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COMMITTEE PRINT
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GOVERNMENT
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STATUS OF THE DEVELOPMENT OF THE
ANTIBALLISTIC MISSILE SYSTEMS IN
THE UNITED STATES

PREPARED FOR THE
SUBCOMMITTEE ON DISARMAMENT
OF THE
COMMITTEE ON FOREIGN RELATIONS
UNITED STATES SENATE

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LETTER OF TRANSMITTAL

FEBRUARY 10, 1967.

Hon. J. W. FULBRIGHT,
Chairman, Committee on Foreign Relations,
U.S. Senate, Washington, D.C.

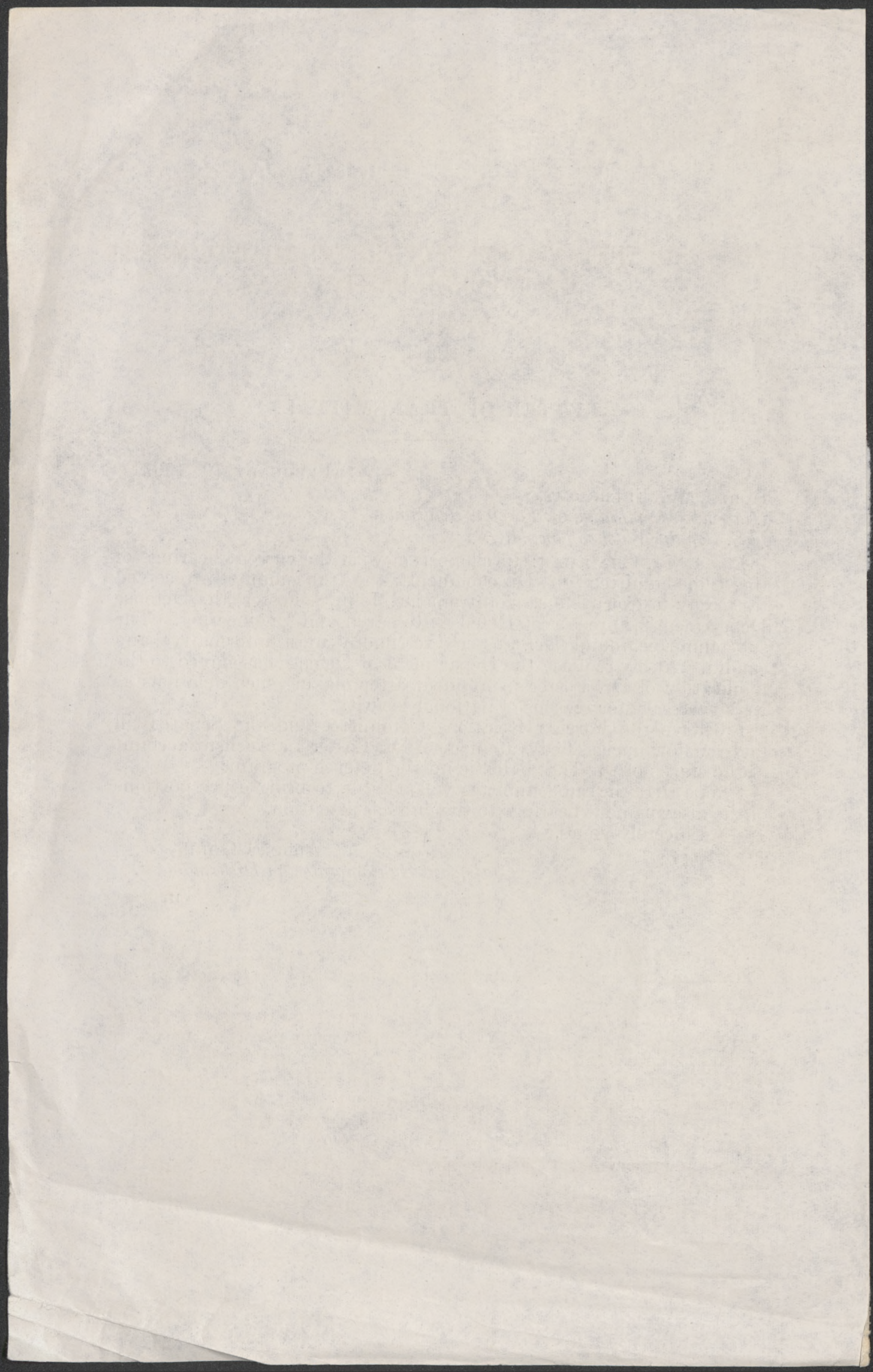
DEAR MR. CHAIRMAN: In connection with the current hearings of the Subcommittee on Disarmament, the subcommittee received testimony in executive session from Dr. John S. Foster, the Defense Department's Director of Defense Research and Engineering. The subcommittee found Dr. Foster's testimony most informative and candid. At my request, the Department of Defense has agreed to the publication of Dr. Foster's statement after making such deletions as were necessary for reasons of national security.

