

*There's a dark lantern of the spirit,  
Which none see by but those who bear it,  
That makes them in the dark see visions  
And hag themselves with apparitions,  
Find racks for their own minds, and vaunt  
Of their own misery and want. (Samuel Butler)*

## THE SAM UPGRADE BLUES

Sayre Stevens

In the period from 1969 until the signing of the ABM Treaty in Moscow in 1972, the intelligence community was faced with a new challenge. Most simply stated, that challenge came in the form of a postulation that the Soviets might somehow give ABM capabilities—through “SAM upgrade”—to their extensively deployed air defenses and thereby significantly affect the strategic balance between the U.S. and the USSR. This postulation came from a scientific and technical community largely outside the intelligence business which found its leadership in the Office of the Director of Defense Research and Engineering (O/DDR&E). As a result of this challenge, the intelligence community, and most particularly the CIA, was forced to assess the likelihood of material possibilities fostered in the lively imaginations of defense technologists whose thinking was largely unfettered by the factual constraints affecting current intelligence judgments. In this confrontation, we were faced with the task of countering an argument which was continuously modified and which preserved its importance so long as any possibility of its viability could be maintained.

### *The Elements of the Strategic Problem*

In order to understand the importance attained by the SAM upgrade question, one must be willing to accept axiomatically a few precepts of strategic thinking. Let us not argue these at the moment, but let each reader for himself put the case:

1. That he must live in a world where international order and national security rely upon a stable, mutual deterrence maintained by the strategic weapons of the U.S. and the USSR.
2. That the only meaningful tests of mutual deterrence are weapons exchanges which take place within the electronic circuitry of large computers where the ability of one nation to exact, through retaliation, an unacceptable price for the aggressive indiscretions of the other can be shown to be assured under all conceivable circumstances.
3. That—in consequence of such a stability criterion—the power to destroy millions of people by either side is desirable, while those developments or actions which might degrade that capability are not: missiles that are only capable of killing people are good; those that might be used to kill other missiles (i.e., those that protect people) are not.

4. That he has not been persuaded by Messrs. Panovsky and Rathjens, among others, that ABM defense is inherently impossible, that he worries about it a lot and notes particularly that when ABM defenses are included in computer wars they are apt to have the unfortunate effect of greatly reducing the number of people killed.

5. That he then understands that the foundations of international order and national security are threatened by the widespread introduction of ABM defenses in either the U.S. or the USSR.

These are more or less the rules which underlie the game of SAM upgrade. They were the means by which the outcome of that game can be directly coupled to a number of important strategic policies. There were some imperatives around at the time the game began which, without a doubt, helped get it going. These imperatives arose from threats to proposed defense technology **R and D intended to enable the U.S. to cope with almost any conceivable military threat.** Most important was debate as to whether or not the Mark-12 MIRVing of our Minuteman force (i.e., equipping ICBMs with multiple independently targetable reentry vehicles) should be implemented. Also of importance, though less logically so, was the heavy flak being encountered by the U.S. ABM program. Underlying all this, of course, was the growing momentum toward the undertaking of serious strategic arms limitation negotiations with the Soviet Union. Negotiations might well ultimately result in our freezing the state of weapons technology and denying us the opportunity for improving or augmenting our forces in ways already being espoused. With threats to programs such as these and with the growing insistence that our defense expenditures be related rather specifically to the anticipated threat from abroad, what might be called "creative threat modeling"—always a popular sport—gained even more adherents.

The intelligence community suffered some important disabilities in dealing with the creative threat modelers: it was reasonably respectable and conservative; it had been responding to military fantasies for so many years that it had been conditioned to an automatic skepticism and short-tempered response to such proposals; and, finally, it really could not match the imagination that it was facing from outside. It had an additional problem in that it was dealing with a group of people whose forte was the innovative development of new weapons concepts and the ability to overcome the technological hurdles which stood in the way of their realization. Technical intelligence analysts must necessarily work within an analytical framework that is bounded by technical constraints which serve to discriminate among the impossible, the possible but unlikely, the probable, the most likely, etc. Thus, while intelligence analysts focused upon the existence and the effective application of technical constraints, the creative modelers focused upon their elimination.

The CIA had furthermore been conditioned to an immediate negative response to the SAM upgrade proposal as a result of the long and bloody fight about the role of the Tallinn or SA-5 system. In the course of this struggle, the community had effectively chosen up sides in disagreement as to whether this Soviet defensive weapons system, deployment of which began in 1963, was an ABM or a SAM system. CIA had steadfastly maintained the system to have been designed and deployed to fulfill an air defense role. The story cannot be con-

sidered at length here but deserves separate treatment in some other article. Suffice it to say that any suggestion of giving ABM capabilities to SAM systems would be viewed as another ploy in that dwindling but still touch controversy.

