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ARMS CONTROL TREATY COMPLIANCE

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CHARGES OF TREATY VIOLATIONS: MUCH LESS THAN MEETS THE EYE

There is much less than meets the eye in the Administration's charges of Soviet violations. First of all, most of the violations in question involve legal and technical issues operating at the fringes of the stated treaty provisions. In the case of the PL-5 (SS-X-25) ICBM and Soviet encryption of telemetry, the Soviets are obviously trying to exploit treaty loopholes and ambiguities, as they have done in the past and will doubtless continue to do in the future.

The dispute over the radar at Abalakova boils down to a question of the interpretation of intent, while the evidence of Soviet testing violations and deployment of SS-16 missiles is shaky at best. Given the ambiguity of some of the treaty provisions, as well as the inconclusive nature of U.S. evidence, few, if any, of the alleged violations can be proven.

WHAT IS AT STAKE

Even if the charges were all incontrovertibly true, what would they amount to strategically?

Not much. In a world in which we have 5,000 warheads on highly invulnerable submarines, perhaps only an ABM could shake our confidence in our basic deterrent. And here the only issue is a single enormous and vulnerable radar of disputable purpose—not a whole new ABM system.

The Threshold Test Ban limits were always so high as to have very little strategic significance anyway; here the main violation, so to speak, is not having negotiated a Comprehensive Test Ban.

And because SALT II expires in December 1985, the most the Soviets could gain through exploiting a SALT loophole would be a few years advance on a second ICBM—a mobile missile many within the U.S. defense community view as a welcome development.

Most important, the Administration's charges have nothing approaching the strategic significance of the complete abrogation of the treaties themselves. Yet it is precisely that dangerous outcome which can result from mishandling suspicions of Treaty violations.

In particular, abandoning the ABM Treaty could incur enormous costs and strategic uncertainty. Without the Treaty, the effectiveness of our most prized strategic force, the Poseidon-Trident submarine-based missile force, could become theoretically vulnerable to a potential Soviet ABM system based on new radars and existing air defense missiles. A similar fate would befall the British and French nuclear missiles. The slower SLBMs and small force of European missiles will be more susceptible to Soviet ABMs than will our land-based deterrent, which has survivability problems of its own. If the Treaty is abrogated, people will suddenly realize how much its presence did to hold down defense alarms of many kinds. Compared to these problems, a radar of controversial purposes is a minor issue.

Similarly, the SALT II regime has favored the United States by restraining hot Soviet production lines that have always been more capable of churning out new missiles than anything we have ever had open at one time. It is the Soviet side that can best exploit a breakdown of the SALT II regime. Should SALT collapse, the dramatic build-ups that will undoubtedly occur on both sides would dwarf the significance of extra, and allegedly illegal, Soviet missiles.

Or again, highly suspect charges that the Soviet side is conducting underground nuclear tests above the 150 kiloton threshold amount to little compared to the tests which would become possible in the absence of the Threshold Test Ban Treaty. More than anything, this Treaty was designed to prevent the testing of weapons in the megaton range—nuclear warheads that would prove useful as each side attempts to increase its counterforce, first-strike capability.

COMPLIANCE AND RATIFICATION

It is remarkable to note that two of the three treaties involved are ones that have never come into force. And they never did so precisely because the United States refused to ratify them. Charging violation of treaties which one has refused to ratify is a tricky business; and when the U.S. is complying with the treaties precisely because it recognizes the greater Soviet ability to break out of the treaties, it is a dangerous business as well.

One cannot read the following analyses without reflecting on how easy it is, with any complicated treaty, to find activities of a suspicious or provocative nature. Indeed, the Soviets have responded by making public complaints about our treaty compliance—a matter we will address in a future newsletter.

None of the issues seems to be beyond resolution—on the contrary. The radar at Abalakova seems to be an isolated event which could be resolved in a number of negotiable ways. The Soviets have made offers to resolve

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Last January the Reagan Administration submitted a detailed report of seven Soviet arms control violations to Congress. The report was demanded by Senate conservatives as further proof of Soviet deception, and for evidence that arms control should be shelved in favor of a continued strategic build-up. Of the seven charges, five concerned the strategically important ABM, SALT II and Threshold Test Ban treaties; and it is these that FAS has chosen to analyze in this initial compliance newsletter prepared by John E. Pike and Jonathan Rich.

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the encryption issue. The Threshold Test Ban Treaty issue can best be resolved, ironically, by ratifying the Treaty and acquiring the data that is mandated by the Treaty's verification provisions. The resolution of the PL-5 and SS-16 issues will require continued efforts at greater clarification of the relationship between the terms of the SALT II Treaty and the exact details of Soviet activities.

The resolution of these complex issues will require hard-nosed private consultation and negotiation, not public condemnations and posturing. They also require a firm commitment to the future of arms control. The Soviets will have little incentive to cooperate on such matters as encryption and the PL-5, if it appears that offensive arms limitation will end with the expiration of SALT II in 1985.

We can and must expect Soviet negotiators to drive a hard bargain—and where they can—exploit treaty ambiguities and loopholes. We must expect a certain amount of chiseling on the spirit of the treaties that is nonetheless within the letter of the agreement. Hard bargaining of this kind goes on not only with the Soviet Union, but throughout our own commercial sector.

If the issues prove to be beyond resolution, there is nothing involved here which we cannot match in our own activities where absolutely necessary, or otherwise offset. There is little at this point that threatens our security. Most certainly, there is nothing that poses as much of a problem to our security as not having the treaties at all.

What the public should learn from this affair is a sense of perspective: how little is at issue, how complicated the treaties really are, how much negotiation must go on even after treaties are signed, and how much more important the treaties are than anything charged thus far.

We ought not, and we need not, tolerate violations. And we can almost always respond to those real violations that we cannot resolve in ways that fall short of (cutting off our nose to spite our face by) cancelling the whole agreement. All of this can and should be done without ruining the atmosphere necessary to keep existing agreements while working toward new ones.

These are, to our mind, the morals of the great violation uproar of 1984, with respect to the five of seven charges reviewed thus far. A subsequent issue of the Public Interest Report will review the two remaining U.S. charges concerning chemical warfare and the Helsinki Agreement, and the Soviet charges of U.S. violations.

NOTE TO MEMBERS:

This issue on allegations of treaty violations seems to be the most comprehensive such analysis publicly available at this time and members are encouraged to draw the attention of Government officials, Congressmen and others by writing them about it, xeroxing it, and sending them this copy. Additional copies are available, $2.00 each, from our office.

The next FAS PIR will be on Argentina and will treat such issues as human rights, scientific exchange and non-proliferation. Director Jeremy J. Stone and Colonel Edward L. King (U.S. Army, Ret.) will provide an on-the-scene report.

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THE RADAR AT ABALAKOVA— WHAT IS IT?

The Soviet Union is presently constructing a large phased array radar at Abalakova, in central Siberia. Because of their utility in guiding ABM interceptors to their targets, large phased array radars are the subject of a number of limitations under the ABM Treaty. If they are deployed for purposes of early warning, they must be deployed "at locations along the periphery of its national territory and oriented outward." Other permitted deployments include: at ABM test facilities; as national technical means of verification; and "for the purpose of tracking objects in outer space."

The Abalakova radar is far from the periphery of the Soviet territory, and has a primary coverage field that encompasses much of Siberia. Thus it does not meet the criteria established for early warning radars. However, the Soviets do not claim that the radar satisfied the Treaty's definition of an early warning radar. Instead, they contend that the radar is for the tracking of satellites. Some Western analysts have found this explanation unconvincing, concluding by a process of elimination that since Abalakova could have some ABM potential, it must be an ABM radar.

But the Soviet explanation is fairly credible when viewed in the context of the Soviet anti-satellite (ASAT) program. Abalakova is ideally located to provide targeting information for an advanced Soviet ASAT that could attack and destroy satellites while they were over Soviet territory. Recent developments in the Soviet ASAT program, and in American ASATs and ASAT countermeasures, lend credence to this explanation.

Thus the radar seems to be intended to serve an ASAT function that was not clearly foreseen at the time the ABM Treaty was negotiated. There has been a longstanding concern that developments in the field of ASATs might impinge on the ABM Treaty regime, and Abalakova seems to be the first serious instance of this. Abalakova provides further incentive for the negotiations of limitations on anti-satellite weapons.

However, the radar would provide a very marginal addition to the Soviet's ability to rapidly break out of the ABM Treaty. Since the radar will take some years to complete, there is ample time for negotiating a satisfactory resolution to this gray area problem, with little danger to U.S. national security in the process. On the contrary, the breakdown of the ABM Treaty as a result of inept or precipitous handling of this issue would pose a major threat to American national security. In particular, an unconstrained Soviet ABM program would raise serious questions concerning the effectiveness of America's sea-based missiles, the most important component of our retaliatory deterrent force.

Activity At Issue

In early 1983 construction activity at a site near the central Siberian village of Abalakova was identified as preparations for a new large phased array radar, of a type similar to several other previously identified sites. Although it is difficult to determine on the basis of open literature sources the exact state of construction at Abalakova, it may be estimated that preparation of the site began several years ago, that at present the major structural shell is sufficiantly complete that a clear identification of the nature and orientation of the radar can be readily determined, and that it will be several years before the facility is fully operational. From the size of the facility, it is clear that, when completed, the radar will have a power-aperture product (that is, the aperture of the transmitter in meters multiplied by the emitted power in watts) far in excess of the three million figure that is used in the ABM Treaty to define radars that are subject to the Treaty's limitations.

Abalakova is located at the juncture of the Angara River and the Yenisey River, just to the south of the town of Yeniseysk, and some distance to the north of the city of Krasnoyarsk. At 58 '8" North latitude and 92 '44" East longitude, Abalakova is about 750 kilometers from the Soviet border with Mongolia, and about 1400 kilometers from the Arctic Ocean.

Although it is difficult to make a precise determination based on published information, it seems that the Abalakova radar is pointed toward the Northern Pacific Ocean. Since the coverage fan extends about 60° either side of the bore-site of the radar, the facility's coverage seems to include most of eastern Siberia.

Prior to the 1980's, the Soviet Union relied on a number of electronically steered radars of the Hen House class for early warning. Two large phased-array radars of the Dog House type were deployed near Moscow, at Chekov and Naro-Fominsk, as part of the single site of the Galosh ABM system permitted under the ABM Treaty. Several years ago construction started on a new large phased-array ABM radar in the Moscow suburb of Pushkino. Smaller versions of this radar are under construction at Pechora in the Ural Mountains near the Arctic Ocean, at Lyaki in the Caucasus Mountains, at Mishelevka near Irkutsk, as well as at the Sary Shagan ABM test center in central Asia. The Abalakova radar seems to be of this type.

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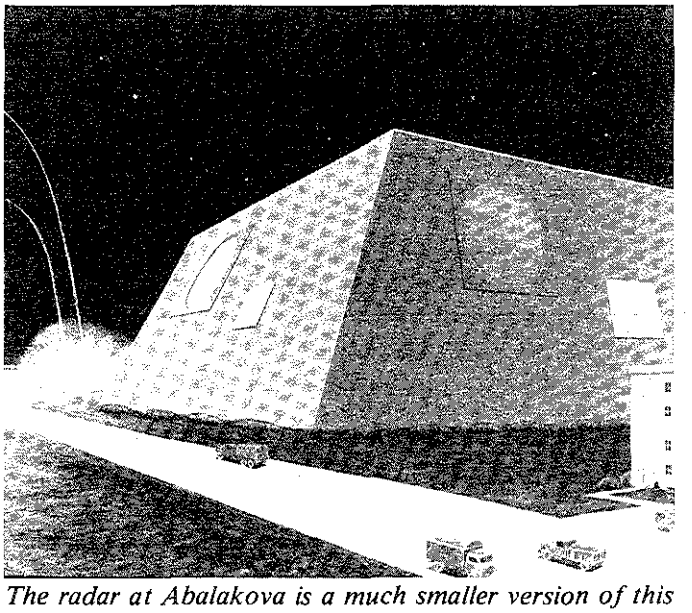

The radar at Abalakova is a much smaller version of this new radar near Moscow.

