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NATIONAL INTELLIGENCE ESTIMATE

Soviet Strategic Defenses

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SOVIET STRATEGIC DEFENSES

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the main approach corridors, and around key centers. The defenses are integrated into an air defense system which increasingly uses automated techniques for faster and more effective control.

D. These integrated forces provide a formidable defense against aircraft and large radar cross section aerodynamic ASMs penetrating at medium and high altitudes in all weather conditions. This capability could, however, be degraded by use of electronic countermeasures, defense suppression, and proper selection of penetration routes and altitudes. Capabilities are extremely limited against low-altitude (below 1,000 feet) penetrations and almost non-existent against attacks by higher velocity, low radar cross section ASMs like the US short-range attack missile (SRAM).

E. Defense against low-altitude attack is made difficult by the fact that the attacking aircraft or ASMs are hard to detect and track, particularly against the background of ground clutter. Soviet air surveillance below about 1,000 feet is spotty at best. We expect the Soviets to continue to improve their low-altitude radar coverage by increasing the number of ground radar sites and by installing more mast-mounted radars. In addition, we continue to believe that they will develop an airborne warning and control system (AWACS) with an overland look-down radar in the late 1970s or thereafter.

F. We also believe that the Soviets could develop an advanced long-range, all-weather interceptor with a look-down, shoot-down capability by the late 1970s. Such an aircraft would complement the overland AWACS. But they may not wait until the late 1970s before deploying a new fighter. While unlikely, they could bring in a new low-altitude fighter, based on an existing model, in the mid-1970s.

G. At the present time the Soviets have no defensive system which could reliably engage an ASM such as SRAM. Only the SA-5 utilizing a nuclear warhead could have a very limited capability against SRAM. To meet this threat the Soviets may attempt further to improve SAM systems already deployed, although this does not appear to be the most effective option for them. However, if attempted, it would have to be done without giving the appearance that the SAMs were being upgraded to perform a ballistic missile defense mission as prohibited in the Treaty. On the other hand, the Soviets might design a com-

SOVIET STRATEGIC DEFENSES

SUMMARY AND CONCLUSIONS

A. Despite a sustained and costly effort over the past several decades, Soviet progress in developing strategic defenses has not matched progress made in offensive capabilities. The Soviet agreement to the Treaty on the Limitation of Antiballistic Missiles (ABMs), in effect, indicated recognition of this situation. The Treaty will, of course, have a major impact on future Soviet defensive developments, and, as we point out below, we do not expect the Soviets to develop systems or forces capable of overcoming the offensive lead.

B. Soviet defenses against ballistic missile attack are negligible and show no prospect of becoming effective against a major attack; the Treaty specifically limits missile defenses. There is no evidence that the Soviets will in the next decade be able to negate the threat posed by Western nuclear-powered ballistic missile submarines (SSBNs). And Soviet air defenses, which already have problems in dealing with low-altitude attacks, face the prospect of further degradation as the US deploys new air-to-surface missiles (ASMs) on present and proposed aircraft.

Air Defenses

C. Soviet air defenses had, as of 1 October 1972, some 4,000 ground-based radars at 1,000 radar sites, 3,000 interceptor aircraft, and over 10,000 surface-to-air missile (SAM) launchers at some 1,100 sites and complexes. These defenses are deployed in barriers, across pletely new SAM system which would be capable of engaging both ASMs and aircraft penetrating at low altitudes. To be effective, such a weapon system would have to be widely deployed and would require integration with new, more efficient surveillance and command and control systems.

Ballistic Missile Defense

H. The Soviets have installed a ballistic missile early warning system on the periphery of the USSR and an ABM system around Moscow. This ABM system would be susceptible to saturation and exhaustion. It cannot discriminate between re-entry vehicles (RVs) and penetration aids outside the atmosphere, and the lack of high acceleration missiles prevents it from waiting for atmospheric sorting after the threatening objects enter the atmosphere.

I. The Moscow System's nominal 300 nautical mile (nm) range gives it an inherent capability to defend regions outside the Moscow area. With only 64 launchers and no provision for rapid reload, the defense would be thin. Used to protect the immediate Moscow area, and utilizing a shoot-look-shoot technique, the system could probably be effective against about 45 targets—including RVs and penetration aids. Thus, the defense would at best be effective against an accidental or unauthorized launch or against a small, third country attack.

J. The present limitations of the Moscow System and continuing ABM research programs at Sary Shagan suggest that the Soviets will want over the next decade to improve and fill out the Moscow defenses to the 100 launchers allowed under the Treaty. If such improvement starts soon, a new exoatmospheric system (ABM-X-2) under development at Sary Shagan would be the most likely candidate. It would provide a greater target handling and engagement capacity, but would, of course, still be of limited capability.

