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Annual Report of the Secretary of Defense, Operational Forces, pp. 11-15:

Continental Defense

The overwhelming and indestructible retaliatory power of the United States constitutes the major deterrent to a direct attack on the North American continent. The rapid increase in the size and effectiveness of our retaliatory forces during fiscal year 1964 should have removed any doubt concerning the dire consequences of such an attack. In addition, the defensive capabilities of the North American Air Defense Command (NORAD) presented formidable hurdles for any potential aggressor to overcome. This combination of retaliatory and defensive strength provided effective protection to our country in fiscal year 1964 as in previous years.

The continental defense system, operated as a combined United States-Canadian effort, continued to be adjusted to the changing nature of the threat. Antibomber defenses were given increased protection against missile attacks by the wider dispersal of manned interceptors and of radar warning and control facilities. Antimissile defenses acquired improved detection capabilities, and substantial progress was made in all development phases of the new NIKE-X missile defense system. In addition, an interim antisatellite capability was developed. Further improvements in many segments of these defenses are scheduled, but major changes will depend on the fundamental decisions yet to be made concerning the eventual deployment of NIKE-X and the expansion of the current civil defense program.

Adjustments in our antibomber defenses are focused on improving survival capabilities in case a bomber strike is preceded by a missile attack. The vulnerability of the Semi-Automatic Ground Environment (SAGE) system to a missile strike presented a key problem in this area. Hardening of the system proved to be impractical and the location of SAGE facilities near potential prime target areas, such as bomber bases and large cities, created additional hazards. To provide a more viable warning and control system, widely dispersed, semiautomatic Back-Up Interceptor Control (BUIC) stations, protected against radioactive fallout, are being constructed. This new approach permitted the closing of six SAGE direction centers and one SAGE combat center, and additional direction centers will be eliminated as the BUIC system becomes fully operational. Increased protection for our manned interceptor force against missile attack is being provided by maintaining one-third of these aircraft on 15-minute alert and by making additional alternate airfields available for emergency deployment. This substantial force of F-101's, F-102's, F-104's, and F-106's is supplemented by Canadian squadrons as well as by about 500 Air National Guard aircraft. Each of the Air National Guard squadrons is keeping a few of its planes on runway alert.

A wide network of surface-to-air missiles supplements the manned interceptor defense. Solid-fueled BOMARC-B missiles, capable of striking targets 400 miles away,

operate from bases in the United States and Canada; the shorter range, liquid-fueled BOMARC-A missiles will, as announced on January 21, 1964, be phased out during fiscal year 1965. Closer to their targets, attacking bombers will encounter a vast array of NIKE-HERCULES batteries, manned by regular Army and Army National Guard units; the last NIKE-AJAX missiles, assigned to the Army National Guard, were phased out during fiscal year 1964. Regular Army HAWK batteries provide additional defenses.

The adequacy of these forces to counter the Soviet bomber threat is being kept under constant review. Against current Soviet capabilities in this area, the existing defenses appear to be sufficient, although additional improvement in protection against missile attacks is indicated. In line with this requirement, current programs call for further modernization and dispersal of surveillance, warning, and control facilities. A special effort to modernize the interceptor force does not seem justified, unless the Soviet Union deploys a radically new long-range bomber. In this case, numerous options for meeting this contingency are available as an outgrowth of an extensive research and development program for advanced aircraft. Among the possible choices are the F-4, already in our inventory; the F-111, scheduled for initial procurement in fiscal year 1965; and the A-11 or YF-12A, a new high altitude, 2,000 miles per hour experimental plane. Research is also being carried forward on various subsystems for even more advanced aircraft. .

In the antimissile defense field, progress continued to be made in broadening the early warning coverage and in the development of NIKE-X, probably the most advanced antimissile system yet conceived by any nation.

The construction of the Ballistic Missile Early Warning System (BMEWS) was completed during fiscal year 1964, when the Fylingdales station in the United Kingdom became operational and joined those at Thule, Greenland, and Clear, Alaska, in providing about 15 minutes' warning of a missile attack. Projects for the continuing improvement of the effectiveness of these stations have been initiated. In addition, a breakthrough in over-the-horizon (OTH) radar techniques involving the detection of missiles within seconds after launch at a distance of several thousand miles by bouncing signals off the ionosphere--will make it possible to double the warning time in the years ahead. The new radars will supplement, rather than replace, the more versatile BMEWS radars and also provide new detection capabilities for the anti bomber defenses.