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Some press reports have suggested that as many as ten such radars are under construction. However, these reports seem to be in error, confusing radars of other types with the large phased-array radar at Abalakova. The radars at Olenogorsk, Skrunda and Angarsk are probably electronically steered early warning radars of the Hen House type. Komsomolsk-Amur and Kiev are the locations of the Over-The-Horizon radars of the type that has earned the nickname in the west of "woodpecker," because of the interference they produce on short-wave radios.

Analysis

Concern about Abalakova stems from its apparent inconsistency with the "at the periphery, oriented outward" provisions of Article VI, and the impact of this inconsistency on the undertakings of Article I. However, these concerns must be balanced against the exception for space-track radars in Paragraph F. In short, while Abalakova is clearly inconcistent with Article VI, it would just as clearly be permitted under Paragraph F, if it could be construed as being "for the purpose" of tracking satellites.

There are at least four functions that Abalakova could perform: early warning, satellite tracking, ABM battle management, or ASAT battle management. Analysis suggests that it is unlikely that Abalakova is intended to perform the early warning or the satellite tracking function. Although the radar could make a contribution to ABM battle management, it is not optimized for this task. If Abalakova were intended to perform ABM functions, it would constitute a violation of the ABM Treaty. But the lack of covertness in this effort, and the manifest absence of various collateral activities that would accompany a breakout (such as the construction of additional radars optimized for battle management) suggests the fundamental implausibility of this interpretation. There is good evidence, however, to support the conclusion that Abalakova is an *ASAT* battle management radar. Although the implications of this conclusion are troubling, they are much less troubling than the conclusion that the Soviet Union is flagrantly violating or actually breaking out of the ABM Treaty. Some analysts have reached this conclusion without considering the possibility that Abalakova might be an ASAT radar.

The Article VI provisions concerning early warning radars are both a specific treaty obligation, and a practical, operational definition of just what constitutes an early warning radar. Such radars must of course be oriented outward, since that is the direction from which attacking missiles will come. Radars of this sort cannot see below their local horizon, and thus need to be located as close to the source of attack as possible, so as to provide the earliest possible warning. Thus some American early warning radars are located in the United Kingdom, Greenland, and Alaska. Other U.S. radars are located within a few hundred kilometers of the coast, or in one case, the national border.

Not Suitable for Early Warning

The location and orientation of Abalakova render it very poorly suited to the early warning role. Indeed, it is so poorly suited for this role that it might better be described as a "late warning radar." It has been suggested that Abalakova was constructed to fill gaps in the coverage of the existing network of radars. However, this does not seem to be the case. If the primary gap in coverage was taken to be ICBMs coming over the North Pole, it would be better to locate the radar at a more forward location, such as Tiksi, a port on the coast of the Arctic Ocean at the mouth of the Lena River. Such a location would give several additional minutes of warning of an attack.

Given the orientation of Abalakova, toward Alaska and the Northern Pacific, it has been suggested that its primary mission is to provide warning of missiles launched from Trident submarines that are now being deployed in that region. However, Abalakova is over 5,000 kilometers from the Bering Sea, and at that distance submarine-launched missiles directed against targets in eastern Siberia would never be detected from Abalakova, since they would remain below the local horizon throughout their trajectory. Warheads launched against more westerly targets, such as in the Lake Baikal region, would not be detected until well after they were launched, and would drop from site long before impact. A more promising location for a radar for this mission would be at Komsomolsk-Amur, near Vladivostok. This location would provide complete coverage of Trident patrol areas.

Some analysts have suggested that these considerations were over-ridden by the practical problem of finding a

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1972 ABM TREATY

The ABM Treaty entered into force in 1972, and is of unlimited duration. Review conferences are scheduled every five years. The review in 1982 resulted in no changes in the Treaty or its provisions. Under the terms of the Treaty Parties may propose amendments or additional Protocols at any time. In 1974 the Treaty was amended by a Protocol, reducing the number of permitted ABM deployment sites from two to one.

ABM TREATY PROVISIONS CONCERNING RADARS

1. "Each Party undertakes not to deploy ABM systems for a defense of the territory of its country and *not to provide a base for such defense...*" (Article I, paragraph 2).

2. "To enhance assurance of the effectiveness of the limitations on ABM systems and their components provided by the Treaty, each Party undertakes...(b) not to deploy in the future radars for early warning of strategic ballistic missile attack *except at locations along the periphery of its national territory* and *oriented outward*" (Article VI, paragraph B).

3. "The Parties agree not to deploy phased array radars having a potential (the product of mean emitted power in watts and antenna area in square meters) exceeding three million, except...*for the purpose of tracking objects in outer space...*"

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suitable construction site, and that the choice of Abalakova was dictated by the problems that would have been encountered in building that radar at a more appropriate location. Specifically, Abalakova lies on a spur of the Trans-Siberian railroad, which would be used to transport construction crews and materials. There are also the notorious problems associated with building large structures on the permafrost. But there is already a massive Over-The-Horizon backscatter radar at Komsomolsk-Amur, and surely the addition of another radar should pose no practical difficulties. The port of Tiksi is regularly supplied by ships, which with the help of ice-breakers could transport the needed construction materials and crews. Although Arctic construction is a demanding task, the Soviets are no stranger to the job, and the United States has successfully built a number of radars in equally inhospitable surroundings. However, the Treaty makes no provisions for such practical problems, should they arise. The language of Article VI is very clear as to the permissible characteristics of early warning radars.

Soviets Don't Claim "Early Warning"

In any event, the Soviets do not claim that Abalakova is an early warning radar; rather, they assert that it is for tracking objects in space. Radars of this type are commonly used for space tracking, and the United States has built at least one such radar primarily for this mission. However, most satellite tracking is done by early-warning and ABM battle-management radars on a part-time basis. Based on the apparent orientation and location of Abalakova, it could track only a small percentage of the satellites that orbit the Earth. Based on the location and orientation of comparable American radars, it would seem that Abalakova would be able to track less than 10% of the satellites presently in orbit. This coverage would duplicate that provided by the large ABM radars located at Moscow. Given the extensive space coverage provided by other Soviet radars, it seems rather unlikely that they would have built Abalakova just for this purpose.

Thus some analysts have been led to the conclusion that Abalakova is in some way connected with the Soviet ABM program. The technical characteristics of the radar itself are not entirely inconsistent with this conclusion. A large phased array radar of this sort is an important component of the ABM system. Abalakova could perform a function similar to that of the Perimeter Acquisition Radars (PAR) of the American Sentinel/Safeguard ABM system. The

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SIGNIFICANCE OF TREATY PROVISIONS CONCERNING RADARS

Large phased array radars are an essential component of conventional ABM systems. Such radars provide the initial warning of an attack, and battle management support, discriminating targets from decoys, and guiding interceptors to their targets. In general, conventional ground based ABM interceptor rockets do not carry their own radar transmitters; rather, they home in on the reflection of radar signals transmitted by ground-based radars.

Because of their size and complexity, large phased array radars can take several years to construct. In a sense, they are the "long lead-time item" for an ABM system. The restrictions on these radars imposed by Articles I and VI of the ABM Treaty were based on the recognition that it might be possible for a country to build the radars needed for an ABM system over a period of time, and then quickly deploy a force of ABM interceptors, which require much less elaborate preparations. However, the Treaty also recognized that large phased array radars are also used for tracking satellites and for early warning, and made provisions for such activities.

Phased array radars are a special type of radar, and it is important to understand how this sort of radar differs from other types. Mechanically steered radars use a dish antenna to project a narrow beam which must point directly at a target in order to detect it, and the dish must be moved if it is to follow the target. Radars of this type can only track one or two targets at a time, and are of limited usefulness for early warning. Electronically steered radars emit a beam in the shape of a thin fan, and any object passing through this fan can be detected. Several overlapping fans can provide information on the number of targets, but only limited information of their trajectory. Radars of this type are used by both the United States and the Soviet Union for early warning, but their tracking capabilities are too limited to be of much use for ABM battle management. Because of their limitations, neither of these types of radars are restricted by the ABM Treaty.

Phased array radars consist of an array of thousands of small radar transmitters that emit signals in phased patterns that can mimic the capabilities of both mechanically and electronically steered radars. Such a radar, with the help of powerful signal-processing computers, can detect targets over a broad area (typically about 60 degrees either side of the direction the fixed radar is pointing), and simultaneously track hundreds of targets with pinpoint precision at a distance of several thousand kilometers.

A typical large phased array radar is housed in a building that may be over ten stories tall, and as long as a city block. However, it is not the size of the radar transmitter, but rather the sophistication of the computers that process its signal, that determines the radar's capabilities. Over the years, American radars have grown smaller, and more capable. Soviet radars use very large transmitters to compensate for deficiencies in signal processing computers.

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radar could provide initial information on incoming targets, including the number and likely impact points of warheads.

The proximity of Abalakova to Soviet ICBM facilities at Alyesk (SS-18), Gladkaya (SS-11), Itatka (SS-11), Uzhur (SS-18) and Zhangiztobe (SS-18) has also been cited as evidence for the ABM function of Abalakova. However, there are few locations in the Soviet Union that are not close to at least some target of strategic significance. A Soviet decision to defend these missiles would be inconsistent with the widely held perception of the SS-18 as a first strike weapon that under Soviet doctrine would have no need of active defense. Defense of missile silos did not seem to be a high priority with the Soviets during the ABM Treaty negotiations, and there is no evidence to suggest that there has been a change in this Soviet view. Finally, the existing network of Soviet radars is adequate to provide coverage of the bulk of Soviet missile fields, and it is difficult to see what benefit would arise from this marginal improvement in coverage.

Not Optimized For Battle Management

Furthermore, the location and configuration of radar at Abalakova does not appear to be optimized for the ABM battle management function. The reasons that led analysts to question the early warning capabilities of Abalakova also disqualify it to perform the ABM duties that were assigned to the American Perimeter Acquisition Radar (PAR). The PAR, as its name implies, was to be located at the perimeter of American national territory, so as to provide the maximum possible amount of tracking time of potential targets prior to interception. Because of its inland location, however, the radar at Abalakova is poorly suited to this task. Although it is sometimes alleged that Abalakova would fulfill the PAR role in conjunction with rapidly deployable radars of the ABM-X3 type (which seem to be much larger than the Patriot, Aegis or LOADS radars) the poor location of Abalakova raises serious doubts as to the feasibility of this option.

Abalakova's location is more akin to that of the Sentinel/Safeguard Missile Site Radar (MSR), which guided interceptors to their targets. However, Abalakova differs from the MSR in several crucial respects. Whereas the MSR was essentially co-located with the area it was to defend, Abalakova is hundreds of kilometers from the areas that it is notionally supposed to defend. This would substantially degrade its defensive capabilities.

Under the Sentinel ABM system, the MSRs typically had from one to four radar faces, depending on the area defended and the notional threat structure. And under the Safeguard ABM, all of the MSRs had four faces to provide a full 360 degrees of coverage. However, Abalakova seems to have but one radar face, which is oriented toward the Northern Pacific. This is a very curious configuration for defending ICBM fields. If the main threat is from counterforce-capable submarine-launched ballistic missiles such as the Trident II, then there is a clear need for a radar face providing coverage of the threat tube from the Indian Ocean. Alternately, if the primary threat is from the MX, then the orientation of Abalakova is ill-suited for dealing with the threat tube, which emanates from the Arctic.

