Anti-Missile Defense: Should Nike X Be Deployed?

Few issues facing U.S. policy makers are as difficult, complex, and full of uncertainties as the question of whether or not to deploy the antiballistic missile (ABM). Even more than most defense questions, it requires guessing what one's adversary will do before he has made up his mind. If proponents of deployment read the future correctly, an ABM system would strengthen the U.S. policy of forestalling Communist aggression through nuclear deterrence, or, deterrence failing, would save millions of lives by intercepting some of the attacking missiles. If history were to justify the apprehensions of some who are opposed, deployment of the ABM would exacerbate the arms race, create new fears and instabilities, and, by encouraging buildup of strategic forces on each side, make a nuclear exchange even more destructive.

The Department of the Army officials who have nursed the ABM through a long period of research and development were hopeful earlier this year that in 1966 their exotic weapon would be approved for deployment. They are discouraged now, however, for they believe that the mounting cost of the Vietnam war has squeezed the ABM out of the new defense budget. This is ironic, inasmuch as it was the prospect of countering the developing nuclear threat from Communist China that had made the ABM seem more attractive to some officials who had regarded it dubiously.

The question of eventual deployment of the ABM will remain alive, whatever Secretary of Defense McNamara and the President have decided for the coming year. Though uncertain, the strategic implications of the ABM are sufficiently significant that neither the United States nor the Soviet Union is ever likely to foreclose the possibility of using the weapon.

The ABM system, dubbed Nike X in early 1963, first underwent development in 1957 as the Nike Zeus. The Nike Zeus proved itself capable of intercepting an incoming missile but never solved the problem of discriminating between warheads and decoys. Nike X is a far more capable system. Using phased-array radars and solid-state digital computers, it could cope with numerous targets simultaneously, the developers claim. It would use two interceptor missiles, the Zeus and the Sprint. The Zeus is capable of interceptions outside the earth's atmosphere. The Sprint, which has phenomenal acceleration, would wait for the warhead to reenter the earth's atmosphere—where it is readily distinguishable from decoys—and, at an altitude of perhaps 100,000 feet (30,000 meters), destroy it with a nuclear burst.

More than $2 billion has gone into the development of the ABM system since the work began on the Zeus, and spending continues at a high level, with $400 million appropriated for the current year. The cost of deployment could vary enormously, depending upon the kind of threat one seeks to counter.

The deployment apparently now receiving the most serious consideration would provide a thinly spread defense to protect the whole country from a small, relatively "primitive" missile attack by China. It would also be a defense against the "Strangelove" type of incident, in which a missile is fired by accident or by a commander who has gone berserk. Cities having ABM sites nearby would receive some protection from a heavy, sophisticated attack such as the Soviets might mount. The cost of such a deployment has been estimated at about $8 billion. Many billions more could be spent to tighten up the defense of cities that might someday be exposed to a massive attack.

Moreover, the ABM is conceived as a part of a larger "damage-limiting" program, which includes two other costly elements—fallout shelters and improved defenses against both manned bombers and air-breathing cruise missiles which could sneak in under the Nike X radar. In McNamara's judgment, shelters would be justified even without an ABM system or without improved bomber defenses. On the other hand, a defense against missiles without an accompanying shelter program could be bypassed by an enemy who depended upon fallout to kill populations protected from direct attack.

One of the damage-limiting programs discussed by McNamara before congressional committees last winter would have cost $15 billion, with $5 billion for shelters, $8½ billion for the ABM, and $1½ billion for bomber defense. According to Pentagon studies, this program would reduce fatalities, in a surprise attack on urban areas, from 149 million to 96 million (the figures were based on an estimated 1970 population of 210 million). A $25-billion program—with $17 billion for the ABM and $3 billion for bomber defense—would save an estimated 78 million lives. One can place as much confidence in these fatality figures as one chooses.

McNamara observed that, as fatalities are reduced, the cost of providing additional forces to save more lives increases sharply while the cost to the attacker of offsetting the new defenses by adding to his own forces grows smaller.

The Secretary did not recommend an immediate start on the damage-limiting program, although he asked for money to continue a modest shelter-marking and stocking effort. He indicated that further analysis would be required to fix program requirements. As for the ABM, he said, production of an operational system would be premature in view of remaining technical problems, and of uncertainties about the best concept of deployment, the relationship of the ABM to other elements of the damage-limiting effort, the attainment of an effective shelter program, and an adversary's possible reaction.

