ABM, MIRV, and the Arms Race

ABM and MIRV require and inspire each other; together they will lessen our national security.

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In 1955, about a year after the United States started development of its first intercontinental ballistic missile (ICBM), the Army asked the Bell Telephone Laboratories to make a study of the feasibility of developing an antiballistic missile (ABM). The problem was then thought of as being simply how to hit a "bullet with a bullet," or, more accurately, how to intercept large, simple, incoming warheads one at a time. The Bell Laboratories concluded that the technological state of the art in radar, electronic computing, nuclear explosives, and rocketry had reached a point such that it was indeed feasible to build an ABM with that simple objective. As a result, the Nike Zeus project was started late in 1956.

Very soon after, it was recognized that the defense problem might well be complicated by various hypothetical "penetration aids" available to the offense. The Office of the Secretary of Defense set up a committee to review the matter. In early 1958 that committee pointed out the feasibility of greatly complicating the missile defense problem by using decoys, chaff, tank fragments, reduced radar reflectivity, nuclear blackout, and—last but by no means least—multiple warheads.

At first, the designers of our offensive missiles did not take missile defense very seriously. By 1960, however, technical progress in our own Nike Zeus program, plus accumulating evidence of a major Soviet effort in the ABM field, forced the developers of our ICBM's and Polaris missiles to take this possibility into account. These weapons designers accepted the challenge, and they initiated a number of programs to exploit the possibilities enumerated above. Thus began the technological contest between missile defense and missile offense which continues to the present and which was discussed before the Senate in considerable detail last year.

Cycle of Action and Reaction

For our purposes here today, the most important result of this contest was the emergence of the multiple warhead idea as the most promising of all the various "penetration aid" concepts. At first, the idea involved a shotgun technique in which a group of warheads plus some lightweight decoys were to be launched along several different paths all leading to a common target area. But shortly after, methods for aiming each of the individual warheads at separate targets were invented. There were three reasons for this extension of the original idea: (i) it provided additional flexibility for the offense, (ii) it made the defense problem still harder, and (iii) it was more complicated and expensive, and thus provided the weapons engineers and scientists with a still better means of displaying their technological virtuosity. This extension of the original idea is, of course, the now well-known MIRV, an acronym standing for multiple independently targetable reentry vehicles. It is, I think, most important to note that these early developments of MIRV and ABM were not primarily the result of any careful operations analysis of the problem or of anything which might be described as a "provocation" by the other side. Rather, they were largely the result of a continuously reciprocating process consisting of a technological challenge put out by the designers of our own defense and accepted by the designers of our own offense, then followed by a similar challenge and response sequence in the reverse direction. In this fashion, our ABM development program made very substantial progress during the early 1960's.

Concurrent with this internal contest, the Soviets were making progress on their own. As early as 1962, Premier Khrushchev and Defense Minister Malinovsky boasted about how they had solved the missile defense problem. By 1965, Soviet progress in development and deployment of an ABM had proceeded to the point where we felt compelled to react. As a result, we decided to deploy MIRV as the one certain means of assuring penetration of Soviet defenses and thus maintaining the credibility of our deterrent.

What was the result of this cycle of action and reaction? Last year, in the course of the national ABM debate, it was said that the Soviets had deployed about 70 ABM interceptors, all of them around Moscow. This year it was announced that the United States was going ahead with its plans to deploy MIRV's on our Minute Men and on our submarine-launched Poseidon missiles. Using figures generated by the Senate Foreign Relations Committee last year, we see that the result of this U.S. reaction will be a net increase of around 5000 in the number of warheads aimed at Russia. If every one of those Soviet interceptors was successful in the event of an attack (and I have substantial doubt that they would be), they could cope with just 70 of those additional 5000 warheads. The deployment of the Moscow ABM must rank as one of history's most counterproductive moves. It also shows more clearly than any speculative analysis how, despite its defensive nature, the ABM can be a powerfully accelerating element in the nuclear arms race.