If the plain facts of Abalakova raise questions about its ABM capabilities, its political and technical context serve to re-enforce these doubts. A project of this scale is the product of an extended planning cycle. Given its present state of completion, it is reasonable to conclude that the Abalakova facility was initiated in the mid-to-late 1970s. It is difficult, if not impossible, to associate this time frame with any considerations that would have led the Soviets to decide to break out of the ABM Treaty (although this time frame does accord nicely with an alternative interpretation of Abalakova).

No Incentive For Abrogation

The present state of the Soviet ABM program provides little incentive for the Soviets to spontaneously abrogate the ABM Treaty, at least in the absence of severe provocation. Such provocation was certainly lacking in the late 1970s (though that situation may be changing). Although comparisons are difficult, at first approximation it would seem that Soviet ABM technology is presently comparable to American ABM technology of over a decade ago. Indeed the Abalakova radar itself is reminiscent of the FPS-85 radar that the United States deployed in the early 1960's, as both have very large separate transmit and receive antenna faces. The new SH-X-04 long range interceptor seems to be roughly equivalent to the Spartan missile. And the SH-X-08 short range interceptor (with a maximum acceleration of 50 G's), seems to be distinctly inferior to the American Sprint (with an acceleration of over 100 G's). The United States ultimately concluded that systems of this sort had little identifiable military utility against Soviet offensive forces in the early 1970's. In the face of a much more formidable threat, it is difficult to believe that the Soviets would come to a different conclusion.

Concern over the ABM potential of Abalakova, and suspicions aroused by the Soviet's explanation of this facility, are more a product of faulty deduction than of analysis of the facts. Since the radar is clearly suited neither for the early warning or the satellite tracking function, some analysts have fixated on the ABM role, without looking for further possible explanations. But the manifest inadequacy of Abalakova for the ABM mission suggests the need to look further to explain its role in Soviet planning.

The Soviets have maintained that Abalakova is intended to track satellites, and have reportedly advised the United States that once the radar is completed, it would become clear that this was its function. This suggests that there will be a clear demonstration of the radar in this role, which further suggests a rather more active demonstration than would be obtained for a radar deployed in the usually passive spacetrack role.

Most Plausible Function: ASAT Battle Management

The most plausible function of Abalakova is as a battle management radar for their anti-satellite (ASAT) weapon. This would be entirely consistent with the Soviet explanation of the radar, as well as with the observed character-

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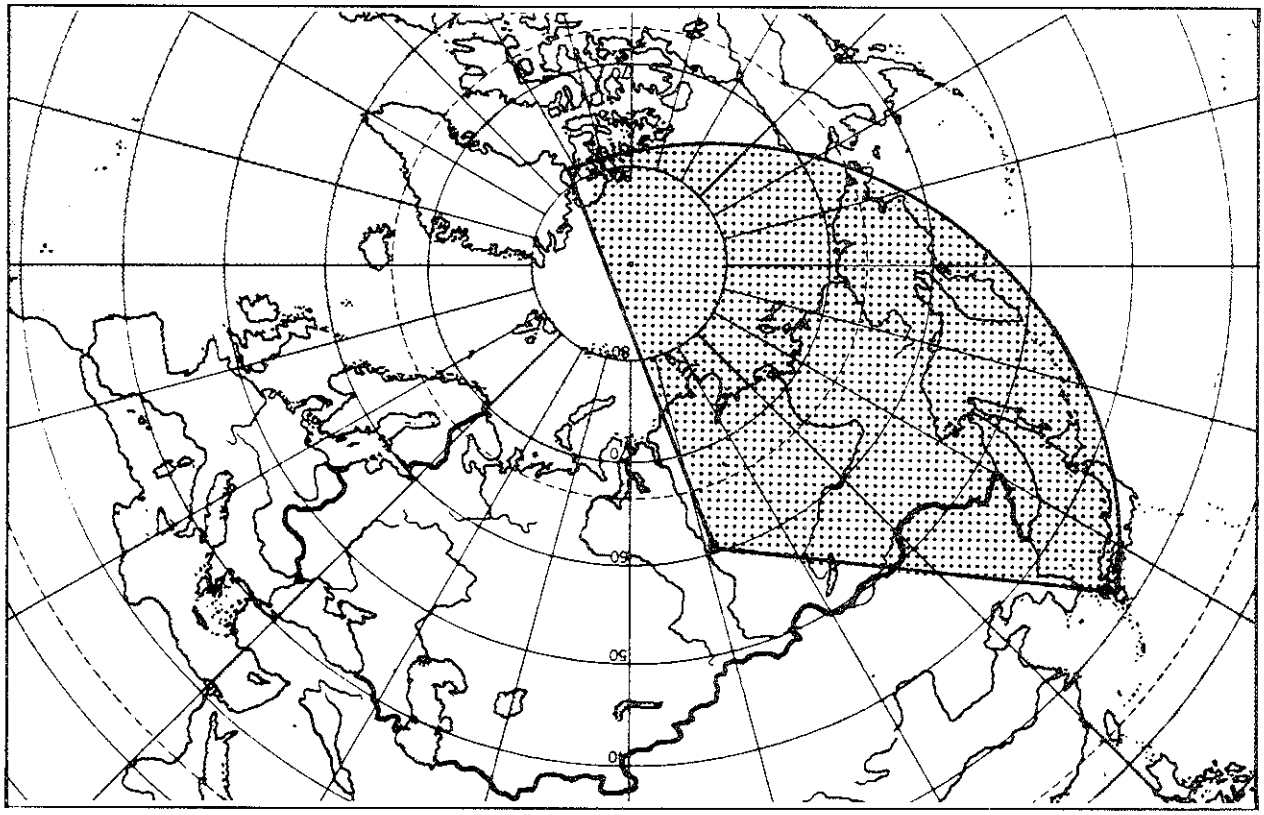
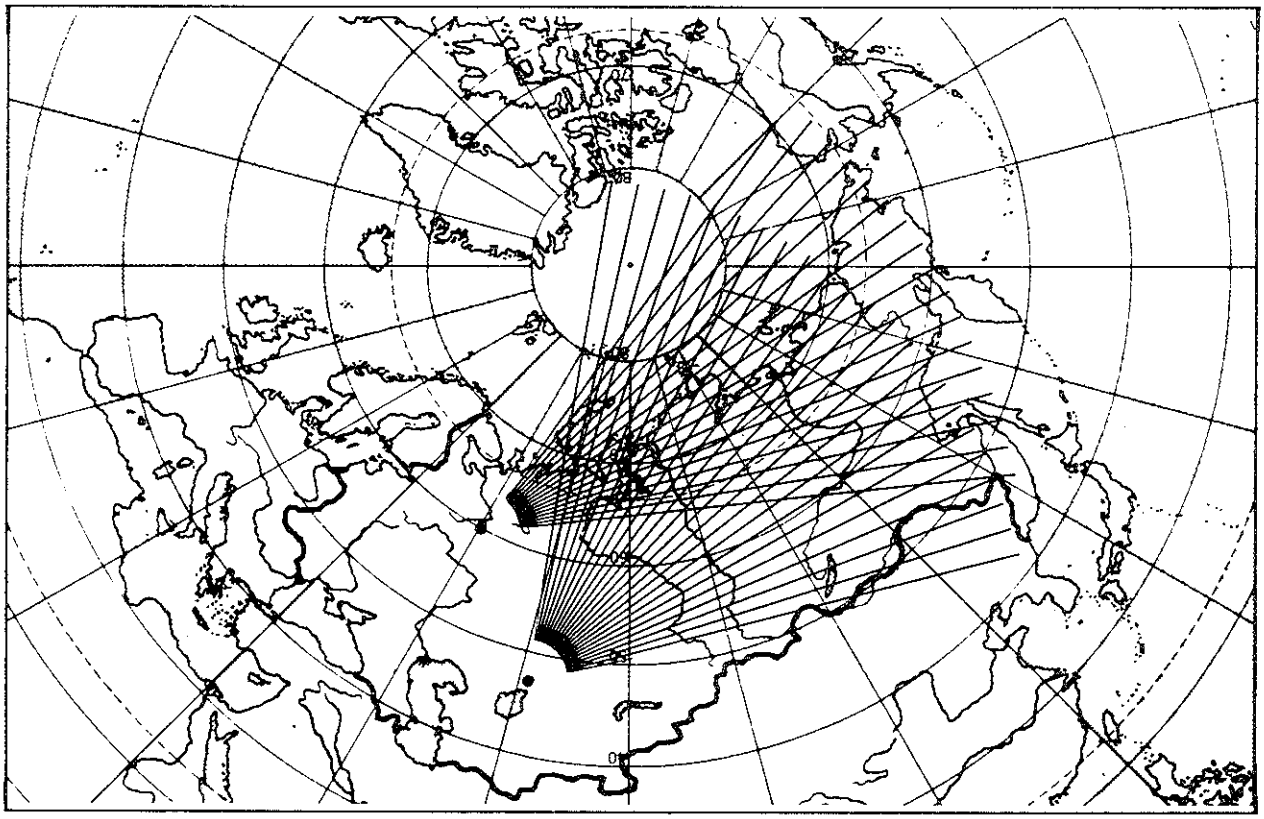
ESTIMATED COVERAGE FAN OF THE ABALAKOVA RADAR



POTENTIAL TRAJECTORIES OF SOVIET ANTI-SATELLITE INTERCEPTORS LAUNCHED FROM THE BAIKONUR AND PLESETSK COSMODROMES



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istics of the radar, and with recent developments in the Soviet ASAT program. The ABM Treaty permits radars for tracking satellites, without specifying the purpose for which the satellites would be tracked. From 1972, when the ABM Treaty was signed, until 1975, when the American Program 437 ASAT (which used a Thor booster rocket and a nuclear warhead) was dismantled, all U.S. phased array radars were part of an ASAT battle management network known as Spacetrack. The application of such radars to the ASAT role was thus clearly regarded by the U.S. as permitted under the ABM Treaty.

The Soviet ASAT program has used a co-orbital intercept technique which places the ASAT interceptor in an orbit that, with maneuvering by the radar-guided interceptor, permits an orbital rendezvous with its target. There are several disadvantages to this technique. The radar guidance on the interceptor provides the target with warning of impending danger. The Soviets have sought to overcome this problem by developing an ASAT that relies on passive sensors to home in on the heat of the target satellite. But in six tests, beginning in December 1976, this system has achieved only a single, qualified, success. Given the difficulties that the Soviets have experienced in developing infrared sensor technology of all sorts, it is not implausible that they decided to initiate the parallel development of another type of ASAT, in the event that the passive heat-seeking ASAT developed the sort of problems that in fact it has.

This possibility is further strengthened by the inherent limitations of the co-orbital rendezvous technique. The interception can take up to three hours to accomplish, allowing considerable time for the employment of countermeasures that could include maneuvering the target to escape or launching an interceptor to destroy the Soviet ASAT before it completes its mission.

U.S. Satellites In High Orbit

Under the Carter Administration it was decided to place most satellites in high orbits that were far beyond the range of the Soviet ASAT. Those which served vital functions that could only be performed in low orbits, such as photographic reconnaissance, were redesigned to include a significant maneuvering capability. The new American Air Launched Miniature Vehicle (ALMV) ASAT, which can attack targets at a maximum altitude of 2000 kilometers, has the potential to destroy a Soviet orbital ASAT before it reaches its target. Using forward staging airfields and aerial refueling, the American ALMV could intercept the Soviet ASAT within 20 minutes of launch. This reduces the effective battlespace of the Soviet ASAT to that part of space that is over Soviet territory.