It is also important to note here that this was not an issue that had been generated and needed to be resolved within the intelligence community. Indeed, the intelligence community was united and in agreement throughout the SAM upgrade affair. The problem was raised outside the community, so that the long-established mechanisms for resolving the kinds of differences that were to emerge were not available for application. The CIA largely represented the intelligence community throughout the debate because of its established role and representation within the SALT community. That it did so reasonably well is attested to by the relatively easy acceptance of its views on SAM upgrade by the other intelligence agencies in NIE 11-3-71.

**Against such a backdrop, we must address the SAM upgrade hypothesis explicitly.** The Soviets had only a limited ABM defense around the city of Moscow, and there was general agreement its capabilities were limited. No evidence of further deployment could be found. A new defensive weapon system, the so-called Tallinn or SA-5 system, was being widely deployed throughout the country. But, while it made eminent strategic sense for that system to be an ABM system, the likelihood that this was the case was being persuasively, if not conclusively, ruled out by the intelligence community. The only remaining possibility rested in the contention that the system might well have a dual capability against both airborne and ballistic missile threats, but even this line was running thin by 1968. If these were, however, air defenses, there was no denying the Soviets had a hell of a lot of them.

More specifically, deployed throughout the Soviet Union were over 10,000 surface-to-air missile launchers of several different types capable of providing defense against attacking aircraft. What, asked the SAM upgraders, would we do if the Soviets were somehow able to provide these wide-spread air defenses with a capability, which they might indeed now have, of attacking our ballistic missiles? Suddenly the limited ABM defenses around Moscow would be replaced by defenses spread across the entire country in very large numbers. As we have noted, ABM defenses have tremendous leverage in affecting the outcome of paper wars searching for the assurance of unacceptable retaliation in the event of a surprise attack. The addition of 10,000 new missile interceptors might indeed throw that assured destruction into question.

A number of specific issues were considered at length in the course of the SAM upgrade arguments. First and foremost was the question of whether air defense systems could be effectively upgraded to perform a useful ABM role. It was about this issue that most of the controversy raged. This is understandable since a demonstration that such a step was not feasible could most quickly end the debate. Unfortunately, one cannot categorically separate SAMs from ABM interceptors with full assurance that a system designed to do one thing will have no capability to do another, though the intelligence community was perhaps guilty for a time of such thinking. A second issue involved the question of whether any meaningful deterioration in our assured retaliatory capability would result even if such upgrading occurred. While a convincing argument that our retaliatory capability would not be put in serious jeopardy by SAM

upgrade could be a powerful counter in the debate, it would be inevitably blunted by the fact that it was Soviet perceptions which were most important. This proved to be an issue which received only limited attention, and one that was repeatedly confounded as the Defense Department continued to unearth remarkable limitations in the flexibility with which the U.S. could employ its strategic forces. Finally, there was the critical question of whether the Soviets would indeed pursue a program like SAM upgrade. Ultimately, the intelligence community had to make its stand on this issue.

#### *Some SAM Upgrade Hypotheses*

No one seriously contended that *all* 10,000 SAM launchers might be used for missile defense. Some of the deployed Soviet air defenses were largely obsolescent (the SA-1 system around Moscow) and others had specific tactical or low altitude missions (SA-3 and SA-4) which denied them the inherent capabilities needed even for upgrading. The only two real candidates were the SA-2 and the SA-5 systems. They alone employed missiles and radars whose performance begins to approach the levels required for such a task. In 1969 there about 5,000 SA-2 launchers and nearly 1,500 SA-5 launchers either operational or under construction across the USSR.

Quite remarkably, the greater part of the SAM upgrade debate centered upon the SA-2 system. The problems with the SA-5 from an upgrade point of view were its deployment in barrier fashion across major routes into the population and industrial centers of the Soviet Union, and the impossibility of relocating it without tearing up yards of concrete. Thus, the limited area protected by an SA-5 operating in a manner consistent with its having an air defense role had relatively little significance. We also suffered from a shameful state of ignorance about its characteristics and so couldn't do the kind of detailed technical analysis that supported SA-2 upgrading studies. The SA-5 re-enters the story later on, however.