But that's not the whole story. The Soviets have proceeded with a multiple warhead development of their own. Their program apparently is a number of years behind ours. It was probably stimulated by our program, and their technologists probably used the same justifications for it that ours did. The device they are currently testing is the payload package for the large SS-9 missile. It is said to contain three separate warheads of five megatons each. The present device may not be a true MIRV, but there is no doubt they could develop one soon.

After making a number of estimates and projections concerning the accuracy, the reliability, and the current deployment and rate of buildup of such SS-9 missiles, our defense officials concluded last year that the threat posed by this Soviet MIRV required us to

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deploy the Safeguard ABM system to defend our Minute Man force. We thus see that the whole process has made one full turn around the spiral: Soviet ABM led to U.S. MIRV; U.S. MIRV led to Soviet MIRV; Soviet MIRV leads to U.S. ABM.

Last year, some of those who spoke in favor of the Safeguard System decribed the Soviet MIRV development as being especially dangerous and foreboding because it seemed to them that its only rational purpose was to destroy our Minute Men before they could be launched. They further speculated that, if this were so, the Soviet MIRV indicated preparation for a possible preemptive strike against us. These same people argued, by contrast, that our own MIRV development was clearly benign, since its main purpose was to maintain the credibility of our deterrent in the face of a hypothetical extensive Soviet ABM, and that, in any event, our MIRV was clearly not a "missile killer."

The main argument in support of this supposed difference between the purposes of the U.S. and Soviet MIRV's involves the large difference in their explosive power. The Soviet SS-9 MIRV is said to have an estimated yield of 5 megatons. This yield is 25 times the yield usually quoted for one of the individual warheads in the U.S. Minute Man MIRV; it is 100 times the common estimate of the yield of a single Poseidon MIRV warhead. These large differences in yield are doubtless real, and they are important, but they are not by any means the whole story. The killing power of a warhead against a hard target, such as a missile silo, depends much more critically on accuracy than on yield. In fact, a factor of 3 in accuracy makes up for a factor of 25 in yield, and a factor of 4.6 in accuracy makes up for a factor of 100 in yield. To be more specific, a Minute Man MIRV warhead having a yield of 200 kilotons and an accuracy (*1*) of about 1/8 nautical mile (accuracy of about 232 meters) has a 95 percent chance of destroying a so-called "300 psi" target (300 pounds per square inch is a typical estimate of the strength or hardness of a missile silo). Similarly, a Poseidon MIRV warhead having a yield of 50 kilotons and an accuracy of about 1/16 mile (nautical) has the same probability of destroying a missile silo.

And what are the prospects for attaining such accuracies? The accuracy of real operational missiles is classified, but in last year's debates a figure of about 1/4 mile for accuracies of U.S. missiles was commonly used. That is quite different from 1/8 or 1/16 mile, but what is the record of progress in improving accuracy? In 1944, the German V-2 missile, which used a primitive version of the guidance system the present-day Minute Man and Poseidon use, achieved an accuracy of about 4 miles in a range of about 200 miles. Ten years later, when the decision to build the U.S. ICBM was made, an accuracy of 5 miles in a range of 5000 miles was estimated to be both possible and sufficient. That was a 20-fold improvement in the ratio of accuracy to range. Now we talk about 1/4 mile accuracy at the same range, so in an additional 15 years we have achieved another 20-fold improvement. Altogether, that makes a 400-fold improvement in only 25 years. Any conservative Soviet planner considering these figures would have to conclude that, in a relatively short time, U.S. technology could improve missile accuracy by another factor of 2 or 4 and thus convert not only the Minute Man MIRV but even the Poseidon MIRV into a missile-silo-destroyer.

We have seen that the SS-9 MIRV is causing our Defense Department to fear for the viability of our deterrent and to react strongly for that reason. In the context of the present international situation, and in the absence of any real progress in arms control, the Soviets must be expected to react to our MIRV in some similarly fear-inspired way.

ABM and MIRV are thus inseparable; each one requires and inspires the other. Separately or in combination, they create uncertainty in each of the nuclear powers about the capability and even the intentions of the other. These uncertainties eventually lead in turn to fear, overreaction, and further increases in the number and types of all kinds of weapons, defensive as well as offensive.