Thus over the past several years Soviet ASAT work has concentrated on "pop-up" trajectories for reducing from three hours to perhaps 30 minutes the interval between the launch of the ASAT and the actual interception. This would reduce the warning time for the target, and permit the interception to take place over Soviet territory, free from observation by most US sensors, and beyond the reach of the American ASAT. Abalakova is ideally suited to this purpose, providing coverage down-range from the Baikonur ASAT base (as well as the Plesetsk space center which can also support ASAT launches), in just the area in space where such pop-up interceptions would take place, if they were to use a modification of the existing ASAT.

The use of a ground-based radar offers several additional operational advantages. The radar (or infra-red) sensors on the interceptor could be off-loaded and replaced with additional maneuvering fuel. The ground-based radar would normally scan each satellite as it passed overhead, and thus there would be little if any warning of tracking for targeting purposes. The very powerful ground-based radar would also improve the performance of the ASAT against rapidly maneuvering targets, as well as against targets that were using other survivability measures such as jamming or decoys.

Abalakova also completes the pattern of radar coverage of space above the Soviet Union. This would provide an important addition to the capabilities of a possible next-generation Soviet ASAT, similar to the American ASAT, which might use air-launched rockets in a pop-up intercept trajectory.

Considered in this light, the Soviet interpretation of Abalakova as a spacetrack radar makes considerable sense. However, questions remain as to how to reconcile this activity with the ABM Treaty regime, as well as with American national security interests.

Resolution

The interpretation of Abalakova as an ASAT battle-management radar do not resolve all the questions concerning its consistency with the ABM Treaty. "Gray area" ambiguities of this sort will become increasingly problematic for the Treaty in the future, as development of more advanced ASATs continues. Between now and the next review conference for the Treaty in 1987, the two countries will have to decide between fundamentally strengthening and extending the ABM Treaty, or fatally weakening it. If the later alternative is to be avoided, the former course must be embraced. Ambiguities of the sort posed by Abalakova must be resolved by mutual restraint, or the Treaty regime will be quickly eroded.

The Soviets have raised several analogous questions about American compliance with ABM Treaty provisions concerning radars, and their concerns are not without merit. Of particular note are the two new PAVE PAWS early warning radars that are under construction in Georgia and Texas. Despite efforts to re-orient these radars, their 240° field of coverage continues to include significant portions of the continental United States. It is doubtful that these radars could be reasonably regarded as entirely consistent with the Article VI requirement that such radars be oriented outward, and thus they might be construed as providing a base for the defense of territory prohibited by Article I of the Treaty. These radars are very similar in performance to the PAR radars planned for the Sentinel/Safeguard ABM system in the 1960's. In 1978 the Soviets raised objections to the first two PAVE PAWS

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radars, in California and Massachusetts. Those radars, however, had much less extensive territorial coverage.

Possible Solutions

There are several measures that the U.S. and USSR could agree to that would lessen the problems posed by Abalakova. The two countries could agree to advance notification and consultation prior to the deployment of radars with a power aperture product in excess of three million. This would reduce the uncertainty and suspicion that has arisen from the Abalakova incident, and would permit the resolution of potential compliance issues before they achieve the status of an accomplished fact.

The two countries could also agree not to deploy in the future any phased array radar with a power aperture product in excess of three million, of a type tested in an ABM mode, except as a permitted early warning radar, or as a permitted ABM radar at ABM test ranges, or at the one permitted ABM site. A type rule of this sort would reduce the ambiguity that has arisen from Abalakova, while "grand-fathering" Abalakova itself. The parties could also agree to more precise numerical descriptions of the "—at the periphery, oriented outward" definition of early warning radars.

Finally, the two countries could agree to dismantle or modify the construction of any existing radar that is not consistent with these agreed rules. The United States could agree to reduce the breadth of coverage of the two new PAVE PAWS to bring them into better compliance with the Treaty (such modifications have already been discussed, based on military considerations). And the Soviets could cease construction of the radar at Abalakova.

However, if Abalakova is indeed an ASAT battle-management radar, it may be very difficult to persuade the Soviets to dispense with an important component of their ASAT system, while the United States retains components of an analogous function, though different construction, such as the mechanically steered radars of the Pacific Barrier network, which are used for ASAT targeting.

If it is decided that activities that would be prohibited under the ABM Treaty are permitted so long as they are characterized as being for ASAT purposes, this would open a Pandora's box of treaty chiseling. The alternative, however, is an effective and comprehensive treaty limiting anti-satellite weapons. If the United States is seriously concerned about Abalakova, it will have to take into account the asymmetries between the Soviet and American ASAT programs. However, these asymmetries must not be allowed to preclude an ASAT Treaty, or to destroy the ABM Treaty. □

THE QUESTION OF THE SS-X-25 ICBM: Are the Soviets testing *two* new ICBMs?

Summary

SALT II permits each side to flight-test and deploy only one "new" ICBM. The Soviets have advised us that their new missile would be a 10-warhead ICBM called the SS-X-24.

They have also proceeded with the flight-testing of a single-warhead missile called the SS-X-25 or PL-5. The United States considers this missile an entirely "new" missile type, and has accordingly charged the Soviet Union with a probable violation. However, a missile is considered "new" under the Treaty only if it can be shown to be different from an existing missile by more than five percent in its major parameters.

The Soviet Union claims that the SS-X-25 is really just an allowed (within five percent) modification of the existing SS-13 built in the late 1960s. To U.S. objections that the SS-X-25 has a much greater throw-weight than the SS-13, the Soviet Union has responded that the U.S. lacks reliable information on the SS-13, which was tested in an age of less effective surveillance techniques, and has miscalculated the missile's throw-weight.

The United States has also claimed that the weight of the SS-X-25 reentry vehicle (RV) is only 40 to 50 percent of the total missile throw-weight, and thus in violation of a SALT provision designed to prevent either side from acquiring a capability to "break out" of the Treaty by adding additional warheads to single-warhead missiles. The Soviets deny it; in any case, an RV that exploits at least 40 percent of the total missile throw-weight will not permit more than one, if any, additional warheads to be added to the missile.

It seems likely that the Soviet Union considered the SS-13 follow-on method when the SALT II Treaty was drafted, and consider this a loophole they had planned to utilize. Unless the United States can demonstrate that the SS-X-25 parameters vary by more than five percent from the SS-13, or that the RV throw-weight is definitely below 50 percent of that available, this activity would not seem to be a probable violation.

Tests At Plesetsk

In late October 1982, the Soviet Union began testing a new MIRVed ICBM from their test center at Plesetsk. The Soviets informed the United States that this missile, dubbed the SS-X-24, constituted their one new type allowed under SALT II. On February 8, 1983, a second missile, known as the SS-X-25, was also tested from Plesetsk. The Soviets gave no formal explanation of its status. The missile is known to have been subsequently tested at least three times.

The SS-X-25 was immediately identified by U.S. intelligence sources as a three-stage, solid-fueled missile. It is also known to carry a bus and to be capable of mobile deployment. There was, and still is, some doubt about its specific dimensions and characteristics. The telemetry, or electronic data, from all tests has been reportedly encrypted to a significant degree. Furthermore, U.S. surveillance ships located in the Bering Sea (near the

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missile impact zone) were reportedly not operational during at least one test.

The United States was immediately concerned that the second missile fired from Plesetsk qualified as a second, and illegal, new type of missile. In response to U.S. queries, the Soviet Union stated that it was an allowed modernization of the SS-13, a three-stage, solid-fueled missile deployed in the late 1960s. In early 1983, Administration officials privately claimed that the SS-X-25 was substantially different from the SS-13 in dimensions and throw-weight. As such it was in violation of the SALT II restriction that a modernized missile must meet the criteria that its length, diameter, launch-weight and throw-weight remain within 5 percent of that of a single already existing missile type. But following an interagency review in March 1983, the President announced on March 23 that it was "difficult to establish and have hard and fast evidence that a treaty has been violated." While the Administration has publicly claimed that the SS-X-25 is a probable violation of the new missile type rule, officials have conceded that not enough information is known about the SS-13 to substantiate a direct accusation.

The Administration has, however, directly accused the USSR of violating another SALT II provision that requires that the reentry vehicle weight of any single-warhead missile be at least 50 percent of the total missile throw-weight. Earlier reports indicated that U.S. intelligence sources had identified the SS-X-25 RV weight to lie within 40 to 50 percent of the total missile throw-weight, although more information may have been obtained.

The Reagan Administration has raised the question of the SS-X-25 at the Standing Consultative Commission (SCC) and in high-level meetings, notably with Soviet Ambassador Anatoly Dobrynin in May, 1983. The Soviets have responded that the United States has based its claims on inaccurate data collected on the payload of the SS-13. According to the Soviet Union, this has resulted in a miscalculation of SS-13 throw-weight, and thus of the difference in throw-weight between the SS-13 and the SS-X-25. The Soviets have also reiterated that the weight of the SS-X-25's reentry vehicle is greater than 50 percent of the missile's total throw-weight. They have implied that during missile testing a lighter instrument package was substituted for the reentry vehicle.

Limiting ICBMS: An Old Dilemma

The present dispute over the SS-X-25 should be placed in an historical context, for it represents the latest chapter in a decade-long dispute over SALT-related ICBM limitations. The goal of restricting the development and modernization of ICBMs has proven one of the most difficult and complex tasks of the SALT process. Both sides have consistently sought to block the other's newest and most threatening forces while creating loopholes for their own programs. With equal regularity, the United States has made the mistake of assuming that loosely constructed provisions or informal agreements are adequate substitutes for carefully stipulated limitations.

In SALT I, U.S. negotiators tried to negotiate a fairly strict definition of "light" versus "heavy" ICBMs. Wishing to preserve their option of deploying the new SS-19 as a "light" missile, the USSR resisted these attempts. After SALT I had been signed, the United States issued a unilateral definition, which would have categorized the SS-19 as a heavy. Although the Soviets never accepted it, many SALT critics later thought the USSR circumvented the treaty's ban on new heavy launchers by deploying SS-19s.

During the SALT II negotiations, the U.S. and Soviet delegations had to resolve significant differences on two central issues: (1) the number and type of new ICBMs to be allowed and (2) the distinction between a modification and

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SS-X-25

TREATY PROVISIONS

1. "Each Party undertakes not to flight-test or deploy new types of ICBMs, that is, types of ICBMs not flight-tested of May, 1979, *except that each Party may flight-test and deploy one new type of light ICBM*" (Article II, paragraph 9).

2. "The term "new types of ICBMs...refers to any ICBM which is different from those ICBMs flight-tested as of May, 1979 in any one or more of the following respects:

(a) the number of stages, the length, the largest diameter, the launch-weight, or *the throw-weight,* of the missiles;

(b) the type of propellant (that is, liquid or solid) or any of its stages" (First Agreed Statement).

3. "...the term 'different,' referring to the length, the diameter, the launch-weight, and the throw-weight, of the missile, *means a difference in excess of five percent*" (First Common Understanding).

4. "...the term 'different'...means a difference in excess of five percent from the value established for each of the above parameters *as of the twenty-fifth launch or as of the last launch before deployment begins, whichever occurs earlier*" (Second Common Understanding).

5. "Each Party undertakes:

(b) not to flight-test or deploy ICBMs equipped with a single reentry vehicle and without an appropriate device for targeting a reentry vehicle, *of a type flight-tested as of May 1, 1979, with a reentry vehicle the weight of which is less than the weight of the lightest reentry vehicle on an ICBM of a type equipped with MIRVs...*"

(c) not to flight-test or deploy ICBMs equipped with a single reentry vehicle and with an appropriate device for targeting a reentry vehicle, of a type flight-tested as of May 1, 1979, *with a reentry vehicle the weight of which is less than fifty percent of the throw-weight of that ICBM*" (Third Agreed Statement, paragraphs (b) and (c)).