There were early suggestions that the Soviets might use SA-2 missiles for ballistic missile defense purposes. The most notable of these suggestions came from Strategic Air Command analysts who linked deployed SAM sites with Tall King air warning radars in a scheme to which they attributed ABM capabilities of a sort. This contention was not taken seriously by the technical intelligence community which looked askance at its mystico-geometrical foundations. The real opening gun of the SAM upgrade affair was fired in the spring of 1969 at Sandia Laboratories in Albuquerque. Analysts at Sandia had looked at the problem for the first time in what proved to be the proper fashion. Using well-accepted models of the SA-2 system and all the characteristics of U.S. ICBM reentry vehicles, they were able to show, through simple engagement simulation that the SA-2 could, in fact, engage a large portion of the U.S. missile force if the interceptor were equipped with a nuclear warhead. Reports of Sandia's results were circulated throughout Washington and within the CIA but were not taken seriously. Sandia's concern with the problem was attributed to its increasing nervousness about the vulnerability of U.S. weapons to nuclear weapons effects and to a desire to get on with the Mark-12 reentry vehicle program. Finally, in the summer of 1969 Sandia persistence resulted in a briefing of analysts working in the defensive weapons field in the CIA. The Sandia argument was simple and impressive. We looked hard for obvious errors; we made

some corrections to their SA-2 model; we questioned some of the characteristics ascribed to the Mark-11 reentry vehicle carried by the Minuteman ICBM force. But we could not shake the basic validity of Sandia's study. Moreover, we were impressed with the importance of a detailed understanding of U.S. weapons when assessing the capabilities of foreign weapon systems to counter them. For example, the Mark-11 RV has an extremely small radar cross-section that poses an almost impossible target for air defense radars. What we had failed to realize was that the nose shield which provides this low cross-section burns off at about 90 thousand feet so that the reentry vehicle then "blooms" as a target. The effect of this characteristic—along with others—was to make incoming RVs far easier targets for SAM systems than we had previously realized. If nothing else, the intelligence community was forced to abandon its consideration of foreign weapons systems largely *in vacuo* and to accommodate its analysis to the need to answer very specific questions arising from the net technical assessment of U.S. and opposing weaponry.

Sandia's work was followed by a study by the General Research Corporation for the DDR&E and a hurried look at the problem by the Strategic Military Panel of the President's Scientific Advisory Committee.

After a substantial amount of agonizing over these studies, and in response to the expressed concern of the DDR&E and the Arms Control and Disarmament Agency (ACDA), it was decided within OSI that we ourselves would investigate the ABM capabilities of the SA-2 system. The report was a departure from previous studies of Soviet advanced weapons developments produced by the CIA. It concerned itself with the potential capabilities of a system—with suitable modifications—to perform a role for which it was not designed and in which it might at best be only marginally effective. We knew from unassailable evidence that the SA-2 system had been designed and developed for defense against aerodynamic targets—not ballistic missiles. All available intelligence information indicated that its deployment and operational doctrine were dictated solely by consideration of its air defense role. Furthermore, our assessment was based upon a greater knowledge of the SA-2 system than almost any other Soviet weapon system; it had been derived from years of collecting information on the system, including the acquisition of actual hardware. It might also be noted that the study was undertaken to the absolute horror of a number of the Agency's best and most respectable air defense analysts.

In performing the study, we required that all the elements of the system be employed in very nearly the same way that they were used in an air defense role, but allowed the introduction of operational doctrine and procedures specifically tailored for an ABM role. We assumed the interceptors to be armed with nuclear warheads—a *sine qua non* for ABM capabilities. This approach later became known as the "mini-mod system" when many more imaginative modifications to the system were introduced in response to the identification of its specific shortcomings when used for missile defense.

The study was completed and published in December 1969. It generally confirmed the basic results of the Sandia analysis: the nature of the ballistic missile defense problem and the characteristics of the existing U.S. missile threat allowed the SA-2 system—under restricted circumstances—to defend portions of the USSR against a part of the U.S. Minuteman force. To provide

even this limited ABM defense, early warning information, prelaunch target acquisition information for the SA-2 guidance radar, widespread deployment of nuclear warheads, and several minor modifications to the SA-2 equipment were required. The availability of each of these was highly conjectural. Without them, the system as deployed could provide no ballistic missile defense whatsoever. Despite these limitations, the depth of defense that *might* be provided by the SA-2 was not insignificant because of the large number of sites deployed near Soviet cities and because of the general purpose flexibility built into this air defense system.