McNamara said the decision on ABM production could be deferred to the succeeding budget year with little loss of time in obtaining an operational system. Now it appears that the decision will be deferred again, although a tentative commitment to production is perhaps possible. But as each year goes by the likely margin for further technical improvements on Nike X grows smaller and China's nuclear threat grows more imminent.

The Chinese threat was pointed up last week by McNamara's warning to the NATO ministers' conference. He said that the Chinese probably could develop and deploy some medium-range missiles by 1968 or 1969, and that they may have an intercontinental missile (ICBM) by 1975. He is reported also to have indicated that China may build

a number of missile-firing submarines. (One such submarine, of the Soviet-type G class, diesel-powered and able to fire three missiles of 400-mile range, may be under construction now.) The Secretary is understood to feel, however, that another year's delay in producing Nike X would still leave time for deploying the ABM system before Chinese missiles could threaten the United States.

In proposing, at the recent White House Conference on International Cooperation, a 3-year moratorium on ABM deployment, the Wiesner committee on arms control and disarmament said that in 3 years it may be possible to judge better not only what strategic threat China will or will not present but also what the U.S. and the Soviet Union should do about it. The committee, chaired by Jerome B. Wiesner, former White House science advisor and now dean of M.I.T.'s School of Science, felt the deployment decision should be deferred because of the committee's doubts about the ABM's military value and its fear that deployment of the ABM by either the U.S. or the Soviet Union would shake confidence in "deterrence," induce an acceleration of the arms race, and aggravate East-West relations.

It would be less than prudent, the Army's experts on missile defense believe, to assume that the pace of Chinese missile development permits a 3-year delay in the ABM program. From 5 to 7 years of effort would be required, after production is authorized, before the U.S. could deploy a significant, competently manned antimissile defense.

Members of the Joint Chiefs of Staff last year unanimously recommended ABM deployment, and they are understood to be still of the same mind, the rising cost of the Vietnam war notwithstanding. (First-year costs for ABM production would be comparatively modest—perhaps $100 million or less for tooling up and for long lead-time items; but later, as production got under way, costs would rise sharply to exceed $1 billion a year.)

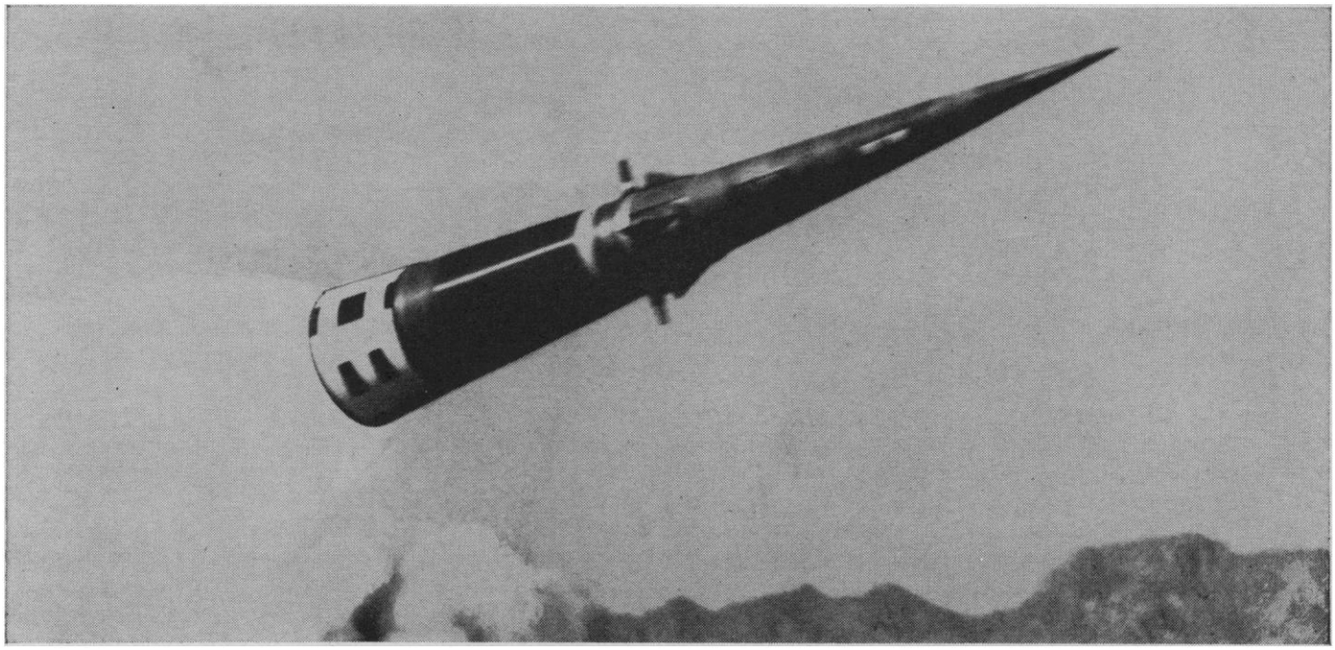
Because the Chinese missile program is still in its infancy, the ABM is more attractive, in terms of cost-effectiveness, in relation to the Chinese threat than in relation to the Soviet threat. Noting this, one Pentagon analyst recently observed that the aggressive attitude of the present Chinese leaders has been overstressed as a reason for deploying the ABM.