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a new missile type. In regards the former, the United States first sought to ban new ICBMs and then tried to permit the future deployment of the MX by proposing that each side be allowed one new MIRVed ICBM. On their part, the Soviets maneuvered to protect their single-warhead new type of ICBM (a planned solid-fuel successor to the aging SS-11) while prohibiting the American MX. The Soviet delegation therefore proposed that the new type ICBM be restricted to a single-warhead ICBM, but later stated a willingness to accept a total ban on new ICBMs of any type. At this point the United States and Soviet Union had exchanged positions in that both had proposed a ban on new ICBMs, but at different times. Perceiving neither humor nor advantage in the "Soviet" proposal, the United States rejected it, and a compromise position allowing an unspecified new type of light ICBM was agreed upon.

Early in the SALT II negotiations, the Carter Administration attempted to negotiate a stringent ban on all ICBM modification, including alterations in guidance systems and reentry vehicles. This approach was soon abandoned due to opposition from American as well as Soviet quarters. Like their Soviet counterparts, the Defense Department recognized that a total modification ban would impinge on planned modernization programs, such as maneuvering reentry vehicles (MARV). It also became clear that any alteration less than five percent would be difficult to detect by aerial photography and remote monitoring. Thus, in 1978 the U.S. and Soviet delegations agreed to the substance of the five percent modification restrictions on missile size, dimensions, launch-weight and throw-weight.

In order to prevent one side from suddenly breaking out of the Treaty by adding warheads to existing missiles, the two parties did agree to weight restrictions on reentry vehicles. Close observation of tests had demonstrated that with most Soviet ICBMs, as with American missiles, the weight of the warhead cluster with its reentry vehicles accounts for approximately half of the total throw-weight. The other half consists of the bus, guidance system, propellant and sometimes penetration aids. The bus or "post-boost" vehicle dispenses warheads toward their targets as it reenters the atmosphere. To preclude a single-warhead missile with a bus from attaining a capacity to add more reentry vehicles, the signatories agreed to prohibit any RV that was less than 50 percent of the total missile throw-weight.

A Forgotten Missile

The restrictions on ICBM modifications were never designed to obstruct the next generation of Soviet SS-17, SS-18 and SS-19 missiles. As one high-level official observed, "What we are going to do is to allow the Soviets to make endless, elegant modifications within a strict set of parameters." Most Carter Administration officials were confident, however, that the Treaty provisions would limit the Soviet Union to one significantly different new type of missile. It was generally accepted that the Treaty would force the Soviets to choose between a solid-fuel, single-warhead successor to the SS-11 or a new light MIRVed missile, similar to the MX.

Whatever the prevailing American opinion, there is good reason to believe that the hard-bargaining Soviets had other plans. After the 5 percent modification rule had been agreed upon, the Soviet delegation suddenly suggested that missile parameters be restricted only for outward expansion, a provision that would have allowed the unlimited development of smaller missiles. U.S. analysts speculated at the time that the Soviet Union was attempting to create a loophole that would permit them to build a new, medium-sized MIRVed ICBM, as well as a single-warhead replacement for either the SS-11 or the unsuccessful SS-16. The Soviets may have found that loophole in the all-but-forgotten SS-13.

The SS-13 was first tested in 1965 and deployed between 1967 and 1969. As a solid-fuel missile carrying a relatively small warhead (1 MT), the SS-13 represented a significant shift from earlier Soviet ICBMs. It was by most accounts intended to serve as a secure hedge against a U.S. first-strike: its propulsion system made it suitable for mobile deployment. However, serious technical problems associated with its guidance system and solid-fuel motor impeded its development and only 60 were ever deployed.

Legal and Technical Uncertainties

Not enough is known about either the SS-13 or the SS-X-25 to substantiate charges of a SALT violation. The United States never obtained complete data on the launch-weight and throw-weight of the SS-13, which was tested in the mid-1960s. The SS-X-25 has only been flight-tested four or five times, an insufficient number for the United States to assess the Soviet implication that it has been using a lighter instrument package, rather than the actual reentry vehicle. While American monitoring capabilities have determined the missile's major characteristics, a combination of telemetric encryption and temporary lack of American surveillance has impeded a complete analysis of the missile in question.

Some analysts have pointed out that because the SALT II restrictions on missile modifications only go into effect after the twenty-fifth test of a new missile, the SS-X-25 could technically be classified as an allowed variation of the SS-X-24. As long as the Soviets maintain that the SS-X-25 is a modification of the SS-13, this argument cannot be considered valid. Some Administration officials have also speculated that the Soviets may argue that the SS-X-25 is governed by paragraph (c) of the Third Agreed Statement, which applies to single-warhead missiles, without a bus, tested before 1979. While the SS-X-25 has a bus, its claimed predecessor, the SS-13, does not. As the clause governing such missiles without a bus allows a much more flexible RV weight, the SS-X-25 would clearly comply with its provisions. Although a debatable point, the Soviets have not chosen to pursue it.

There clearly exist certain technical and legal ambiguities that must be resolved before the question of a violation is firmly established. From the American point of view, the Soviet Union has violated the spirit, if not the letter, of the SALT II restriction of one new missile type. A missile tested in 1983 is likely to have some significant differences

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from one developed in the mid-1960s. With more foresight, however, the United States would have specified which Soviet missiles were eligible for modernization, and which were to be banned, as indeed it did with the SS-16. As long as there is no conclusive evidence that the SS-X-25 exceeds the SS-13 on crucial parameters by more than 5 percent, it cannot be considered a SALT violation.

No Security Threat

SALT II is essentially an imperfect legal document designed to enhance the security and stability of both sides. If the legal provisions or technical evidence seems ambiguous, each party must determine whether the activity in question jeopardizes its security, and thus its ability to comply with the Treaty. In this respect, it is important to note that the SS-X-25 poses no foreseeable threat to American security. In general characteristics and function, the SS-X-25 is very similar to the SS-13. Both missiles seem to have been designed to provide mobile, secure reserves against the threat of an American first-strike attack.

The Soviet move toward less vulnerable and less threatening single-warhead mobile missiles has in fact been advocated by many government officials and defense analysts, including the Scowcroft Commission. Even if the SS-X-25 reentry vehicle weight is below 50 percent of the total throw-weight, it is not light enough to substantiate any fears of a break-out. With an RV in the 40 to 50 percent range, it is improbable that even one extra warhead could be added. Finally, the development of the "Midgetman" missile will give the U.S. a comparable mobile missile by 1992.

The Reagan Administration should continue to pursue the question of the SS-X-25 in serious discussions within the SCC. In particular, it should seek a reduction of telemetric encryption on future tests, so as to facilitate an accurate determination of its RV weight. Missile testing programs usually require several years of testing, and often involve substantive modifications. It is not beyond the realm of possibility that if the Soviets have indeed exceeded the throw-weight restriction, and if the Reagan Administration exerts the correct diplomatic pressure, the USSR could choose to modify its reentry vehicle to comply with SALT II.

The Soviet response will depend largely on the Reagan Administration's approach to both arms control and U.S. strategic initiatives. Although the Administration is conditionally committed to SALT II, the President and other high officials have leveled considerable criticism against the document. The Treaty, which expires in 1985, does not seem likely to be extended by a second-term Reagan Administration. Meanwhile, the Administration's commitment to two new ICBMs, the MX and the Midgetman, demonstrates the government's intention to ignore the same SALT II provisions by the late 1980s. Soviet officials have indicated that their compliance with the Treaty is contingent on American actions and intentions. If new, constructive arms control initiatives that restrict new ICBMs are not soon forthcoming, the Soviet leadership may have little incentive to cooperate in the resolution of this issue.

POSSIBLE DEPLOYMENT OF SS-X-16 IN MOBILE MODE AT PLESETSK

Summary

The question of whether the SS-X-16 ICBM is operationally deployed at the Soviet rocket test facility at Plesetsk is clearly the least important SALT-related issue included in the Administration's compliance report. The report concedes that "the evidence is somewhat ambiguous and we cannot reach a definitive conclusion." Nonetheless, the report concludes that "the activities at Plesetsk are a *probable* violation" of the SALT II agreement.

Indeed, so meager is the evidence to support this concern that it is difficult to understand the basis for its inclusion in the compliance report. Previously, the Reagan Administration has stated its conclusion that the SS-X-16 was *not* deployed operationally at Plesetsk, and there is no evidence to suggest that this situation has changed since these statements were made. There are literally dozens of similarly ambiguous and inconclusive issues that could have been included with equal justification (or lack thereof).

Analysis

The SS-X-16 (the "X" stands for experimental) is a three stage solid-fueled ICBM. Development of this rocket, a follow-on to the SS-13, began in the mid-1960s, with the first flight test in 1970. During the SALT II negotiations the American side was concerned by the similarity between the SS-X-16 and the SS-20, an intermediate-range rocket that is based on the first two stages of the SS-X-16. Because of its limited range, the SS-20 would not normally be counted under SALT. However, the similarity between the two missiles posed the danger that, in a time of crisis, SS-20s could be rapidly upgraded to SS-X-16s by the addition of a third stage.

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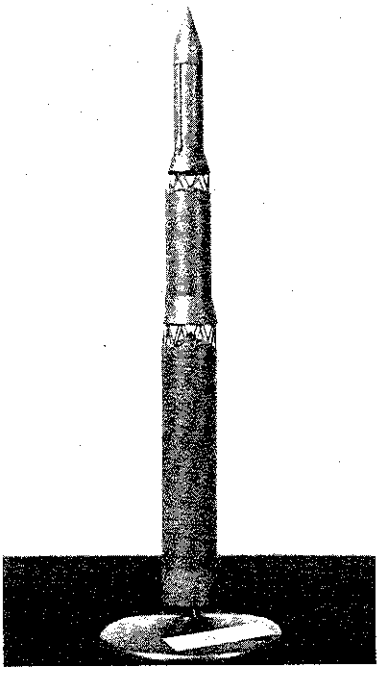

The SS-13 is the predecessor of the SS-X-16 and the SS-X-25.

SALT II ON THE SS-X-16

1. "Each Party undertakes not to convert land-based launchers of ballistic missiles which are not ICBMs into launchers for launching ICBMs, and not to test them for this purpose" (SALT II Treaty, Article III, paragraph 8).

2. "During the term of the Treaty, the USSR will not produce, test or deploy ICBMs of the type designated by the USSR as the RS-14 and known to the United States as the SS-16, a light ICBM tested after 1970 and flight tested only with a single reentry vehicle" (SALT II Treaty, Article III, paragraph 8, Common Understanding).

3. "Each Party undertakes not to deploy mobile ICBM launchers or to flight test ICBMs from such launchers" (SALT II Protocol, Article 1).

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Soviet agreement to a prohibition on the testing, production and deployment of the SS-X-16 was a major breakthrough in the SALT II negotiations. This was the first time that either side had agreed to cancel a new offensive weapon system prior to deployment. The most important aspect of the Soviet concession was the ban on testing. In test flights in the early 1970s the SS-X-16 had been a rather dismal performer. In particular, the crucial third stage of the missile experienced repeated failures. The ban on the testing of the SS-X-16 prevented the Soviets from perfecting the third stage, and neatly solved the problem of how to deal with the SS-20.