The NIKE-X program, which was announced in January 1963, constitutes a major effort for the development of a more effective anti-ballistic missile (ABM) defense system than that offered by the NIKE ZEUS. The speed of its high acceleration SPRINT missile provides additional time for its radars to discriminate between warheads and decoys, and its advanced Multifunction Array Radar (MAR) can not only acquire and track a large number of objects simultaneously but can also operate from hardened sites, providing increased survivability. Successful tests of SPRINT components during the past year kept the development of this new missile on schedule. The first test version of MAR, which combines the previously separate acquisition, tracking, and discrimination radars into a single system, started operating at the White Sands Missile Range, New Mexico, on July 1, 1964. Valuable information for the development of the new system

was obtained from NIKE-ZEUS tests at Kwajalein Island, where new intercept techniques were tried against inter-continental ballistic missiles (ICBMs). A NIKE-ZEUS tracking radar installed on Ascension Island, the southern terminus of the Atlantic Missile Range, provided additional data for tracking oncoming missiles. Project DEFENDER, directed by the Advanced Research Projects Agency (ARPA), continued to be closely associated with these tests and also supported a broad research program for new defense and penetration concepts.

The eventual deployment of NIKE- X remains an option for future decision. Assuming the successful completion of the development phase, a complex variety of technical, strategic, and economic factors will have to be considered. The relative effectiveness of the new system against small, moderate, and major missile attacks will have to be balanced against the capability of potential enemies to develop new penetration techniques at relatively low cost. In these circumstances, the high deployment cost of NIKE-X, measured against its eventual effectiveness, becomes an important factor. The deployment of NIKE-X around some 20-odd cities, containing about 30 percent of our population, is estimated to cost between $15 and $17 billion, and the operational costs, thereafter will amount to about $1 to $2 billion a year. In addition, the effectiveness of a ballistic missile defense system in saving lives will depend in large part upon the existence of an adequate civil defense system protecting the American people against fallout. Thus, even after all the technical problems relating to NIKE-X are resolved, a most careful review by the Congress and the Executive Branch of competing advantages and disadvantages is indicated.

An effective defense against submarine-launched ballistic missiles (SLBMs) raises equally complex problems. A key element in this defense remains the extensive Anti-Submarine Warfare (ASW) program for the detection and destruction of enemy submarines before they have an opportunity to launch their missiles. This effort continued to show good progress during fiscal year 1964. A modification of coastal radars to improve the detection of submarine-launched missiles has also been initiated. For an active defense, NIKE-X appears to offer the greatest promise.

To counter the possible threat of armed enemy satellites, two antisatellite systems have been developed, as announced by the President shortly after the close of the fiscal year. Both systems, one developed by the Army and the other by the Air Force, utilize data from our global space detection and tracking networks. The Army system, a derivative of NIKE-ZEUS, was initiated in May 1962 and had a successful intercept a year later. The Air Force system, based on a modified THOR missile, was started in the spring of 1963 and completed a successful operational test in May 1964. The two systems have been effectively tested and the interception of U.S. satellites by dummy warheads occurred well within the destructive radius of the weapons.

Annual Report of the Secretary of The Army, Research and Development, p. 188:

During fiscal year 1964, the Army's antimissile activities were highlighted by achievements in several areas. System definition was completed and work was initiated

or continued on all major NIKE-X system components. Revised funding estimates and a new technical development plan were prepared as a result of the completion of system definition. Construction of the Multifunction Array Radar (MAR) at White Sands Missile Range was completed. SPRINT missile component tests were conducted to determine optimum materials and design criteria. Progress in system development was most encouraging and the program remained on schedule.

The emphasis in ZEUS testing was shifted from intercept tests to gathering data on reentry phenomena using the ZEUS radars. Controlled experiments with advanced reentry vehicles have produced valuable data to assist in the NIKE-X system design. Intercept tests will continue at a reduced rate, however, for sometime.

During the year the Secretary of Defense directed the Army to assume command of the Department of Defense national range facilities at Kwajalein Atoll. A detailed transfer plan was prepared in conjunction with the Navy, the present range command agency, and approved by the Secretary of Defense. The Army will assume responsibility for Kwajalein on July 1, 1964.

In July 1963, Secretary of Defense Robert S. McNamara directed the Army to study in depth the effectiveness of NIKE-X against the anticipated ICBM threat of the future. This study, called "Threat Analysis," was nearing completion at the end of the fiscal year and will be forwarded to the Secretary of Defense.