, 1965.

Kintner, William R. *Peace and the Strategy Conflict*, Frederick A. Praeger Publishers, Washington, D.C., 1968.

Kissinger, Henry *A Nuclear Weapons and Foreign Policy*, Council of Foreign Relations, Harper, New York, 1957.

Kridler, T.P., Day, D.A., and Patterson, G. F. *Military R&D Management—U.S.S.R.: The Role of the Academy of Sciences in Military Aerospace Product Research and Development*, Defense Intelligence Agency, ST-CS-01-162-72, April 1972.

Kuns, H.J. *Aerospace Production Technology—U.S.S.R. and PRC Vol. I, Aerodynamic Systems*, Defense Intelligence Agency, ST-CS-01-32-73, January 1973.

Laird, Melvin R. "Statement of Secretary of Defense Melvin R. Laird before the House Armed Services Committee on the FY 1972–1976 Defense Program and the 1972 Defense Budget, March 9, 1971," Washington, D.C.: GPO, 1971.

Laird, Melvin R. "Statement of Secretary of Defense Melvin R. Laird Before the House Armed Services Committee on the FY 1973 Defense Budget and FY 1973–1977 Program," Washington, D.C.: GPO, 1972.

Laird, Melvin R. "Statement of Secretary of Defense Melvin R. Laird Before the House Subcommittee on Department of Defense Appropriations on the Fiscal Year 1971 Defense Program and Budget," Washington, D.C.: GPO, 1970.

Leonard, Ltc. Richard E. *Civil Defense—Its Role in Nuclear Deterrence*, U. S. Army War College Research Report, Carlisle Barracks, Pa., 22 February 1971.

Liebmann, LTC. Seymour. *Civil Defense and Its Importance to National Security*, U.S. Army War College, Research Report 19, October 1970.

McNamara, Robert S. *The Essence of Security*, Harper and Row, New York, Evanston, and London, 1968.

McNamara, Robert S. *The Fiscal Year 1969–1973 Defense Program and the 1969 Defense Budget*, Washington, D.C.: U. S. Dept. of Defense, 22 January 1968.

McNamara, Robert S. "Statement of Secretary of Defense Robert S. McNamara Before a Joint Session of the Senate Armed Services Committee and the Senate Subcommittee on Department of Defense Appropriations on the Fiscal Year 1966–1970 Defense Program and 1966 Defense Budget," Washington, D.C.: GPO, 1965.

McNamara, Robert S. "Statement of Secretary of Defense Robert S. McNamara Before a Joint Session of the Senate Armed Services Committee and the Senate Subcommittee on Department of Defense Appropriations on the Fiscal Year 1968–1972 Defense Program and 1968 Defense Budget," January 23, 1967. Washington, D.C.: GPO, 1967.

McNamara, Robert S. "Statement of Secretary of Defense Robert S. McNamara Before the Senate Committee on Armed Services The Fiscal Year 1963–1967 Defense Program and 1963 Defense Budget," Washington, D.C.: GPO, 1962.

McNamara, Robert S. "Statement of Secretary of Defense Robert S. McNamara Before the Senate Armed Services Committee on the Fiscal Year 1969–1973 Defense Program and 1969 Defense Budget," Washington, D.C.: GPO, 1968.

Malykhin, F. "Some Problems in the Preparation of the Rear Area for Support of the Armed Forces in the Initial Period of a War," *Voyennaya Mysl* (Military Thought), Top Secret Second Issue, 1960.

Maxam, William Pierce. *Federal Civil Defense 1946–1963: A Study in Organization and Administration*, The American University Ph.D. Program, Washington, D.C., August, 1964.

Mikhaylov, V. "Antimissile Defense of Troops of a Front," *Voyennaya Mysl* (Military Thought), Top Secret Second Issue, 1961.

Mironov, S. "Several Questions on Evaluating the Effectiveness of the Basic Means of Antiair Defense of a Front, and its Organizational Structure," *Voyennaya Mysl* (Military Thought), Top Secret first issue, 1961.

Miroshnikov, I.P., Zapolskil, G.N., eds. *Zashchita Naseleniia ot Sovremennykn Szedstv Porazzheniia* (Protection of the Population Against Present Means of Attack), DOSAAF, Moscow, 1959.

Mitchell, Donald W. *Civil Defense Planning for Survival and Recovery*, Industrial College of the Armed Forces, Washington, D.C., 1962.

Moulton, Harland B. *From Superiority to Parity: The United States and the Strategic Arms Race, 1961–1971*, Greenwood Press, Inc. Westport, Connecticut: 1973.

Murdock, Clark A. *Defense Policy Formation: A Comparative Analysis of the McNamara Era*, State University of New York Press, Albany, 1974.

Murphy, Charles H. "The Decision to Curtail Strategic Air Defense Programs in FY 1975: Rationale and Implications," Washington, D.C.: Congressional Research Service, Library of Congress, April 5, 1974.

Newhouse, Hohn. *Cold Dawn: The Story of SALT*, Holt, Rinehart and Winston, New York, Chicago, and San Francisco 1973.

Nixon, Richard. "U.S. Foreign Policy for the 1970's, Building for Peace. A Report to the Congress by Richard Nixon, President of the United States, February 25, 1971," Washington, D.C.: GPO, 1971.

Nixon, Richard. "U.S. Foreign Policy for the 1970's, A New Strategy for Peace. A Report to the Congress by Richard Nixon, President of the United States, February 18, 1970." Washington, D.C.: GPO, 1960.