Nevertheless, the possibilities of a nuclear confrontation some day between the U.S. and China appear real enough. The restraint displayed by the American and Russian governments in the Cuba missile crisis suggests that neither country will take the risk of resorting to force if a safer way of protecting its vital interests is left open. But the Chinese, though careful thus far not to provoke a general war in Asia, seem fixed on a policy of promoting "wars of national liberation" in Southeast Asia.

A State Department specialist in politicomilitary affairs recently suggested a scenario indicating how the ABM could give the U.S. a stronger hand in countering Chinese aggression. Assume that the U.S. is engaged in combating Communist forces in a Southeast Asian country, and that the Chinese enter the conflict with their own ground and air forces. The U.S. threatens to attack military installations in China unless the Chinese forces are withdrawn. But the Chinese reply that any attack on China will result in a retaliatory strike by ICBM's or missile-launching submarines on the United States.

In this script, the President of the United States knows the Chinese strategic forces are quite limited in number and quality, but does he dare to call the Chinese bluff by following through on the ultimatum? If he does, he will rely primarily on the overwhelming superiority of the United States' nuclear forces to deter a Chinese strike. Recognizing, however, that deterrence might somehow fail, the President presumably would be more confident if ABM's were in readiness.

Whether the President would, in fact, be emboldened by the readiness of the ABM—a system never tried in war—to take actions that he might otherwise



Sprint missile being tested at White Sands Missile Range. Launched by an explosion, this solid-fuel, radar-guided missile climbs so fast—gaining speed at a rate of 3000 feet per second—that it can intercept warheads after they have reentered the atmosphere. Sprint would be nuclear armed.

Major General Austin W. Betts

shrink from is unanswerable. The psychological effect on China's neighbors of a U.S. decision to deploy the ABM also is unpredictable. The decision might so confirm fears of China's nuclear potential that they would seek to acquire nuclear weapons of their own —thus undermining the U.S. policy goal of obtaining world-wide adherence to a nonproliferation treaty. On the other hand, the deployment could have precisely the opposite effect, by increasing confidence in the U.S. pledge of protection against any attempt by China at nuclear blackmail.

Two large questions are raised when one ponders the effect of ABM deployment on the U.S.-Soviet military relationship. Would the U.S. deployment of the ABM shake the Soviets' confidence in their deterrent? And, even if the answer to the foregoing question is no, would the Soviets—to insure an ability to destroy all major U.S. targets —increase their strategic forces sufficiently to make sure that, in the event of war, U.S. losses would be as large as, or larger than, they would have been if the ABM had not been deployed?

Many persons who question the wisdom of deploying the ABM share the opinion of the Wiesner committee (whose members included former Deputy Secretary of Defense Roswell Gilpatric) that the ABM would cause the Soviets to step up their strategic weapons program in order to safeguard their deterrent. However, at a congressional hearing last March, Secretary McNamara expressed the view that deployment of the ABM would not heat up the cold war. But McNamara added that, if the Soviets believed the U.S. had deployed a perfect missile defense, and not merely one capable of reducing casualties, they would build up their strategic forces.

Major General Austin W. Betts, the Army's Deputy Chief of Research and Development and its leading authority on missile defense, dismisses the possibility that the ABM might upset deterrence. "Buying seat belts doesn't mean that you intend to smash into the car of someone you don't like," he said.

General N. Talensky, a Soviet military historian and editor of the journal *International Affairs*, has suggested that an aggressor tempted to strike another country's nuclear retaliatory forces by surprise might be deterred by the ABM. Talensky argues that the ABM also affords protection against an adversary's lapses from rational behavior, which he suggests are likely in a deepening crisis. General Betts has expressed much the same thought: "In a crisis, there is a tremendous pay-off to the country that strikes first. An ABM defense would reduce an adversary's temptation to strike."