The "Launch-on-Warning" Doctrine

What about the future? In the absence of international arms control agreements, what can we expect? Predictions are, of course, very uncertain, but one can single out some likely possibilities.

The ABM is a low-confidence system. The expressions of confidence in the system made by those who supported it last year are bound to give way to a more realistic appraisal by the time the system is deployed. When that happens, the defense establishment will turn, in accordance with the precepts of "worst plausible case" analysis, to other methods of insuring the survival of the Minute Man. Of the various possibilities, the surest, quickest, and cheapest is simply to adopt the "launch-on-warning" doctrine. This doctrine involves (i) detecting the fact that a launch of enemy missiles has occurred; (ii) analyzing the information in order to determine whether the launch endangers our missile forces; and (iii) if it does, launching our missiles toward their targets before the incoming warheads can catch them in their silos and destroy them. This method of coping with the problem has been in people's minds since the beginning of the missile program.

In the early 1950's we anticipated that the early warning systems then foreseen would provide about 15 minutes' notice before enemy warheads landed. For that reason, the original Atlas was designed to be launched within less than 15 minutes after receipt of orders for launch. One of the major reasons for switching, in the early 1960's, to the Titan II, with its storable propellants, and the Minute Man, with its solid propellants, was that the time from the "go signal" to the actual launch could be made still shorter.

Many of the people who have proposed this solution to the problem are thoughtful and moderate, but, even so, I find this resolution of the dilemma to be completely unsatisfactory. The time in which the decision to launch must be made varies from just a few minutes to perhaps 20 minutes, depending on the nature of the attack and on the details of our warning system, our communication system, and our command and control system. This time is so short that the decision to launch our missiles must be made either by a computer, by a "pre-programmed" President, or by some "pre-programmed" delegate of the President. There will be no time to stop and think about what the signals mean or to check to see whether they might somehow be false alarms. The decision will have to be made on the basis of electronic signals electronically analyzed, in accordance with a plan worked out long before by apolitical analysts in an antiseptic and unreal atmosphere. In effect, not even the President, let alone the Congress, would really be a party to the ultimate decision to end civilization.

If launching *our* missiles on electronic warning does not seem so bad,

then consider the situation the other way around. Our current technical developments—specifically, the greater accuracy and reliability of our missiles, MIRV and ABM—are pushing the Soviets in the same direction. Further, in their case a far larger fraction of the deterrent is provided by fixed land-based forces than in ours, and so they have an even greater need to find a truly reliable means of protecting their deterrent from a preemptive attack by us. If we continue with our MIRV developments, and thus force the Soviets to go to a launch-on-warning system, can we rely on them to invent and institute adequate controls? Do they have the necessary level of sophistication to solve the contradiction inherent in the need for a "hair trigger" (so that their system will respond in time) and a "stiff trigger" (so that they will not fire accidentally)? How good are their computers at recognizing false alarms? How good is the command and control system for the Polaris-type submarine fleet they are now rapidly, if belatedly, building? Will it be "fail-safe"?

It cannot be emphasized too strongly that unfavorable answers to these questions about *their* capability will mean diminished national security for *us*. Yet there is no way for us to assure favorable answers. The only way we can avoid the danger to our security inherent in these questions is by eliminating the need to ask them. Strategic weapons systems on both sides must be designed so that no premium is put on a preemptive attack, and so that neither side is forced to adopt the kind of "hair trigger" epitomized in the launch-on-warning concept.

Fortunately for us, the Soviets have also expressed concern about this problem. In words very similar to those used by witnesses before our Senate last spring, Foreign Minister Gromyko last summer said (*2*):

> [There] is another matter that cannot be ignored. . . . It is linked to a considerable extent to the fact that the command and control systems for arms are becoming increasingly autonomous, if one can put it this way, from the people who create them. Human capacity to hear and see are incapable of reacting to modern speeds. The human brain is no longer capable of assessing at sufficient speed the results of the multitude of instruments. The decisions made by man depend in the last analysis on the conclusions provided by computers. Governments must do everything possible to be able to determine the development of events and not to find themselves in the role of captive of events.