Nixon, Richard. "U.S. Foreign Policy for the 1970's, Shaping a Durable Peace. A Report to the Congress by Richard Nixon, President of the United States, May 3, 1973," Washington, D.C.: GPO, 1973.

Ostrovmov, N. and Kozhevnikov, M. "Aviation Operations in an Initial Front Offensive Operation," *Voyennaya Mysl* (Military Thought), Secret Fifth Issue, 1961.

Pavlovskiy, N. "The Initial Period of a Future War and the Special Features of the Conduct of Military Operations During This Period," *Voyennaya Mysl* (Military Thought), Top Secret First Issue, 1961.

Podgornyy, I. "The Fundamentals of Anti-missile Defense," *Voyennaya Mysl* (Military Thought), Top Secret First Issue, 1962.

Polmar, N. "Stronger Sealegs for Soviet Airpower," *Air Enthusiast*, June 1974.

Popov, M.M. and Chuykov, V.I. "Critique of the Front Two-Stage Operational Rear Area Exercise Conducted in July 1961," Top Secret report of the Ministry of Defense, Moscow, 1961.

Raymond, Jack. "U.S. Says Russians Plan Anti-Missile," *The New York Times*, 15 October 1960.

Razuvayev, V., and Yegorov, M. "On Zonal Protection of Troops and Installations in the Operational Rear Area by the Forces of Antiaircraft Missile Units of a Front," *Voyennaya Mysl* (Military Thought), Secret Third Issue, 1962.

Reitz, James T. *Selected Aspects of the Soviet Civil Defense Program*, SRI, October 1974.

Reshetnikov, N. "On the Development of the Theory of the Combat Employment of Front Aviation in the Post-War Period," *Voyennaya Mysl* (Military Thought), Secret Fifth Issue, 1961.

Richardson, Elliot L. "Statement of Secretary of Defense Elliot L. Richardson Before the House Armed Services Committee on the FY 1974 Defense Budget and FY 1974–1978 Program," Washington, D.C.: GPO, 1973.

Roberts, Chalmers. "Shape of Arms Pact Emerges with 50-50. Chance of Accord," *Washington Post*, 21 May 1970.

Root, L.W., Russell, R.F., and Gamer, R.V., *United States versus U.S.S.R. Ground-Based Air Defense Radar Comparison*," U.S. Army Missile Command, Red Stone Arsenal, Alabama, December 1971.

Ryvkin, Ye. "Some Pressing Problems of the Antiair Defense of the Country," *Voyennaya Mysl* (Military Thought), Secret Sixth issue, 1961.

Savko, V., and Maksimov, N. "The Organization of Anti-missile Defense," *Voyennaya Mysl* (Military Thought), Top Secret First Issue, 1962.

Schlesinger, Secretary of Defense James R. *Annual Defense Department Report, FY 1975*.

Schneider, Mark E. "Six and Sixty," *Survive*, May–June, 1972.

Scott, William F. *Survival in the Nuclear Age: An Examination of a Soviet Concept*, PhD. Dissertation, George Washington University, Washington, D. C., February 1974.

Sinyakov, J., and Kozhevnikov, M. "The Air Forces in the New Stage of Developments of the Soviet Armed Forces," *Voyennaya Mysl* (Military Thought), Top Secret Third Issue, 1960.

Smith, Mark E., III, and Johns, Claude J., Jr., ed. *American Defense Policy*, Johns Hopkins Press, Baltimore, 1968.

Spanier, John. *American Foreign Policy Since World War II*, 6th ed., Praeger Publishers, New York, 1973.

Sturm, Thomas A. "Command and Control for North American Air Defense 1959–1963," USAF Historical Division Liaison Office, January 1965.

Suta, B.E. *Evaluation of U.S. Capabilities Against Soviet Civil Defense*, Strategic Studies Center, SRI, No. 8974, November 1972.

Tikhomirov, V.I. *Organization and Planning of an Aircraft Construction Enterprise* (Organizatsiya I Planirovaniye Samoletostroitel'nogo Predpriyatiya, Moscow, 1957), FTD Trans. AD 414392.

Ulam, Adam. *The Rivals: America and Russia Since World War II*, Viking Press, New York, 1971.

Varentsov, S. "The Problem of Combat with the Nuclear Means of the Enemy and Its Solution," *Voyennaya Mysl* (Military Thought), Secret Fifth Issue, 1961.

Von Braun, Werhner, and Ordway, Frederick III. *History of Rocketry and Space Travel*, Revised, Crowell, New York, 1966.

Wiesner, Jerome B. Text of paper, "Comprehensive Arms Limitations Systems," delivered at Sixth Pugwash Conference, *Conference Proceedings*, Moscow, 29 November 1960.

Wiesner, Jerome B. "Against," a *Center Occasional Paper 2*, February 1969.

Wiesner, Jerome B. "Forward," Special Arms Control issue, *Daedalus*, Fall 1960.

Wigner, Eugene D. "The Myth of 'Assured Destruction,'" *Survive*, July–August, 1970.

Wigner, Eugene P., ed. *Who Speaks for Civil Defense?*, Charles Scribner's Sons, New York, 1969.

Witze, Claude. "Fight Over the ABM: Debate or Witch Hunt," *Air Force and Space Digest*, April 1969.

Wolfe, Thomas W. *Soviet Response to U.S. Policies and Problems*, RAND, December 1965.

York, Herbert F. "ABM, MIRV, and the Arms Race," *Science*, 17 July 1970.

Zemskov, V. "Problems in the Development of Antiair Defense of the Ground Troops and Ways to Resolve Them," *Voyennaya Mysl* (Military Thought), First Issue, 1962.