The Soviet Union, inferior to the U.S. in the numbers and quality of its strategic weapons, is expected to continue its efforts to narrow the gap—whether the U.S. deploys the ABM or not. (For example, the Soviets are believed to have about 270 ICBM's, as opposed to more than three times as many in the U.S. arsenal.) Some analysts believe that the planned buildup of Soviet arms is large enough so that Soviet leaders will not feel it necessary to try to fully offset an ABM's damage-limiting capability.

Analysts disagree among themselves as to how the Soviets would react, however. "This is a very fuzzy area," one remarked. The studies vary in the emphasis placed on the influence of economic constraints on Soviet defense policies. A study headed by General Betts, in which many scientists participated, concluded that the most likely Soviet response to the ABM—and the most "cost-effective"—would be, not to build more missiles, but to make greater use of penetration aids in missile warheads; this would require some reduction in their total megatonnage.

One analyst indicates that, insofar as the Soviet threat is concerned, a "thin" ABM deployment—such as might be mounted against the possibility of Chinese attack—could prove worse than useless. He reasons, partly from a historical analysis of previous Soviet weapons programs (such as the bomber program), that Soviet decision-makers are quite sensitive to economic constraints in their weapons' procurement policies. He believes that, if the cost were light in relation to the increased destructiveness, the Soviets would strengthen their forces sufficiently to overwhelm the defense and perhaps kill more people than if there were no ABM. Thus, a very tight ABM defense, extremely costly to deploy but also costly for an adversary to offset, is the kind he deems most likely to discourage the Soviets from increasing their missile forces. This kind of analysis, according to some of McNamara's associates, places too much emphasis on economic constraints and too little on political and military factors.

It does not seem unlikely that the Soviets might overreact to a small ABM deployment by believing that it is sure to grow into a larger one. Soviet military leaders, eager for their own country to deploy more missiles and eager for a large ABM system of their own, doubtless would be ready to make the most of any U.S. deployment of Nike X. The Soviets already may be committed to an ABM program. The evidence on this point from intelligence sources appears ambiguous. The Soviets are known to be improving their air defenses generally, but often it is difficult to tell whether a particular system has an antimissile capability.

There is no question whatever that the Soviets have long been committed to an ambitious program of ABM research and development. Khrushchev was boasting of a Soviet ABM as early as 1961–62; ABM's have been displayed in Moscow parades, and a film purporting to show the interception of a missile by an ABM has appeared on Soviet television.

Tass broadcasts from Moscow commented favorably upon certain parts of the Wiesner committee's report, such as its recommendation against the creation of any new nuclear forces in Europe, but conspicuously refrained from mentioning the proposed 3-year moratorium for the ABM.

The U.S. proposal of January 1964 to the 18-nation Disarmament Committee at Geneva of a verified "freeze" on strategic nuclear offensive and defensive vehicles would, of course, cover the ABM. "A freeze on strategic delivery systems without a freeze on antimissile systems would be destabilizing

and therefore unacceptable," William C. Foster, director of the U.S. Arms Control and Disarmament Agency (ACDA), told the Geneva conference.

ABM deployment would be regarded by ACDA officials as an unfavorable development, but they do not argue that arms control should be the overriding consideration in deciding whether the system should be used. The Army has kept the ACDA informed as to the state of ABM technology and as to the various alternative schemes for deployment. In Betts's view, it is inevitable, for reasons of arms control as well as for other reasons, that initial deployment of the ABM should be "thin"—a massive deployment would be grossly incompatible with the U.S. negotiating position at Geneva.

A major policy question that would be raised by deployment is how the United States' NATO allies would react. Would they regard the deployment as a sign that the U.S. was withdrawing to a "Fortress America"? Or would they take it as new evidence that the U.S. was willing to meet its commitments for the defense of Europe, even at the risk of a nuclear exchange?

Moreover, the Europeans live under the threat of large medium-range Soviet missile forces and might want the ABM for themselves. If the U.S. shares the ABM with its allies, how will the command and control arrangements be worked out? The nuclear warheads for a defensive system on instant alert cannot be put in the custody of U.S. soldiers, as is the case with tactical weapons such as the Sergeant missile. These are all questions which remain to be answered.

Some people fear that the ABM and the associated fallout-shelter program would generate internal political pressures inimical to proposals for reductions in strategic weapons. The results of a sample survey of public opinion conducted last year by the General Electric Company's Tempo division suggest that most people know little about the defense establishment and its capabilities and limitations. For example, two-thirds of the some 1400 respondents thought the U.S. already had an antimissile defense.