I believe the Foreign Relations Committee and the Senate will find the now unclassified statement of Dr. Foster an excellent account of the status of the U.S. ballistic missile defense program.

I hope that the subcommittee will be able to bring other portions of the disarmament hearings to the public's attention.

Sincerely yours,

ALBERT GORE,
Chairman, Subcommittee on Disarmament.



STATUS OF THE DEVELOPMENT OF THE ANTIBALLISTIC MISSILE SYSTEMS IN THE UNITED STATES

Monday, February 6, 1967

UNITED STATES SENATE,
SUBCOMMITTEE ON DISARMAMENT OF THE
COMMITTEE ON FOREIGN RELATIONS,
Washington, D.C.

The subcommittee met, pursuant to notice, at 10:20 a.m., in room S-116, the Capitol, Senator Albert Gore (chairman of the subcommittee) presiding.

Present: Senators Gore, Lausche, Clark, Pell, McCarthy, Hickenlooper, Aiken, Williams, Case, and Cooper.

Senator GORE. The committee will come to order.

Last Friday, Mr. Helms, of the Central Intelligence Agency, gave the subcommittee a briefing on weapons development, the status of ballistic development and antiballistic development in other countries, and this morning the Subcommittee on Disarmament continues its series of hearings on these and related subjects.

We are pleased and privileged to have with us Dr. John S. Foster, the Defense Department's Director of Research and Engineering, to give this subcommittee a briefing on our own development in these interesting and dangerous fields. It has been my privilege to know Dr. Foster and work with him for quite a long while. He is, in my view, a very able and dedicated public servant.

The committee is pleased to hear you, Dr. Foster, and you may proceed.

STATEMENT OF DR. JOHN S. FOSTER, JR., DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING

I am pleased to be here today. I understand that you have requested a discussion of the technical status of the U.S. ballistic missile defense program.

In discussing the general subject, let me first say that every system we have ever seriously considered for deployment involves the use of radars to detect and track the incoming targets, and the use of these same or different radars to guide ground-to-air interceptor missiles to the vicinity of the targets. There a command from the ground causes the interceptor warhead to detonate and destroy the target. It is clear that such a defense system does not provide a shield which makes a nation impervious to attack, since the interceptors can always be avoided or outnumbered—provided always that the enemy is willing to pay the price in decreased fatalities or increased cost to his offensive effort.

In reviewing the history of ballistic missile defense over the past 10 years, it seems there has always been controversy over its value or lack of value. Of course, if the defense had been a true shield, there would have been no controversy, and we would have made a deployment decision long ago.

The first controversy arose around the question, "Could a bullet hit a bullet?" This phase passed, first when calculations showed the feasibility of such an intercept and later and most definitely when successful intercepts of actual ICBM targets fired from Vandenberg Air Force Base were accomplished by the old Nike-Zeus system in 1962-63. We had 10 out of 14 successful intercepts.

After this "simple" problem was solved, it was realized that the offense would replace the relatively easy-to-intercept single warhead with clouds of objects, or take other deceptive measures. Examples of these objects were decoys designed to look like warheads to the radar, and chaff designed to conceal the warhead in a cloud of light objects. Against those more sophisticated targets there was a necessity for the defense to discriminate among them so as to know which objects to take under fire. Hence many objects might have to be tracked and observed simultaneously. Also, it might be necessary for the defense to wait for atmospheric reentry of the targets and rely on slowdown and burnup of the lighter objects before this discrimination could be accomplished.