Despite the inherent capabilities of the system, three very significant drawbacks to its use for ABM purposes became clear:

1. The coverage provided depended heavily upon the reentry angle of the attacking reentry vehicle (RV). At the time of the study, about half the U.S. Minuteman force was targeted to employ trajectories involving reentry angles of 19°. Against these targets, the protection that might be provided by an SA-2 site could cover an area as large as 100 to 300 square nautical miles. The other half of the Minuteman force reentered at 24°. Coverage of targets attacked by these missiles would extend at most to about 70 square nautical miles and in some circumstances would not exist at all. No protection could be achieved against ICBM's with reentry angles greater than about 28°. The Mark-12 RV (now deployed on about half our Minuteman force but then only planned) reenters at such steep angles.

2. The coverage similarly waxes and wanes with the minimum intercept altitude the defense is willing to accept. To achieve the larger coverages noted above, intercepts down to 6,000 feet would have to be allowed. At altitudes this low, the thermal and blast damage from a 1 to 20 KT defensive warhead could be fairly extensive. Furthermore, if the offense were willing to detonate the RV at higher altitudes, it could overcome the defense without serious degradation to RV damage of soft targets.

3. A third drawback resulted from difficulties in discriminating engageable targets from those which were acquired by the SA-2 radar but not within reach of its missile. If a limited number of nuclear armed interceptors were available, they might quickly be expended to no avail in the event of a multiple RV attack.

It is not my purpose here to deal at length with the technicalities of SAM upgrade, but these analytical results shed light on some important considerations. Any ABM capability that might be ascribed to the SA-2 system was highly qualified and conditional. But those who took the possibility seriously noted that some capability could indeed be shown to exist. Those who denigrated the possibility emphasized that such capabilities were "technical" or "theoretical" and not "real," though no means for giving meaning to those characterizations ever emerged. It was also pointed out that no country would rely upon a defense which depended upon the attacker's behaving in a certain way which made him peculiarly vulnerable; on the other hand, it was noted that the approaching strategic arms limitations negotiations might freeze the offense so that pre-

cisely such a situation might occur. Discussions about the possibilities of changing reentry angles or burst heights quickly showed that it could be accomplished only with great difficulty.

The report we prepared was not enthusiastically received. In several parts of the Agency and elsewhere in the community, we were charged with having added fuel to a destructive fire by not rejecting out of hand a palpably ridiculous suggestion. Within the defense technology community, we were ridiculed as delicate flowers unwilling to go the whole way in addressing the possibilities of upgrading SAMs. Throughout the rest of the debate—through the SALT considerations and the preparation of NIE 11-3-71—CIA's defensive weapons systems analysts alternately defended the possibilities of SAM upgrade or argued against its likelihood depending upon the particular protagonist being encountered.

Our SA-2 "mini-mod" led to far more ambitious efforts by others. Charles Lerch and Chris Nolen of the Institute for Defense Analysis did a truly magnificent job for the DDR&E. We all agreed that their accomplishment was rivalled only by the "Report from Iron Mountain." In its later stages the Lerch-Nolen system—employing radars that in ELINT were indistinguishable from TV stations—could even handle Mark-12 MIRVs. Most galling to the intelligence analyst was their imaginative use of the obsolescent Spoon Rest as an acquisition radar for the SA-2. Because of its relatively low frequency, some substantial modifications and proper use of this radar might allow detection of U.S. ICBM RVs—which appear very small to radars operating at higher frequencies—at very long ranges. We knew a lot about the Spoon Rest. We had measured its effective power and established its detection range in a very sophisticated and sensitive technical collection program associated with assessing the vulnerability of the U-2 and Oxcart aircraft. What was the point of such efforts, if our hard evidence about capabilities could be blithely assumed away when an issue critical to national security arose? But Lerch and Nolen could show how the improvement they needed to make their system work might be obtained and we couldn't rule out the possibility that such modifications might have been made since we made our measurements. Or, that if not made yet, that they might not be made tomorrow.

Meanwhile, the beginning of serious SALT discussions was approaching and the vast paper underpinnings of that effort were in preparation. SAM upgrade posed serious problems in the treatment of ABM limitations since no one was anxious to include air defenses within the scope of the discussions. Furthermore, the possibilities of using SAMs for ABM defense argued against prohibiting ABM deployment or limiting it to low levels, inasmuch as the U.S. had almost no SAMs it might upgrade. They argued as well against prohibiting MIRVs since they appeared necessary to penetrate a widespread ABM defense. Since ABMs and MIRVs were the two developments that arms control proponents most wanted limited, SAM upgrade was particularly vexing. ACDA in particular felt anguish. It counterattacked by bringing into its camp a number of "hired guns" in the form of leading scientists prepared to take issue with the technical argu-