K. The Soviets are also developing another ABM system (ABM-X-3) at Sary Shagan. The first sites could be deployed rather quickly (on the order of a year from start of construction to initial operational capability), although widespread deployment might require 5 years or more. This system could, without the addition of an appropriate long-range acquisition radar, provide a thin defense against RVs which exhibit large radar cross sections and re-enter the atmosphere relatively slowly (such as Polaris or postulated Chinese RVs). Defense against more sophisticated weapons (e.g., Poseidon or Minuteman) would require an interceptor with much higher acceleration. Even so, if deployed in the near future, this system seems at present to be the best candidate for defense of an area containing intercontinental ballistic missiles as allowed under the Treaty.

Defense Against Ballistic Missile Submarines

L. The Soviets have demonstrated no capability to detect US SSBNs on patrol in the open ocean. The USSR has no equivalent to the US sound surveillance system and thus cannot keep track of patrolling SSBNs by this method. Further, Soviet submarines are not able to trail US SSBNs covertly (using passive sonars) because of the noise advantage enjoyed by the US submarines. The Soviets have not attempted to maintain overt trail (using active sonars) on patrolling SSBNs, and we believe that if they did they probably could not maintain it for extended periods. Nor is open ocean search by Soviet ships, submarines, and aircraft effective against SSBNs.

M. We do not anticipate that the Soviets will arrive at any fundamental solution to detecting US SSBNs within the decade. The basic difficulty of detecting SSBNs on patrol in the open ocean will remain. We do, however, expect the Soviets to improve their acoustic detection devices, to install them on ships and submarines, and perhaps to deploy, in limited areas, some improved fixed acoustic arrays and moored buoys. Even though the Soviets will reduce the noise levels of their submarines, the noise advantage enjoyed by US SSBNs is such that, as a force, they will not be vulnerable as a result of these improvements during the 10 year period of this Estimate.

N. We expect the Soviets to improve their magnetic anomaly detection capability and to develop other non-acoustic detection methods. However, they would still face the problem of integrating the non-acoustic detection techniques into their antisubmarine warfare forces, and none of the better understood methods appears to offer a solution to the problem of submarine detection in the open ocean.

Antisatellite Defense

O. Since 1968, the Soviets have been conducting an active orbital intercept program. They have demonstrated on at least seven different occasions that they are capable of engaging satellites in orbit at altitudes between 100 and 600 nm. On the basis of these tests, we believe the Soviets can conduct non-nuclear attack on satellites below about 1,000 nm. Use of a powerful enough launch vehicle might permit them in the future to engage satellites at geostationary (19,300 nm) altitudes. Another approach available to the Soviets would be to use the Galosh ABM interceptor to conduct non-nuclear attacks on satellites up to 300 nm and perhaps as high as 450 nm, although at this altitude a nuclear warhead might be required.

P. Considering the importance of space reconnaissance to the viability of the Strategic Arms Limitation Talks agreements, we continue to believe it highly unlikely that the Soviets would actively interfere with US satellites. They have agreed in the Treaty to Limit ABMs and the Interim Agreement on Offensive Missiles not to interfere with national means of verification. They also would not wish to cause US retaliation against their own considerable satellite reconnaissance program.

Future Force Development

Q. The development of the future Soviet strategic defense force structure will be heavily influenced by the Treaty on Limitation of ABMs and the Interim Agreement on Offensive Missiles. The ABM Treaty has the more immediate and direct impact, but the Interim Agreement on Offensive Missiles is particularly significant to this Estimate in that it does not limit aircraft or missiles delivered by aircraft. The agreements at one and the same time simplify and complicate estimates of future Soviet strategic forces. They simplify by permitting force projections in line with the agreements, as in the case of ABMs. But they complicate by raising the question of under what conditions the agreements might be terminated, and what force deployments might occur after such a break. And future Soviet defensive forces will not only be affected by the interaction of momentum and constraints in the USSR on the development, production, and deployment of successive generations of new weapon systems. They will also be sensitive to the course of negotiations with the US. The developing Chinese strategic threat to the USSR is also a complicating factor in assessing the future developments in Soviet strategic defenses.

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R. If the Soviets believed the prognosis to be favorable for further agreements between the US and USSR to limit strategic arms, they would probably build their strategic defenses more slowly than in the past. In fact, if they judged that the US would eventually reduce its forces, they might do little more than complete programs underway and continue essential R&D activities. More likely, they might feel impelled to continue to improve their defenses across the board within the limits of the present agreements in order to enhance their security vis-à-vis the US and the People's Republic of China and to improve their bargaining position in the strategic arms limitation negotiations.

S. The Soviets might, of course, be prepared to stop negotiations and terminate existing agreements if they came to believe that their security or position of equality with the US were threatened. In this case, the Soviets might build up permitted systems while the Treaty was in effect and prepare to deploy additional systems after 1977. Or negotiations might deteriorate to the extent that they or the US would withdraw from the Treaty prior to 1977 and embark upon a more intensive buildup.