The old Nike-Zeus system, when confronted with these more sophisticated targets, had two fatal defects. One was that it used what are now considered to be old-fashioned mechanical radars, which had to be mechanically slewed or pointed at each target in turn—a matter of seconds. One practically had to have a radar for each target. And the Zeus missile could not be delayed in firing until atmospheric reentry of the targets took place, because it was too slow. Hence discrimination could not be aided by atmospheric filtering.

Because of these defects, the Nike X concept was born. First, the mechanical radars of Nike-Zeus were replaced by phased array radars, which by varying the electrical phase of the power over the face of a fixed antenna array could change the direction of the radar beam in a matter of microseconds. This imparted a capability of tracking many objects simultaneously, and thus removed one of the Zeus defects. Second, a very high-performance, short-range-interceptor missile, the Sprint, was introduced. It was smaller, cheaper, and had much higher acceleration than Zeus, and thus could afford to wait until reentry of the targets before being committed to fire. Atmospheric filtering was now feasible and the remaining targets could be attacked with the high firepower Sprints.

The old Zeus interceptor was retained in the system for long-range attacks on simple targets. We now had two interceptors—the Zeus and the Sprint.

The Nike X development, initiated in 1963, was thus much more effective than the old Zeus system. It must be noted, however, that it was essentially a "terminal defense" system. The Sprint could only defend cities or selected sites. Hence, since it is obviously impractical to deploy terminal defenses at every small city or village in the United States, it was subject to bypass attack. An enemy could always target the undefended cities and obtain high casualties. This option

was available even to unsophisticated opponents. The sophisticated opponent, by concentrating his firepower, could overwhelm the defense at any selected defended site. The value of ballistic missile defense was therefore questioned.

The next important development in defense effectiveness came with the introduction of "area defense" in the period 1964-65. I would like to define the term "area defense."

The detection sensor is the perimeter acquisition radar (PAR) which detects ballistic missiles at long ranges. The PAR radar tracks the incoming missile and predicts its future path. To intercept the incoming missile, we employ the Spartan missile which is a long-range interceptor developed from the old Nike-Zeus. Once the PAR radar has predicted the future path of the missile a Spartan missile is fired so as to intercept it. This interceptor intercepts the incoming missile well above the atmosphere. Because of its long range the Spartan can intercept incoming missiles directed at targets several hundred miles from the Spartan battery location. The Spartan missile is guided by a missile site radar (MSR) which is associated with each battery.

With the introduction of Spartan, the Zeus interceptor was no longer required—in effect, the Spartan replaced the Zeus.

Comparatively few Spartan batteries can defend the whole United States from simple attacks.

You will note I said "simple attacks." It is still possible for a sophisticated opponent to confuse the defense and make the firepower demands on Spartan too high. In this case, terminal defense Sprints must be relied upon if we are to furnish a defense. The Spartan thus functions in two ways. It can provide a very effective defense over extended areas against simple threats. Against not so simple threats, it provides a defense in depth and is complementary to Sprint. In any case it forces the enemy, if he wishes to penetrate, to pay the price demanded by a sophisticated penetration aids program.

You will note that I have described a flexible set of building blocks consisting of PAR and MSR radars and two types of interceptor missiles, Spartan and Sprint. We also have a very large, sophisticated radar called TACMAR, designed specifically against sophisticated attacks. They can be put together in various ways to provide varying levels of defense against different threats.

For example, if we wished to defend the United States against a large Soviet attack, we would provide an overlay of an area defense such as I have described. As I mentioned earlier, however, it would be necessary to depend primarily on terminal Sprint defense, including TACMARs, at selected cities. A selected city defense (including the area component) would cost about \$10 or \$20 billion depending on the number of cities defended.

As a matter of technical judgment, I believe that these larger deployments carry with them technical risks. The likelihood of large and sophisticated attacks with the deployment of significant U.S. defenses increases the technical uncertainty of the defensive system. Even with an ABM deployment we would have to expect that in an all-out exchange, dozens of their warheads would likely explode in our cities.

Mr. Chairman, I believe that sums up the technical assessment of ballistic-missile defense. It has changed greatly in recent years and no doubt will continue to change. That is why, even in the absence of a deployment decision, a high-priority research and development program is so necessary.