Steady Decrease in National Security

The nuclear arms race has led to a situation that at once is absurd and poses a dilemma. Ever since the end of World War II, the military power of the United States has been steadily increasing, while at the same time our national security has been rapidly and inexorably decreasing. The same thing is happening to the Soviet Union.

At the end of World War II, the United States was still invulnerable to a direct attack by a foreign power. In 1949, the development of the atomic bomb by the Soviet Union ended that ideal state of affairs, perhaps forever.

By the early 1950's, the U.S.S.R., on the basis of its own unilateral decision to accept the inevitable retaliation, could have launched an attack on the United States with bombers carrying fission bombs. Most of these bombers would have penetrated our defense, and the American casualties could have numbered in the tens of millions.

During the late 1950's and early 1960's, first thermonuclear bombs and then intercontinental missiles became part of the equation. As a result, by 1970 the U.S.S.R., again on the basis of its own unilateral decision to accept the inevitable retaliation, could launch an attack that could produce 100 million or more American casualties.

This steady decrease in national security does not result from inaction on the part of responsible U.S. military and civilian authorities. It is the inevitable consequence of the arms race and the systematic exploitation of the fruits of modern science and technology by the United States and the U.S.S.R. Our attempts to deploy bomber defenses during the 1950's and 1960's did not substantially modify this picture, and ABM deployment will, I believe, have an even smaller direct impact on the number of casualties we might suffer in a future attack.

Effects on Strategic Arms Limitation Talks

Nearly everyone now recognizes the futility of the arms race, and nearly everyone now realizes that still more of the same baroque military technology is not going to provide a solution to the dilemma of the steady decrease in our national security that has accompanied the increase in our military power. The SALT talks are one hopeful result of the widening recognition of the absolute necessity of finding some other approach to the problem, and finding it soon.

So, how do ABM (and MIRV) affect these talks? We must consider both of these elements of the arms race, since they are really inseparable. ABM automatically leads to MIRV, and vice versa. There are at least two major effects.

First of all, ABM has both a multiplying and a ratchet effect on the arms race; its deployment produces a stepwise, irreversible increase in the number of offensive missiles required. It does not matter whether the deployment is Chinese-oriented or Soviet-oriented. Consider a Chinese-oriented ABM. People who propose such a system imagine the Chinese blackmailing us with just a few (50 to 100) ICBM's by threatening to destroy some small but vital part of the United States. Since the defensive coverage of an ABM interceptor is small as compared to the dimensions of the United States, since Hawaii and Alaska must be defended, and since the offense in this special and peculiar case could concentrate all of its missiles on just one small area of the United States, we would need many times as many ABM's as the Chinese have missiles. If they have no penetration aids, we might get by with only 24 times as many interceptors as they have missiles; however, if they do have good decoys or multiple warheads, a cautious U.S. defense planner would call for a great many more. Thus, a really serious Chinese-oriented ABM system requires many thousands of U.S. ABM interceptors. Now reverse this and ask what the Soviets would have to do in the face of such a Chinese-oriented U.S. ABM deployment. In their case we do not imagine them as merely blackmailing us by threatening to destroy a few cities. Rather, we imagine them as trying to deter us, as we try to deter them.

According to the current fashion in strategic analysis, in order to achieve deterrence it is necessary to have an offensive force which, after weathering a surprise attack, can still retaliate and destroy a large fraction of the enemy's population and industrial base, and as much of his offensive force as may still remain in silos and on bases. In order for the Soviets to be able to do that, they must be able to penetrate *all* parts of our ABM shield with whatever force

they might have left after a first attack by us. And to guarantee that outcome, a conservative Soviet planner would have to call for many more total Soviet offensive warheads than there were total U.S. interceptors. Thus, an ABM designed to cope with blackmail by 50 to 100 Chinese missiles can produce a multiplying and a ratchet effect requiring a total Soviet warhead inventory much larger than the more than 1000 warheads they now possess. Clearly, in such an event we cannot hope to achieve any meaningful strategic arms limitation.