Under the provisions of SALT II the Soviets retained an inventory of SS-X-16s that were produced as part of the testing program. The number of these missiles is estimated at between 40 and 200 (the smaller number is probably closer to the mark). These missiles are stored in a warehouse at the Plesetsk missile test center. The Soviets also retained a small number of mobile launchers that could be used to fire the SS-X-16. These launchers have been variously designated in the West as the Scrooge, SS-X-15 or SS-XY. These launchers are also located at Plesetsk.

The Administration's complaint is that the remaining SS-X-16s could be quickly removed from their warehouse and inserted into the Scrooge launchers. According to their reasoning, this residual capability constitutes an operational deployment. There are a number of reasons for questioning this assessment. The test program of the SS-X-16 was never very successful, and the rocket has not been tested at all since 1975. Thus it is very difficult to assign any real operational readiness to this system. The very small number of rockets involved would be unlikely to attract the attention of Soviet war-planners, nor should it attract concern by their American counterparts.

There is nothing particularly unusual or suspicious about the presence of the SS-X-16s or the Scrooge at Plesetsk. This presence is consistent with American practice. The United States retains a number of old and obsolete missiles in storage, including the Minuteman I ICBM, Polaris SLBMs and Sprint and Sentinel ABMs.

On several previous occasions, Administration statements have reflected the meager evidence for a SS-X-16 compliance problem. Responding to charges by Senator McClure, Richard Perle, in a 1982 interview, noted that "The statement that they have deployed the SS-16 goes beyond the evidence available to us." In response to a direct question by Senator McClure on 1 March 1983 "Does the Air Force believe that Soviet mobile SS-16 ICBMs are deployed at the Plesetsk test range?" the written Defense Department response was "No, we do not believe mobile SS-16s are operational at the Plesetsk Test Range."

Resolution

Given the admitted ambiguity of the evidence on the SS-X-16, it is far from clear that this is a compliance issue in need of resolution. The Soviets seem to be in compliance with the relevant provisions of the SALT II agreement, at least to the limits of verification by national technical means. Any concerns about the SS-X-16 must revolve around possible inadequacies in the original agreement, rather than compliance with the agreement's terms. In any event, the actual military significance of this issue is really quite difficult to identify.

To the extent that there is an interest in achieving greater assurances of the non-deployment of the SS-X-16, there are ample precedents for possible courses of action. The Standing Consultative Commission has developed agreed procedures for dismantling strategic launchers in a verifiable manner, and these could be applied to the SS-X-16. The surplus Scrooge mobile launchers could be dismantled in accordance with these procedures, resolving any questions about their status. Verifiable procedures are also available for dismantling the SS-X-16 rockets themselves. Questions about the number of rockets in storage at Plesetsk could be resolved by requiring the dismantlement of the entire storage facility.

These means of resolving the SS-X-16 issue must be weighed against the significance of the issue, and likely Soviet responses to these suggestions. In the best of all worlds, perhaps these measures should be implemented. However, within the larger arms control context, the SS-X-16 must rank very low on the agenda. An American effort to induce the Soviets to dismantle the existing SS-X-16s could result in a Soviet counter-demand that the United States reciprocate by dismantling surplus Minuteman Is or IIIs. This would not be a particularly productive avenue to follow.

In the final analysis, resolution of the SS-X-16 deployment issue should follow the axiom "if it ain't broke, don't try to fix it." The Soviet concessions in SALT II were a major accomplishment. There is no evidence to suggest that the Soviets are presently not in compliance with the terms of the agreement. The present situation poses no identifiable threat to American security. We should leave well enough alone.

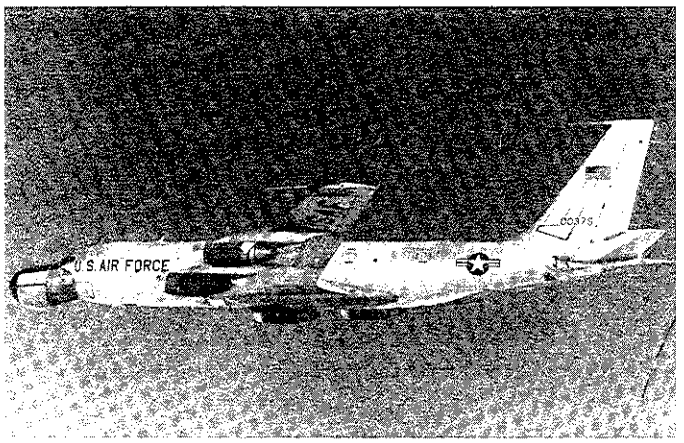
SOVIET ENCRYPTION OF MISSILE TELEMETRY
Has the coding of missile tests violated SALT II?

Summary

Both the United States and the Soviet Union "listen in" to the data sent back from space from the missile tests of the other. Because restrictions on missile characteristics require monitoring these tests rather closely, the two sides agreed during SALT II to prohibit the practice of coding this electronic data, or telemetry, whenever such deliberate concealment "would impede verification by national technical means of compliance."

Since the encryption, or coding, of telemetry is not banned outright, there is inevitable ambiguity over when encryption is impeding verification. The United States has claimed that the encryption of information from new Soviet ICBM and SLBM tests, particularly on the SS-X-25, violates SALT II. The Soviet Union has argued that its encryption practices are not impeding verification, and that the matter could be resolved if the U.S. would specify which telemetric channels it needs for verification—something the Administration has reportedly declined to do.

This clearly is an area that requires further discussion to sharpen the definition of the provision and its meaning. As a historically sensitive and controversial issue, its resolution will also require serious, private exchanges, not debates in the public arena.



RC-135 telemetry interception aircraft

Ultimately, the significance of any Soviet violation in regard to encryption is limited by the existence of other American means to monitor SALT II compliance. Where telemetry is most important is in the observation of specific missile characteristics, such as the throw-weight of the SS-X-25 missile and its reentry vehicle. But potential cheating on the RV throw-weight bears little strategic significance—being much less important than the wholly permitted changes in missile accuracy—while the numbers of this missile are totally verifiable and regulated under SALT.

Bargaining Over Encryption

Telemetric encryption posed one of the most contentious

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ENCRYPTION

TREATY PROVISIONS

1. "Each Party undertakes not to interfere with the national technical means of verification of the other Party..." (Article XV, paragraph 2).

2. "Each Party undertakes not to use *deliberate concealment measures which impede verification by national technical means* of compliance with this treaty" (Article XV, paragraph 3).

3. "Each Party is free to use various methods of transmitting telemetric information during testing, including its encryption, except that...neither Party shall engage in deliberate denial of telemetric information during testing, including its encryption, such as through the use of telemetry encryption, *whenever such denial impedes verification of compliance with the provisions of the Treaty*" (Second Common Understanding).

TELEMETRY AND COMPLIANCE

Telemetry is the electronic means by which a rocket, or a stage of a rocket or a warhead, sends back to earth data about its performance during a test flight. Telemetry generally consists of between 40 and 60 separate channels carrying a wide range of information pertaining to a test missile, including its trajectory, speed, acceleration, fuel consumption and warhead releases. Although telemetry is designed to aid a nation in evaluating the performance of its test missiles, telemetry can also be monitored by outside parties. By combining information from different channels, U.S. analysts can determine the launch-weight, throw-weight, and other characteristics of Soviet missiles and their components.

Both the United States and the USSR have historically engaged in the encryption, or coding, of missile telemetry to protect sensitive military information, such as missile accuracy. The United States has employed encryption while testing some shorter-range missiles, a single-warhead ICBM, and information on the performance of an ABM radar. The United States has also used capsules to retrieve information about the performance of ICBM components during reentry, when extreme temperatures made telemetry transmission impossible. The use of such capsules in effect denies the monitoring of any test data.

Although telemetry is an important source of information on Soviet missiles, it is only one of several means the United States has at its disposal for monitoring compliance with SALT. A global network of radars, satellites, ships and planes monitor Soviet test missiles from their take-off in the southwestern USSR to their impact areas in the Kamchatka Peninsula or Northern Pacific. Telemetry is not required to verify the majority of significant SALT provisions, such as limitations on missile and warhead numbers. It is important for the determination of specific missile and warhead characteristics, such as throw-weight.

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issues of the SALT II negotiations. While many within the American SALT delegation favored a looser restriction, the CIA and other elements of the American intelligence community adamantly argued for a complete ban on encryption. U.S. efforts to restrict encryption were also complicated by its hesitancy to discuss telemetry in detail for fear of revealing its monitoring capabilities. Meanwhile, American efforts to set definitive restrictions on encryption raised traditional Soviet suspicions that the United States was attempting to seek military secrets under the guise of verification. Although the Carter Administration decided not to seek a total ban on encryption, which would have also restricted American activities, it sought to achieve a formal recognition that some forms of telemetric encryption would be prohibited. After delicate negotiating, a compromise position banning encryption "whenever it impeded verification" was agreed upon.

This may have proved sufficient had it not been for two SS-18 tests on July 29 and December 21, 1978, which were both heavily encrypted. For the first time, information that would help the United States determine reentry vehicle characteristics and missile throw-weight was encoded. Because throw-weight was one of the parameters restricted by SALT, U.S. intelligence services wished to ensure that such encryption was formally prohibited. Although the Soviets refused to directly acknowledge that in the future such encryption would violate SALT, Soviet Ambassador Anatoly Dobrynin accepted a note from Cyrus Vance stating that SALT should ban any encryption which impedes verification, "as indeed it did on July 29 and December 21."

A Problematic Provision

The Soviet statement made at the Vienna summit in June 1979, was reported by the Executive Branch to say "there must be no encryption of information involving parameters covered by the Treaty, that there was an understanding between the Parties on this issue..." Commenting on this statement, the staff report accompanying the SALT II Treaty stated that it seemed to acknowledge that there were some parameters in telemetry whose denial would impede verification of compliance. But the staff report also made clear that *"there are no agreed criteria, however, for determining when denial of telemetric information could impede verification."*

Many of the major actors in SALT II were comfortable with this sort of ambiguity. Because telemetry was only one of many national technical means of verifying the Treaty, Ambassador Paul Warnke and other U.S. negotiators remained confident that the United States could quickly discern when encryption was being employed to deny important information. And while the USSR was free to encrypt intelligence secrets, the United States could raise through the SCC any suspicions over the encryption of information necessary for SALT compliance. The U.S. intelligence community, however, retained serious misgivings over the inadequacy of the restrictions on encryption. Controversy over SALT II's verification provisions also posed a major impediment to the Treaty's ratification in the Senate.

Two years after the signing of SALT in June 1979, Soviet encryption practices became problematic. The Soviets reportedly have been encrypting significant portions of the telemetry from ICBM and SLBM tests since 1981. Specifically, the USSR is known to have encrypted data from the SS-X-24 and SS-X-25 ICBMs, as well as its new multiple-warhead SLBM, the SS-N-20. Although the level of encryption is classified, it has been reported at levels between 30 and 98 percent. There is also concern that the USSR has been denying the transmission of telemetry through the use of capsules or highly directed signals.

Attempts to resolve this issue have run aground over the ambiguity of the stated provisions, traditional concern for not revealing intelligence sources and the ambivalence of the Administration over SALT II. After hesitating for months—reportedly for fear of lending legitimacy to the unratified Treaty—the Reagan Administration raised the issue of encryption at the SCC and through diplomatic exchanges in 1983. The USSR has responded that its employment of encryption has not impeded the verification of SALT provisions. Official sources have privately indicated that the Soviet Union has also stated that if the United States would indicate what telemetric channels it needed for verification, the subject could be discussed. The United States has responded that the Soviets already knew what channels were required, and that further discussion was not necessary, these officials said.