ments of the defense technologists. Such men as Wolfgang Panofsky, Sid Drell, and Dick Garwin were involved in this effort. They turned their imaginations loose on improving the U.S. missile force. As one side improved Soviet defenses by modifying SAMs, the other found ways of reducing the vulnerabilities of U.S. missiles in an interacting spiral of technical inventiveness. An early attempt to prepare a paper for SALT purposes on the effect of SAM upgrade on U.S. retaliatory capabilities virtually collapsed as DDR&E representatives insisted on the "realistic" treatment of U.S. missile forces but freely modified the intelligence characterization of Soviet SAMs, while ACDA representatives upgraded U.S. strategic weapons and insisted on sticking to intelligence estimates insofar as Soviet forces were concerned. Caught in the middle, we tried to cling to some vestige of what we thought might be reality and desperately sought some technical constraint on the possibilities of SAM upgrade which might stem the tide. We investigated computer and software limitations, communications problems, human factors, the availability of nuclear weapons material, etc.; but nowhere could we find that constraint that the Soviets might not be able to overcome.

Many others came up to bat in trying to upgrade the SA-2. There is little point in reviewing all these efforts. None was able to push the possibilities beyond those conjured up by Lerch and Nolen. In general, our original conclusion was sustained. Some capability could be shown through technical analysis to exist; that capability had strategic significance because of the large number of SA-2 sites and their deployment close to Soviet cities. That capability, even if it actually existed, however, was fragile and subject to some drawbacks which might allow the offense to deny it through modification of his ballistic missile force.

The reader might well insist that the ABM possibilities of the SA-5—which some were claiming already had ABM capabilities—be now addressed. The deployment shortcomings of the SA-5 have been noted. It is not a system that might easily be moved. The limited area protected by an SA-5 site intercepting incoming RVs within the atmosphere simply could not be stretched to protect major population or industrial centers. A good deal of work was done on investigating possibilities for using the SA-5 system to attack ballistic missiles outside the atmosphere in ways that would allow the system to provide extensive coverage. As we learned more about the system, however, it became clear that the SA-5 missile required aerodynamic control which tended to dampen enthusiasm for such schemes. Nevertheless, somewhat later in the game, a major net technical assessment of the capabilities of the SA-5—as it was best understood by the intelligence community—was undertaken jointly by the Agency and the DDR&E. That study showed that with some important modifications, fairly large areas might be protected by the SA-5. Once again, however, the defense could only be characterized as fragile and uncertain. This analysis was necessarily performed with more diffidence than in the SA-2 case because of the relatively large gaps in our knowledge about the SA-5.

Though the electric qualities of the SAM upgrade debate now are all but gone, concern about the matter continues because of the possibility that new air

defense systems will emerge with inherent capabilities so improved that they might have a true dual capability enabling them—with different operational doctrines—to cope with both aerodynamic and ballistic missile targets. If Soviet air defenses are to cope with threats like the U.S. Short Range Attack Missile, (SRAM), they will have inherent capabilities of this order. The early identification of such a system is, of course, tremendously important.

### *The Matter of Likelihood*

But enough of the question of technical feasibility. The ultimate question of concern is whether these possibilities were such that the Soviets might indeed try to capitalize upon them. As noted above, there was some contention as to whether or not the upgrading of SAMs would have any real effect on our ability to retaliate in the event of a first strike. Clearly, one could show that with the full U.S. arsenal intact, enough RVs would penetrate to dissuade the Soviets from going to war. It was not so clear that that would be the case were our retaliation to follow a successful first strike by the Soviet Union. In such circumstances, it would be uncertain which missiles would remain in our arsenal. Targeting would be incomplete, and no pre-attack scheme for assuring penetration could be relied upon because important elements of that attack might have been lost. The rapid retargeting of missiles after a first strike was not considered a realistic possibility.

Little has been said here about the capability of upgraded SAMs to cope with the Polaris submarine-launched ballistic missile. It appeared for a time that the Soviets' lack of knowledge about where submarine-based missiles might be launched left them with an initial detection and acquisition problem that could not be handled by an upgraded SAM system. As the upgrade investigation continued, however, it was found that Polaris missiles present remarkably large radar cross-sections and that a number of possibilities were available to provide terminal SAM defenses with the acquisition information they needed. Some argued early on that no first strike could counter our Polaris force and that these missiles would by themselves have sufficient retaliatory capability to assure deterrence since they could not be attacked by widespread SAM defenses. This argument was, of course, blunted as ways to handle that threat were devised.