A second way in which ABM and MIRV affect the possibility of a successful outcome of the SALT talks is through the uncertainties they introduce into the strategic equation. The main uncertainty connected with ABM is the one that has been so persistently raised for more than a decade: How well will it work? The main uncertainty connected with MIRV has to do with the impossibility of knowing how many warheads were actually poised for launch. As is well known, we are fairly confident about our ability to know how many missiles the Soviets have, but, as others have pointed out, it is quite another matter to know how many MIRV warheads each missile carries.

At present, then, each of us, the United States and the U.S.S.R., is fairly confident in his predictions about the results of a hypothetical nuclear exchange, and each is confident that he has a force adequate to deter the other. With ABM and MIRV, this confidence will be greatly weakened, and neither of us will be sure of what we could do to the other, and of what he could do to us. Unfortunately, experience has clearly shown that such gross uncertainties produce an atmosphere in which arms control agreements are practically impossible. For example, for more than a decade, similar uncertainties about detecting underground explosions, combined with wild speculations about the kinds of developments which might flow from a secret series of underground tests, have inhibited any progress toward eliminating such tests and thus achieving a complete nuclear test ban. In the same way, the uncertainties inevitably associated with ABM and MIRV will lead us into a similar morass, and no progress will be possible in the extremely vital area of strategic arms limitations.

In summary, the steady progress of the arms race has led to an equally steady and seemingly inexorable decrease in our national security and safety. Today, the strategic balance is such that strategic arms limitation agreements, which could bring an end to the nuclear arms race, seem possible. ABM and MIRV threaten to upset this balance in a way which will make such agreements impossible, or at least extremely difficult. ABM and MIRV are inseparable; each inspires and requires the other. They must be stopped before it is too late, if we are to avoid another increase in the magnitude of the nuclear holocaust we all face.

Reference and Note

1. An "accuracy of x nautical miles" means that, if a large sample of missiles were fired at a single target, then half of them would fall within a distance of x nautical miles from the target. This measure of accuracy is usually referred to as CEP, or "circular error probable."
2. Report to the Supreme Soviet of the U.S.S.R., 10 July 1969.

NEWS AND COMMENT

South Africa: (II)

University System Follows Apartheid Pattern; Government Enforces Limits on Academic Dissenters

Several of South Africa's English universities have long records of opposition to *apartheid*, but their dissent results in a caricature of the conflicts now commonplace between universities and established authorities around the world. It is a caricature in the sense that the sides are so greatly disproportionate in strength, the reigning national authorities being virtually omnipotent, and the dissenters weak, diffused, and ineffective. Nevertheless, the forms and rhetoric of opposition are amply in evidence. Yes, students and academics in South Africa do sit-in, march, petition, and assail the government on *apartheid*. They do so at what is often considerable personal risk, ranging, at the mildest, from the intimidation of simply being observed by police or informers operating under the Bureau of State Security (BOSS), to confiscation of passports, which is the plight of the novelist Alan Paton and the playwright Athol Fugard, who recently was denied permission to attend the opening of one of his plays in New York. And the risks of opposition extend to midnight arrest, unexplained disappearance, deportation or pressure to leave on a one-way visa, imprisonment, or that South African contribution to contemporary law enforcement, legal banishment, which creates a "nonperson," barred from employment, travel, public assemblage, publication, and mention in public print. In all cases, the repression is "legal," for under two all-enveloping legislative acts, covering "Terrorism" and "Communism," the government's power is virtually unlimited. When whites are involved, there is a tendency to observe the technical niceties of the law, possibly because the South African economy is dominated by an English-derived minority that tends to fuss over proper legal procedure. When blacks are involved, the laws are applied with bland brutality, as was the case with 22 Africans, who, upon being acquitted of charges under the Communism Act, were promptly rearrested under the Terrorism Act and held incommunicado for over a year, until their release just recently. Some 350 Witwatersrand students who marched in their behalf during the spring were arrested and released. At this writing, charges against them, if any, have still not been announced—a status not conducive to further political activity.

Those foreigners who would respond to *apartheid* by extending a blanket ostracism to all things South African are beseeched by white liberals there to ponder that South Africa's miniscule opposition is the first to suffer from the absence of foreign contact (the candid views of nonwhites on this subject,