Redundant Capabilities

While excessive Soviet encryption is a troubling issue, with definite implications for Soviet credibility, it is more a legal and technical question than a serious military matter. Even if the Soviets were to engage in a total encryption of information from missile tests, it would not represent a serious threat to American security. Telemetry provides a secondary, redundant information source for an extensive network of surveillance equipment on satellites, ships and planes. In those cases for which telemetry is important—such as in the precise determination of RV throw-weight—Soviet encryption violations cannot obscure any real military advantage. If anything, excessive encryption spurs the other party to scrutinize the activity being encrypted, as has happened with the SS-X-25.

The fact that the USSR is encrypting to a substantial degree does not automatically constitute a SALT violation. SALT II only prohibits encryption which impedes verification of the Treaty provisions. Whether encryption is impeding verification depends on what channels have been blocked. But SALT II never defined what channels were necessary for verification, nor under what circumstances telemetric denial impedes verification. As the staff report to the SALT II Treaty pointed out, the result was that no criteria for determining when encryption impedes verification was ever established.

On the basis on the SALT II provisions and several diplomatic exchanges during the negotiations, the United States is probably justified in claiming that the USSR has

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violated the restriction on encryption. From the U.S. point of view, Soviet encryption is impeding its verification of compliance. But this may, or may not, be the Soviet view. Given the ambiguity within the relevant provisions, it is up to the United States to make clear to the Soviet Union what is impeding verification and what degree of encryption is acceptable. Although excessive Soviet encryption has been a matter of concern for several years, the Reagan Administration has only actively engaged the USSR on this issue since the latter half of 1983.

The Soviet Union may be coding its telemetry to conceal activities or missile characteristics, such as throw-weight, prohibited by SALT. As the United States seeks to develop more survivable land-based forces, the USSR may also wish to conceal information on the accuracy of the new ICBMs and SLBMs that will be targeted against them. Whatever the Soviets' intentions, their incentive to restrict encryption practices has probably been diminished by the Reagan Administration's dubious enthusiasm for arms control, and particularly for SALT II, which expires in 1985. Many within the American SALT II delegation, including Paul Warnke and Ralph Earle, were comfortable with the inherent ambiguity in the provisions on telemetry because of their confidence that any disputes could be resolved within the SCC. The resolution of this extremely delicate and controversial issue can only be reached, however, if both sides are clearly committed to upholding and preserving the Treaty. In the present climate of mutual suspicion and recriminations, this will be hard to achieve.

A Ban on Telemetric Denial

The United States should continue to pursue the issue of encryption within the Standing Consultative Commission, where it has only been seriously discussed in late 1983. In defining its position on encryption, the United States should agree to specify which telemetric channels it requires for verification of compliance. If these channels are already being blocked, indicating their importance is not going to further compromise U.S. intelligence abilities. Meanwhile, it will put pressure on the USSR to reduce its encryption levels.

Ultimately, the ratification of SALT II or a new arms control agreement will probably be required to resolve this issue. Towards this end, the Administration should attempt to, negotiate a modified verification regimen as it seeks agreement on a new treaty. While avoiding unnecessarily provocative requirements, such as on-site inspection, the agreement should include specific and detailed restrictions, wherever possible. Serious attempts should be made to negotiate a total ban on the encryption of telemetry, as well as on any other methods which deny telemetry. Although anathema to the military establishments of both nations, such a ban would eliminate a continual source of friction and controversy. By allowing each side full access to information on strategic systems, a ban on encryption would increase the confidence of the United States and the USSR in both their assessment of the military balance and their adversary's compliance with arms control agreements.

THE THRESHOLD TEST BAN TREATY (TTBT): Have the Soviets exceeded the 150 kiloton limit?

Summary

Signed in 1974, the Threshold Test Ban Treaty (TTBT) prohibits either the United States or Soviet Union from testing nuclear weapons with yields greater than 150 kilotons. The Treaty was primarily designed to prevent either side from testing and perfecting nuclear weapons in the megaton range.

The United States claims that the Soviets have probably violated the 150 kt. threshold on numerous occasions since the Treaty went into effect in 1976. The Administration has also argued that the Treaty is presently unverifiable, and has unsuccessfully sought to renegotiate stricter verification provisions for the TTBT, which never has been ratified. The Soviet Union has responded that once the U.S. has ratified the Treaty, any questions of verification and compliance can be addressed through provisions established by the Treaty.

The evidence of Soviet test violations, which the Administration itself concedes is ambiguous, has been challenged by many scientists inside and out of the government. For many years, seismologists have known that the seismic waves recorded from nuclear tests vary according to the surrounding geological formation. It is widely believed that the U.S. formula for measuring the yield of Soviet tests, which is based on data from our own tests in Nevada, systematically overestimates Soviet tests, which are conducted in a different land mass.

Controversy over Soviet test yields would most likely be resolved by ratifying the TTBT, which requires an extensive exchange of testing and geological information to bolster national technical means of verification. Meanwhile, the largest recorded Soviet tests—even by the Administration's calculations—have little military significance. If the United States is seriously interested in a verifiable and effective prohibition on testing, it should finish negotiating a Comprehensive Test Ban, which is far more constraining on the development of nuclear weapons.

An Unratified Treaty

The Treaty on the limitation of Underground Nuclear Weapons Tests, also known as the Threshold Test Ban Treaty, was signed by President Richard Nixon and Soviet Premier Leonoid Brezhnev in July 1974. The Treaty was not submitted to the Senate until July 1976 to allow the negotiation of the companion treaty on peaceful nuclear explosions (PNET). This two-year interlude also permitted both sides to continue extensive testing of high-yield weapons. In July 1977, the Senate Foreign Relations Committee held hearings on the Treaty, and favorably reported it to the whole Senate in 1978. A threat by some senators to add more to the verification process, as well as the Administration's emphasis on SALT II and the Comprehensive Test Ban (CTB), led then-President Carter to stop the ratification process.

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The treaties still await action in the Senate. In 1982, the Reagan Administration decided not to submit the treaties for ratification until the Soviet Union had agreed to expanded verification provisions. After expressing concern over Soviet test violations, the Administration proposed in early 1983 a renegotiation of the verification provisions to allow U.S. scientists to directly monitor any nuclear tests over 75 kilotons. On May 12, the Soviet embassy in Washington replied that "the U.S. side has no basis for raising the issue of 'improving' the verification provisions." It said that once the Treaty had been ratified, verification questions could be resolved through routine consultations, as the Treaty provides.

In January 1984, the Administration publicly charged the Soviet Union with a probable violation of the TTBT. In the unclassified version of the compliance report sent to Congress, the Administration states, "While the available evidence is ambiguous, in view of ambiguities in the pattern of Soviet testing and in view of verification uncertainties, and we have been unable to reach a definitive conclusion, this evidence indicates that Soviet nuclear testing activities for a number of tests constitute a likely violation of legal obligations under the TTBT." The issue is presently in a stalemate, although both sides have pledged to abide by the threshold aspects of the treaties, which prohibit nuclear tests above 150 kilotons.

Verification Concerns

Although the Administration has expressed concern about Soviet violations of the 150 kt. threshold, all but the most hawkish officials will concede that few, if any, of the violations have military importance. The larger issue—aside from the question of Soviet credibility—is whether and how the Treaty can be adequately verified.

Verification has historically posed a major obstacle to the successful negotiation of nuclear test bans. In 1963, an unresolved dispute over the number of seismic listening posts to be placed on each nation's territory proved a small, but insurmountable, obstacle to the signing of a Comprehensive Test Ban. Instead, the Kennedy Administration was forced to settle for a Limited Test Ban Treaty (LTBT), prohibiting all but the underground detonation of

Underground nuclear test

nuclear devices. During the TTBT negotiations, members of the Nixon Administration recognized that seismic monitoring techniques were not precise enough to ensure total compliance. They remained confident, however, that the exchange of geological and testing data provided for in the Protocol would reduce any uncertainty to an acceptable level. Small breaches in the Treaty's 150 kt. limit were not considered militarily significant.

Seismic monitoring capabilities have improved dramatically in the two decades since the LTBT was signed. Most scientists now believe that given the technical ability to distinguish and identify nuclear detonations down to 1 kiloton, a Comprehensive Test Ban could be verified with high levels of confidence. Disagreement persists, though, on the level to which a TTBT can be verified. The dispute marks the continuation of a long-standing rift between the U.S. government and the majority of the American scientific community on how to measure the magnitude of Soviet nuclear tests.

Body Versus Surface Waves

A nuclear explosion emits two basic types of waves that

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THRESHOLD TEST BAN TREATY

TTBT PROVISIONS

1. Each Party undertakes to prohibit, to prevent, and not to carry out any underground nuclear weapon test having a yield exceeding 150 kilotons at any place under its jurisdiction or control, beginning March 31, 1976.

2. Each Party shall limit the number of its underground nuclear weapons tests to a minimum.

3. The Parties shall continue their negotiations with a view toward achieving a solution to the problem of the cessation of all underground nuclear weapons tests.

PROTOCOL

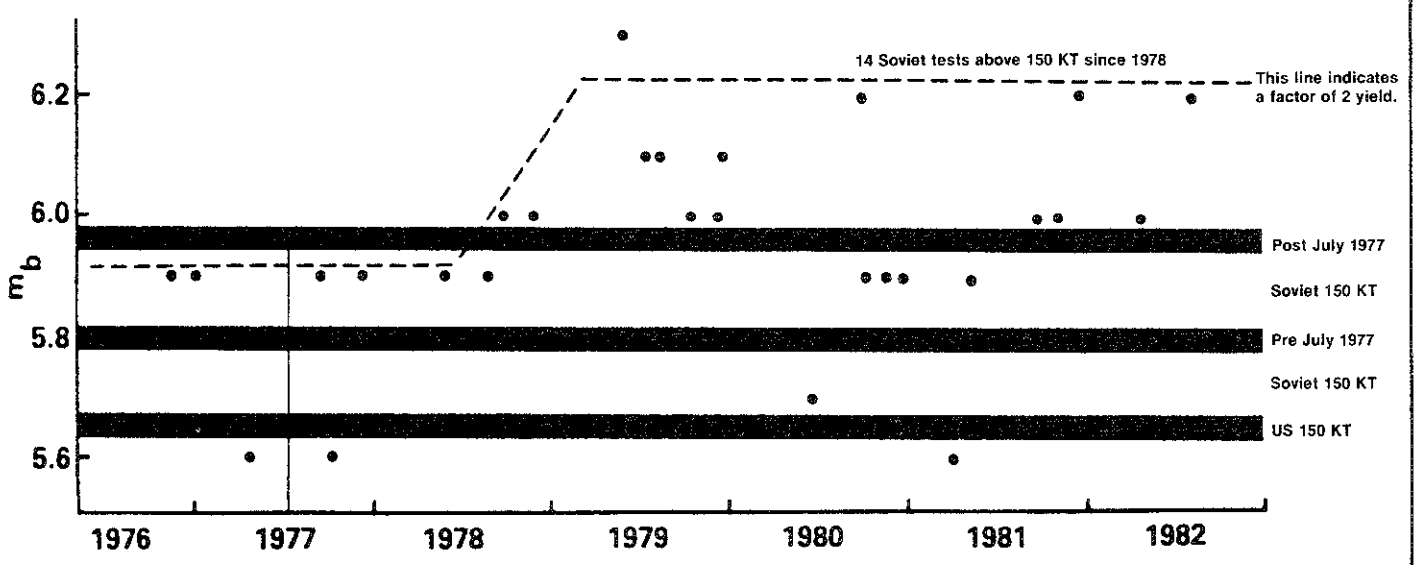
1. "For the purpose of ensuring verification of compliance with the obligations of the Parties under the Treaty by national technical means, the Parties shall...exchange the following data:

a. The geographic coordinates of the boundaries of each test site and of the boundaries of the geophysically distinct testing areas therein.

b. Information on the geology of the testing areas of the sites...

c. The geographic coordinates of underground nuclear weapons tests, after they have been conducted.

d. Yield, date, time, depth and coordinates for two nuclear weapon tests for calibration purposes from each geophysically distinct testing area where underground nuclear weapon tests have been and are to be conducted."