A number of simulated weapons exchanges were run to determine the extent of degradation that might be accomplished as SAMs were used for ABM defense by the Soviets. When these simulations concerned themselves only with the extent of possible protection, they showed such defenses to have a significant effect. But the element lacking in this analysis was a measure of the quality of defense. Certainly the likelihood that the Moscow ABM system could defend targets within its calculated coverage must be higher than that an SA-2 site could defend targets within the coverage we had calculated for it. The SA-2 system necessarily operated at the very margin of its capabilities. Human performance had to be almost perfect. High assurances of RV kill were not involved, etc. Despite the recognition of this problem, it was never adequately dealt with throughout the debate. What was really needed was a quantitative measure

of the probability of kill by an SA-2 interceptor operating against targets within its range of coverage. No one was successful in generating such a number. Thus, we were left in the unhappy situation of running studies that assumed an SA-2 interceptor was as good as the Galosh missile in killing incoming RVs. This is, of course, patently inadequate. The result was to leave us with the conclusion that should Soviet SAMs be used for missile defense they could, under some circumstances, have a significant effect on our ability to retaliate.

But would the Soviets actually pursue such a course of action? Would they undertake the costly task of upgrading a country-wide system of air defenses in order to attain a limited and conditional defense? Our studies on the effects of upgrading had shown that such defenses would not have high effect in the event of a calculated U.S. first strike. Thus, such a massive upgrading scheme would seem to make little sense for simple defensive purposes. The real question seemed to be whether the Soviets would pursue such a policy in the belief that, coupled with a first strike, it could perhaps protect them against the response that would follow. Since we now had indications that the Soviets were interested in ABM limitations, the cost of their following the SAM upgrade path would presumably include the risks of being caught in violating arms limitations agreements they apparently wanted. They would buy, at best, an uncertain defense, one upon which it was hard to believe they would be willing to risk their country. It was certainly an approach not in keeping with the Soviet way of doing things. The Moscow ABM system employs huge radars of great power, interceptor missiles that are larger than the Minuteman ICBMs they are to counter, and, generally, a remarkable profusion of expensive system elements for the amount of defense they could hope to achieve. To rely on a jury-rigged SAM system seemed wholly inconsistent. The Agency's view on this likelihood was expressed in fairly straightforward and simple terms:

The Soviets for years have demonstrated conservatism in assessing their own defense requirements and in designing systems to meet those requirements. With this conservative outlook, conscious of the shortcomings and ephemeral nature of any defense which SAM systems might provide against missiles, and uncertain about the effects of being detected in a treaty violation, Soviet leaders are unlikely to view the upgrading of SAMs as a viable means of altering the strategic balance.

Although the inherent ABM potential of Soviet SAMs might be utilized *in extremis* in an effort to reduce the destruction caused by a U.S. missile attack, the uncertainties involved in such a step—even with upgraded SAMs—make it very unlikely that the Soviets would adopt this procedure. In view of these considerations, we believe that a program of SAM upgrading for ABM defense is not likely to be undertaken by the Soviets.\*

There were, of course, other views; but none took sharp exception to that of the Agency. The SAM upgrade enthusiasts tended to question anyone's ability

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\*National Intelligence Estimate, NIE 11-3-71, TCS 2027-71, 25 February 1971, p. 58.

in the U.S. to anticipate how the Soviets would act in such circumstances. We were continually confronted with the argument that while we might call upon any subjective arguments we chose, the objective fact of SAM upgrade effectiveness had been shown and must be dealt with.

### *SAM Upgrade and SALT*

The most immediate problem posed by SAM upgrade in negotiating the existing ABM treaty hinged on the matter of verification. How could we be assured that the Soviets were not evading compliance with treaty limitations by upgrading their SAM systems to provide an ABM defense beyond the levels allowed? We looked hard at our ability to detect signs of SAM upgrade through "National Technical Means of Verification." We believed we could detect a number of things. In particular, we in the CIA were convinced that we could detect the testing of SAM systems in an ABM mode, that we would detect significant changes in operating radars or in the patterns of deployment. Though we argued these beliefs strongly, we suffered when the state of our knowledge of the SA-5 system was raised. We had at that time not yet identified a single signal intercept from the SA-5 radar. Conclusive proof that the system had no ABM capabilities could not be mustered despite the fact its deployment was approaching 100 complexes throughout the country. How then were we so sure that we could detect a small matter of equipment modification and improvement? When we pointed to our ability to monitor and technically characterize the large Soviet early warning radars needed for SAM upgrade schemes, defense technologists invented a radar built into the side of a building which emitted signals indistinguishable from those of a TV station. Though we raged, we could not disprove the possibility or even the outlandishness of such schemes if the Soviets truly intended to develop a system deceptively in violation of arms limitation agreements.