The study, jointly sponsored by the Defense Department's Advanced Research Projects Agency and Office of Civil Defense, turned up certain attitudes which, if truly indicative of public feeling, would be disturbing. About a third of the respondents said that, if their city were not protected by ABM's, they would move to a defended city. (A tenth of the respondents said they would move *away* from a defended city, however.) This suggests that, once an ABM system was deployed, the public might be unwilling to see it dismantled, even though such a step were necessary to carry-through an agreement on reduction of strategic armaments.

Unless the Soviets undertake what appears to the U.S. to be a large-scale deployment of an ABM, the Johnson administration is probably unlikely to come under heavy political pressure to deploy the system. The ABM has had its champions on Capitol Hill and will continue to have them. They may, in view of the Chinese threat, step up their demands for deployment. But experience has shown that such demands arouse little interest in the body politic.

The administration has been able to think calmly about the ABM. But no amount of study and analysis will answer the question of deployment, which must rest more on judgment and intuition than on known facts.

—LUTHER J. CARTER

MIT Appoints New President

Howard W. Johnson will succeed Julius A. Stratton as president of Massachusetts Institute of Technology, effective 1 July.

Johnson, 43, is a graduate of Central College, Chicago, and of the University of Chicago. He has been on the M.I.T. faculty since 1955 and professor and dean of the Sloan School of Management at the institute since 1959.

Stratton, who will reach the mandatory retirement age of 65 in May, will continue as president until the end of the school year. His appointment as chairman of the board of trustees of the Ford Foundation was announced last month. He is to assume that post as of January 1.

Grants, Fellowships, and Awards

Two postdoctoral research fellowships in **biomedical sciences** are being sponsored by the Swedish Medical Research Council. They will provide 12 months of work in basic or clinical sciences at a government-supported training institute in Sweden. Candidates must be U.S. citizens who have been doing independent research in a health science for at least 2 of the past 4 years. They must also have been accepted in advance by a training institute and a preceptor. Stipends will range from $5500 to $6000 depending on seniority, plus $500 for each dependent. Travel costs will be included. Deadline for receipt of applications: *1 February*. (Samuel Abramson, Office of International Research, National Institutes of Health, Bethesda, Maryland 20014)

The Royal Norwegian Council for Scientific and Industrial Research is offering postdoctoral fellowships for **science or engineering research** in Norwegian institutions. The program covers all fields of science and technology within the Council's sphere; agriculture and medicine are excluded. Studies may be carried out at the universities of Oslo and Bergen, the Technical University of Norway, Trondheim, or at applied research institutes in these cities. Candidates should be under 35 and have the equivalent of a British or American Ph.D. Stipends: 20,000 to 22,000 Norwegian kroner ($2800 to $3100), plus Nkr 1000 (about $140) for each dependent child. Deadline: *1 February*. (Royal Norwegian Council for Scientific and Industrial Research, Gaustadalleen 30, Oslo 3)

Erratum: Errors in number of pages and price in the advertisement for the American College of Neuropsychopharmacology on page 1757 of this issue will be corrected in a forthcoming issue.

Erratum: In Table 1 of the report "The earliest Primates" by L. Van Valen and R. E. Sloan (5 Nov., p. 743) the section beginning on line 3 under the subheading Insectivora should have been printed as follows:

—Mixodectidae, n. gen. and sp., cf. *Elpidophorus*	2	3
—Microsyopidae or Mixodectidae, n. gen. and sp.	2	5
Palaeoryctidae, n. gen. and sp., cf. *Palaeoryctes* (*13*)	1	3
—cf. *Gelastops* n. sp.	1	2
about other three species		

Erratum: In Table 1 of the report "Judgments of sameness and difference: experiments on decision time" by D. Bindra, J. A. Williams, and J. S. Wise (17 Dec., p. 1625), the entries for experiment 2 under columns 1 and 2, "Test condition" and "Response," should have read as follows:

". . . same?"	Yes
". . . different?"	No
". . . same?"	No
". . . different?"	Yes

Reprints have been corrected.

Erratum: The report "Lactate dehydrogenase: electronic properties in noble-metal transition elements," by M. A. Jensen, B. T. Matthias, and K. Andres (10 Dec., p. 1448), should have included the acknowledgement that the work at La Jolla was supported in part by the U.S. Air Force Office of Scientific Research.

Erratum: In the report "Lactate dehydrogenase isozymes: substrate inhibition in various human tissues" by E. S. Vesell (17 Dec., p. 1590), the words "LDH-1" and "purified" in the fifth line were transposed; the sentence should have begun, "Based on inhibition at 25°C of isolated, purified LDH-1 by concentrations of pyruvate . . ." In the legend to Fig. 1, the temperature should have been given as 25°C.