Both charts graph Soviet nuclear tests at their Eastern Kazakh test site (also known as the Shagan River Test Area) between 1976 and 1982. In the DoD chart to the left, the fact that Soviet tests seem to double in magnitude between 1978 and 1979 has been used as evidence that the Soviets discovered U.S. plans to modify its yield calibration formula, and raised its tests accordingly. But a more complete chart constructed by seismologists Sykes and Evernden demonstrate

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can be employed to calibrate its yield. "P," or body waves, are compressional waves similar to sound waves in air and water. They travel directly through the body of the earth, penetrating its mantle and crust before being recorded by seismic stations. In contrast, the slower surface waves travel only over the surface of the earth.

The United States has always monitored body waves to determine the yield of Soviet tests. Observations at the Nevada Test Site (NTS), where American nuclear weapon tests are conducted, established a correlation between the recorded value of P wave magnitude and the weapon yield. These correlations were then applied to Soviet tests to estimate their yield. The initial results showed some of the largest Soviet tests to be in blatant violation of the TTBT, registering yields as high as 400 kt.

From the beginning, prominent seismologists associated with the negotiations and the Defense Advanced Research Projects Agency (DARPA), which oversees research on this issue, criticized the government's reliance on a pure P wave formula. For several years, it had been known that body waves were very sensitive to regional variations in the geology of the test site. Due to relatively recent volcanic activity, the rock formation at the Nevada test site absorbs P waves more than most other places in the world. In contrast, the primary Soviet test sites are located in areas that have not been geologically active, and which therefore emit a high amplitude of P waves. The scientists argued that when the linear curve established from Nevada test site data was used to calculate Soviet test yields, systematic overestimation resulted.

In recognition of this difference, between 1977 and 1978 the United States modified its formula to include a 20 percent bias for waves from Soviet tests. Many seismologists, however, had concluded that a modification of about 40 percent was necessary to correct for the distortions in wave magnitude. More recently, a number of prominent scientists, led by Dr. Lynn Sykes and Dr. Jack Evernden, have advocated a monitoring system that relies primarily on surface rather than body waves. (A member of the TTBT negotiating team, Dr. Sykes is now a consultant with DARPA. Dr. Evernden formerly worked with DARPA and is now with the U.S. Geological Survey.) Unlike P waves, surface waves remain relatively unaffected by variations in geological formations. It has been the experience of the United States that for explosions in hard rock at many Nevada test sites, estimates of yield based on a surface wave calculation have invariably agreed with actual yields, whereas estimates based on the P-wave formula have sometimes been in drastic variance with the actual yield.

Ambiguous Evidence

DARPA, which is generally considered the most conservative government agency in its estimate of Soviet test yields, has been less inclined to modify its scales. It has been largely from information derived from this source that the Administration has based its case for Soviet violations. According to a recent DARPA study, which compared the largest 40 U.S. and Soviet tests between 1976 and 1981, the Soviets have detonated nine bombs above the 150 kt. threshold since the treaty came into effect. Of these, two were between 200 and 250 kt., while one just exceeded 300 kilotons. According to Ralph Alewine, director of geophysical sciences at DARPA, the yields were calculated from a P wave scale that had been corrected by 30 percent.

DARPA's evidence, which even the Administration concedes is ambiguous, is not without its critics. The in-

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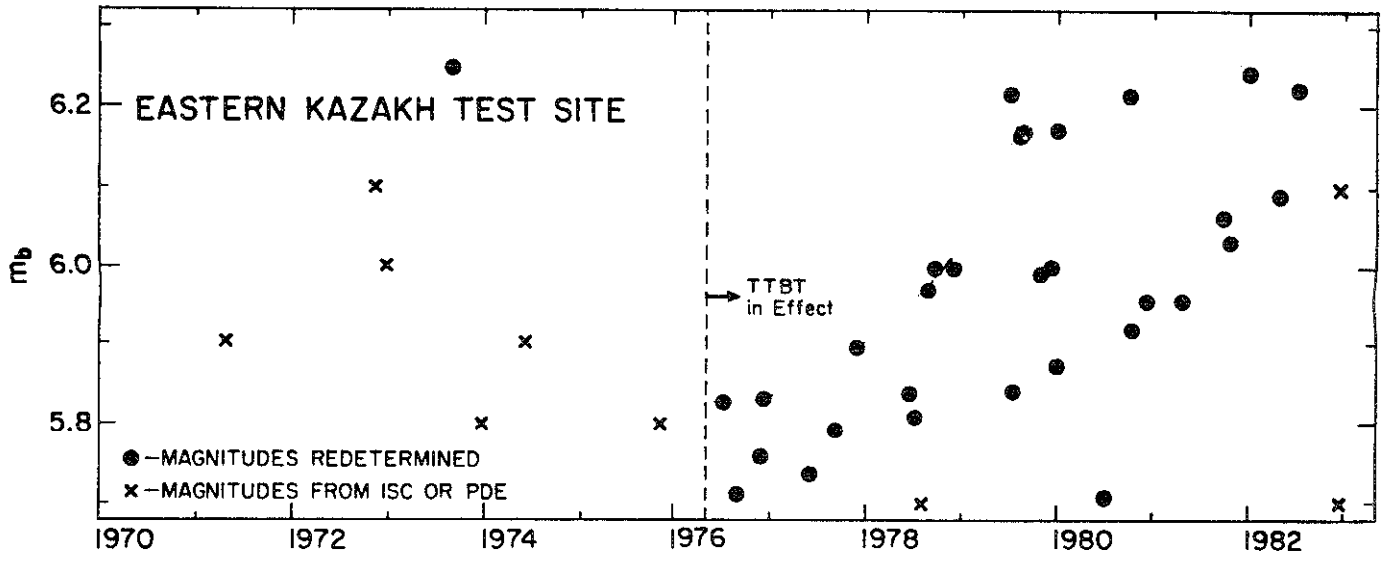

that test yields at this site actually rose gradually over a period of three years. This supports the alternative argument that after the TTBT went into effect, the Soviets decided to gradually increase the yields of its tests in Eastern Kazakh, while closing most of its northern test facility, where all the largest tests had previously been conducted.

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conclusive nature of the Administration's findings has been affirmed by scientists within several relevant government agencies. According to Mike Nordyke, director of the verification program at Lawrence Livermore National Laboratory, there is "no hard evidence" of Soviet test violations. This analysis has been affirmed by Livermore seismologists Warren Heckrote and Peter Moulthrop, who, in a series of reports concluded that "The distribution of seismically measured yields of Soviet nuclear weapons tests is not inconsistent with Soviet observance of the 150 (kiloton) limit."

Although the United States has reportedly modified further its formula for calculating the yield of Soviet tests, to reflect a bias of 30 percent, many scientists maintain that the bias should be higher. During a recent symposium on the verification of nuclear test bans, several speakers presented a wide variety of evidence that P-waves from explosions at the eastern Kazakh test site register magnitudes that are about 35 to 45 percent greater than those from explosions in Nevada of the same size. Expressing this general view, Dr. Sykes has stated that the Administration's allegations "are based on the systematic overestimation of the relation between seismic magnitude and explosive yield." After calibrating Soviet test yields according to a scale based on surface waves and corrected body waves, both Sykes and Evernden concluded that none of the weapons tests exceeded the threshold, although several came close to it.

A Misleading Chart

U.S. concern has also stemmed from the distribution of a Department of Defense chart, which identifies the yields of nuclear tests held at the Soviet testing area in eastern Kazakh between 1976 and 1978. According to the chart, the estimated yields of the largest explosions at this site, which were constant between 1976 and 1978, roughly doubled between 1978 and 1979. For the Soviet Union to be in compliance with the 150 kt. threshold after 1978, its earlier tests would have to be 75 kilotons or less. Senator Jesse Helms (R-N.C.), columnist Jack Anderson and other critics believe the more likely explanation is that the Soviets were testing just under the limit until 1978, discovered that the United States was modifying its yield-estimation formula, and raised the level of its weapons tests accordingly.

However, there is good reason to believe that the chart has been incorrectly assembled and interpreted. In the first place, Soviet practice prior to the TTBT was to conduct all large tests (above 50-75 kt.) at the island of Novaya Zemlya in the Artic Ocean. Sykes and Evernden have suggested that this was done for the same reason the U.S. conducted its multi-megaton tests on Amchitka, to avoid excessive ground-shaking to nearby cities. It is also known that very few explosions at Novaya Zemlya had yields as low as 150 kt.

After signing the TTBT, the Soviets had to choose between maintaining the Novaya Zemlya test facilities for yields of 75 to 150 kt. only, or accepting higher ground motions in the eastern Kazakh test center near the city of Semipalatinsk, and thereby close down most of the northern test facility activities. According to a chart constructed by Sykes and Evernden, it is clear that the magnitudes of the largest Soviet explosions in eastern Kazakh gradually increased in at least three increments between 1976 and 1979 before stabilizing in 1979. One can interpret this incremental increase in yields as a careful and deliberate

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evaluation of the ground effects of the higher yields on the nearby city of Semipalatinsk. It is thus not surprising that the Soviets did not immediately begin testing here at the threshold limit.

Even if the USSR has exceeded the treaty threshold on nine occasions, as the DARPA report suggests, there are mitigating factors to consider. All but three of the possible violations could be excused by the common understanding which permits several minor broaches in the threshold per year. Furthermore, none of the tests have been large enough to confer any military advantage to the USSR. The significance of even large tests is now somewhat limited. The TTBT recognized the relationship between the explosive power of reliable, tested warheads and the confidence of either side in a first-strike capability. Dramatic improvements in missile accuracy, however, have proven far more effective in increasing hard-target, first-strike capability, thereby lessening the impact of the Treaty's restriction on high-yield tests. Both the United States and the USSR have also perfected the technique of testing powerful warheads at less than their maximum yield.

A Painless Resolution

Although the Administration has charged the USSR with a probable violation of the TTBT, it has acknowledged that the evidence is ambiguous. Because of this inability to determine a definite violation, the Administration has argued that stricter verification measures must be negotiated before it is willing to ratify the Treaty. This is clearly a case of putting the missile before the warhead. The protocol's elaborate provisions for exchanging a wide range of geological and testing data was designed to provide a framework for high-confidence verification. By agreeing to ratify the TTBT, the Administration should be able to resolve any of its suspicions. If, after signing the Treaty, the United States determined the existence of past or present violations, it would have formal grounds and channels for discussion, as well as the ability to withdraw from the Treaty altogether.

Administration officials have expressed concern that testing data received from the Soviets could be falsified, and would therefore require verification through on-site inspection. But geological data from the Soviet test sites would be hard to falsify and should permit resolution of the long-standing dispute over how to evaluate the magnitude of body waves. The ratification of the accompanying PNET, with its provisions for on-site inspection, would also bolster confidence in Soviet compliance.

If the Administration is truly seeking an effective and verifiable agreement on nuclear testing, it should join the Soviet Union in completing the negotiation of a Comprehensive Test Ban. Unlike the Threshold Test Ban, a CTB would seriously constrain a future generation of exotic weapon systems now on the drawing board. It is also easier to verify a total, rather than partial, ban on testing. Most important, the framework for an effective verification regimen, including provisions for seismic monitoring stations and on-site inspection, has already been agreed upon during negotiations conducted by the Carter Administration.

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