As a result of these discussions, verification of the fact that SAM upgrade was not occurring became an important consideration in the initial U.S. arms limitation proposals. Indeed, the first options presented to the Soviets for prohibiting MIRVs were accompanied by a requirement for on-site inspection to insure that SAM upgrading had not occurred. In other options, less intrusive but nevertheless quite detailed ancillary constraints were included to insure that verification could occur through national technical means. The Soviets very quickly ruled out any possibility of their accepting any agreement which included provisions for on-site inspection. And it is perhaps fortunate they did, because a very detailed look at what we could learn about SAM system modification by simply visiting air defense sites showed that it wouldn't necessarily be much. In the course of the negotiations that led to the ABM treaty, nearly all these initial provisions dropped away. Some few important ones remained. Most important, both sides have undertaken "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;" the belief that we can monitor compliance with such an

undertaking rests in our belief that no country would be willing to risk its fate when it had to rely upon an untested defense. Thus, we believe we will detect evidence of test programs intended to prove the effectiveness of upgrading SAM systems for ABM purposes if the Soviets do indeed intend to rely upon such a defense.

### *How Well Did We Do?*

In assessing Agency performance in coping with the challenge of SAM upgrade, it is necessary to understand some basic problems which existed. In the first place, the intelligence community sees its function as providing the best description that it can of what is really going on and identifying those possibilities of future developments which it believes are most likely to happen. It is a matter of conscience that the conclusions it reaches are not influenced by the **effect of any specific answer on policy decisions.** While we might select questions to answer on the basis of their importance to policy-makers, we must not let their effects on policy choices influence us in assigning likelihoods to specific answers. The people with whom we were dealing in the SAM upgrade debate were not a part of the intelligence community. They were primarily interested in policy choices. Thus, the policy impact of a specific answer gave that answer great importance even when the possibility of its being right was low. So long as a possibility of SAM upgrade could be "demonstrated," its possible effects on our national security were large enough to require that it be taken seriously.

A number of these people were among the Agency's severest critics. They criticized the Agency primarily because of its "arrogant refusal" to do more than provide its conclusions on such intelligence questions as the likelihood of the SA-5 system's having an ABM role. It was not that they believed the Agency's conclusions were wrong. They would frequently admit—at least, in private—that they probably reflected the greatest likelihood. What they did object to was our alleged unwillingness to consider or explicitly treat other possibilities than those we had settled upon as being most likely. Often these possibilities posed threats that were so significant that to ignore them even if their likelihood was low was to stultify the policy-making process. This argument has validity only if there remains some real probability that such fears may come to pass. Does the intelligence community have a responsibility to establish the extent of that probability in each case? It is often a very difficult thing to do. Or are these "possibilities" so obviously just apparitions produced by the "dark lantern" of the defense technologists' spirits that they would best be dismissed out of hand?

I believe they deserve our serious attention. At least in the case of the SAM upgrade hypothesis, I am convinced that it was proper that our policy makers, faced with the decision of whether to take it seriously, were armed with all the analysis and consideration of the problem we could muster. Thus, I think the Agency deserved good marks for effectively taking a lead in seriously addressing the feasibility and likelihood of a development it almost automatically found repugnant. The technical intelligence analysis that was done did much to satisfy the complaints of the Agency's critics. Indeed, a search for acerbic criticism about its performance from former protagonists in order to enliven this paper

was a generally unrewarding attempt. The results showed that once the Agency became willing to discuss what *might* be rather than just what it believed was true, these critics found the Agency's performance impressive and responsive to their concerns. All felt that the Agency's position throughout the debate was objective, and those on both sides of the debate rapidly turned to the Agency for support in furthering some piece of the argument. Beyond that, we provided technical information on the weapons systems involved that was authoritative enough so that it was never challenged by proponents of either side.

There is, of course, another question of how much damage was done by taking all this seriously. Clearly, possibilities of SAM upgrade affected the SALT discussion and U.S. proposals. The fact that the many initial collateral constraints concerned with SAM upgrade could be dropped throughout the course of the negotiations is in large measure a result of the full and detailed airing of the threat it posed and the possibility that the Soviets might play the upgrade game. In the last analysis, the SAM upgrade debate led to a far more enlightened set of negotiations on arms control than might otherwise have been the case and did not in any significant way limit the extent of arms control that was achieved.

Having said all this, the technical intelligence analysts failed to do some important things. They failed to solve the most critical question in their domain, namely: the quality of defense that could be provided. To date, this problem remains unsolved. We need to know how to treat such matters. Something can be done in this regard but will probably involve a far more perceptive consideration of human contributions to weapons system effectiveness and a better understanding of weapon system performance in the midst of nuclear war than have been employed heretofore. In defense of the technical analysts on the latter point, a summer study performed by the Jason Panel, a group of the country's top physicists working for the Defense Advanced Research Projects Agency, noted that the effectiveness of the SA-2 could probably not be determined until "a few well-instrumented nuclear wars" had been fought.

Most important, the intelligence community went into the whole problem in very bad shape as a result of its inability to cope with the SA-5 problem. Its general credibility and its ability to assure the verification of treaty compliance were brought into doubt by its inability at that time to answer the critical questions about this system. Harder and more explicit analysis of the problems the Soviets would encounter in trying to accomplish a SAM upgrade program, and the probabilities of their successfully cheating, would have strengthened our position on the verification matter.

Our performance would have been improved had we worked both the technical feasibility and the likelihood parts of the problem more nearly together. The strategic analysts were right in insisting that the likelihood of the Soviets adopting the scheme was the ultimate question, but they might have been more sensitive to the fact that that likelihood depended heavily upon whether or not it would work. But we would have benefited from the more serious considerations of the non-technical factors as well. A set of "organizational constraints on breaching" an arms limitation agreement would plague any bureaucracy deciding upon and implementing such a decision. The nature and strength of such

constraints are powerful considerations that bear directly on this argument. A good discussion of these is given in Abram Chayes' "An Inquiry into the Workings of Arms Control Agreements." \* Such considerations were never brought forth in a systematic, organized way as part of the SAM upgrade debate.

#### *A Soviet View of the Matter*

During the first phase of the SALT negotiations in Vienna, it was the practice for both sides to exchange formal presentations between heads of delegation three times a week. These meetings were held in alternate embassies Mondays, Wednesdays and Fridays. The principal delegates would solemnly face each other across a table with their advisers sitting behind, while the heads of delegation would read their statements interspersed with translation. After these formal meetings, the entire group would retire to vodka and caviar or bourbon and peanuts, as was appropriate, for informal discussion. It was during this phase of SALT that the SAM upgrade problem first arose. The Soviets were absolutely horrified. They appeared to have no doubts that we had a bad "dark lantern" problem. Professor Aleksandr Shchukin, a tall, gentle-mannered academician of great scientific presence, noted to Paul Nitze, with agony on his face, that one thing he really did know something about was the terrible problem of making an ABM defense work, and he could assure us that you could not do the job with air defenses. The U.S. delegation, as instructed, continued to express its concern about the possibility of SAM upgrade and to seek inclusion of measures that would preclude it.

On June 19, 1970, the meeting was held in the American Embassy. SAM upgrade was mentioned in the Soviet presentation as an extraneous matter the U.S. was introducing to complicate the negotiations. Subsequent to the formal meeting, drinks in hand, informal discussions were going on in a number of groups scattered about a sitting room in the Embassy. In one such group, Lt. General Royal Allison of our Air Force was conferring with Col. General N. M. Alekseyev and Col. General A. A. Gryzlov, both of the Soviet General Staff, and Minister P. S. Pleshakov of the Ministry of the Radio Industry on the matter of SAM upgrade. Pleshakov (whose ministry had built the Soviets' huge ABM radars) was arguing that SAM upgrade was not feasible. Allison countered by insisting that if this were so the Soviets should have no objections to accepting a prohibition on SAM upgrade. The Soviets insisted that since it was not feasible no prohibition was necessary. Allison pointed out that he wasn't so sure it couldn't be done and finally called upon the Soviets to tell us in forthright fashion about the capabilities of the Tallinn (SA-5) system if they really wanted to allay our fears about this matter. The Soviet generals were tough birds. Gryzlov, a former head of the GRU, not only looked like a horror-movie principal but hovered in the background much as a military conscience to the delegation. The Soviets had said almost nothing about their weapons and had taken pleasure in our obvious discomfiture about the SA-5. The Soviets continued to evade but Allison persisted. Alekseyev, the senior military delegate then in Vienna, at long last shot a look at Gryzlov, gulped visibly, and answered that the Tallinn System was

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an air defense system like Nike—Hercules or Hawk, and that if it were to be used in an ABM role, virtually all its components, including missile and radar, would have to be replaced. Standing on the edges of this conversation, I somehow saw a whole life of battles about the capabilities of the SA-5 system and the possibilities of SAM upgrade flash before my eyes. Though I returned to further battles on both issues, I somehow felt more relaxed about it all.