T. We have, in Section IX of this Estimate, postulated four force models which illustrate a range of possible defensive deployments under differing conditions during the remainder of the decade.[1] Force Models I and II illustrate deployments the Soviets might undertake within the terms of the ABM Treaty. Model I represents a minimum effort in which little is done beyond completing programs already in progress. Force Model II illustrates a greater level of effort, but deployments are still within the limits of the ABM Treaty. Force Models III and IV illustrate different postures the Soviets might adopt if the Treaty were terminated. Model III is representative of a continuation of the arms competition as it was before the limitation agreements, while Model IV illustrates a maximum defensive effort short of actual war.

U. Force Models I and IV represent a low and a high level of effort, respectively; both are quite feasible under the assumptions given,

[1] Vice Adm. Vincent P. de Poix, USN, the Director, Defense Intelligence Agency; Maj. Gen. William E. Potts, the Assistant Chief of Staff for Intelligence, Department of the Army; and Rear Adm. Earl F. Rectanus, the Director of Naval Intelligence, Department of the Navy, are in fundamental disagreement with several aspects of Section IX. For their views see their footnotes throughout that Section.

but we consider them to be unlikely extremes. We believe that Force Model II represents a likely level of effort and technical progress. It assumes that the US and the USSR would continue present strategic arms limitation agreements and reach new ones, and that neither country would have to contend with a third country threat so great as to cause withdrawal from the agreements. On the other hand, if further agreements are not reached, and the ABM Treaty were to be terminated in 1977, the Soviets might build defenses roughly equivalent to those shown in Force Model III. But we wish to emphasize that these models are strictly illustrative, and not to be regarded as confident estimates or as projections for defense planning. As one moves beyond the next 2 years or so, all projections become increasingly uncertain; beyond 5 years they are highly speculative.

DISCUSSION

I. THE SOVIET APPROACH TO STRATEGIC DEFENSE

1. The policies which have provided the basis for the development of Soviet strategic defenses have been influenced over the past 25 years by three major factors: the Soviet projection of relations between the US and the USSR; their assessment of all of the forces, intercontinental and peripheral, which could conduct nuclear attacks on the Soviet Union; and the capacity of the Soviet economy and technology to produce the necessary defensive systems. As these factors evolved, so have the composition and strength of the defenses.

2. In the immediate post-World War II period the major threat was from US and allied aircraft, the bulk of which would be directed against targets in the western USSR. Thus, Soviet defenses were designed primarily to defeat the manned bomber. In the mid-1950s the nature of the threat was changed in a fundamental way with the introduction of long-range ballistic missiles. Thus, while defenses against aircraft and aircraft-carried weapons were still necessary, new defense systems were required which would defeat ballistic missiles and other threats from space.

3. Soviet strategic defense policy was further influenced, also in a fundamental way, by the eventual militarization of the Sino-Soviet dispute. No longer are the Soviets able to concentrate defenses solely against the North Atlantic Treaty Organization (NATO). They must now also be concerned with an independent Chinese threat from the south.

4. A number of developments, both political and military, are going to have a profound effect on the future of Soviet strategic defenses. The agreement to limit strategic weapon systems will influence the development and deployment of defensive systems—particularly ballistic missile defenses. There will, however, still be a need to develop more effective defenses to combat new air-to-surface missiles

(ASMs), aircraft penetrating at low altitudes, and continually more sophisticated intercontinental and submarine-launched ballistic missiles (SLBMs). And the Soviets must reckon with these latter threats even in a strategic arms limitation environment. The estimate which follows considers in some detail both the present state of Soviet strategic defenses and their future development. The latter case is illustrated by a series of force models which take into consideration the initial constraints imposed by agreements to limit strategic arms.

II. STRATEGIC AIR DEFENSE

There have been over the past year no major new developments in Soviet air defense programs or forces; these defenses continue to be improved slowly but steadily. Our estimates of the capabilities of Soviet air defenses have therefore not changed in any essentials since last year.

The discussion which follows highlights two problems facing Soviet air defenses—improving capabilities against low-altitude penetration and against small, high-speed ASMs such as short-range attack missiles (SRAM). Characteristics and performance of Soviet air defense systems are given in Tables I – V. Definitions of some of the air defense terms are given in the Glossary.

A. Current Forces and Capabilities

5. Although the strength of the US intercontinental bomber force has diminished by more than two-thirds over the last decade, its technical sophistication has greatly increased with the addition of more effective decoys and electronic countermeasures (ECM) and the development of small, high-speed ASMs. The Soviets are also well aware of the nuclear threat posed by US tactical aircraft stationed in Europe, Asia, and at sea and the air threat posed by the rest of NATO in the west and China from the south. As a result, the Soviet Union continues to maintain the world's largest air defense system.

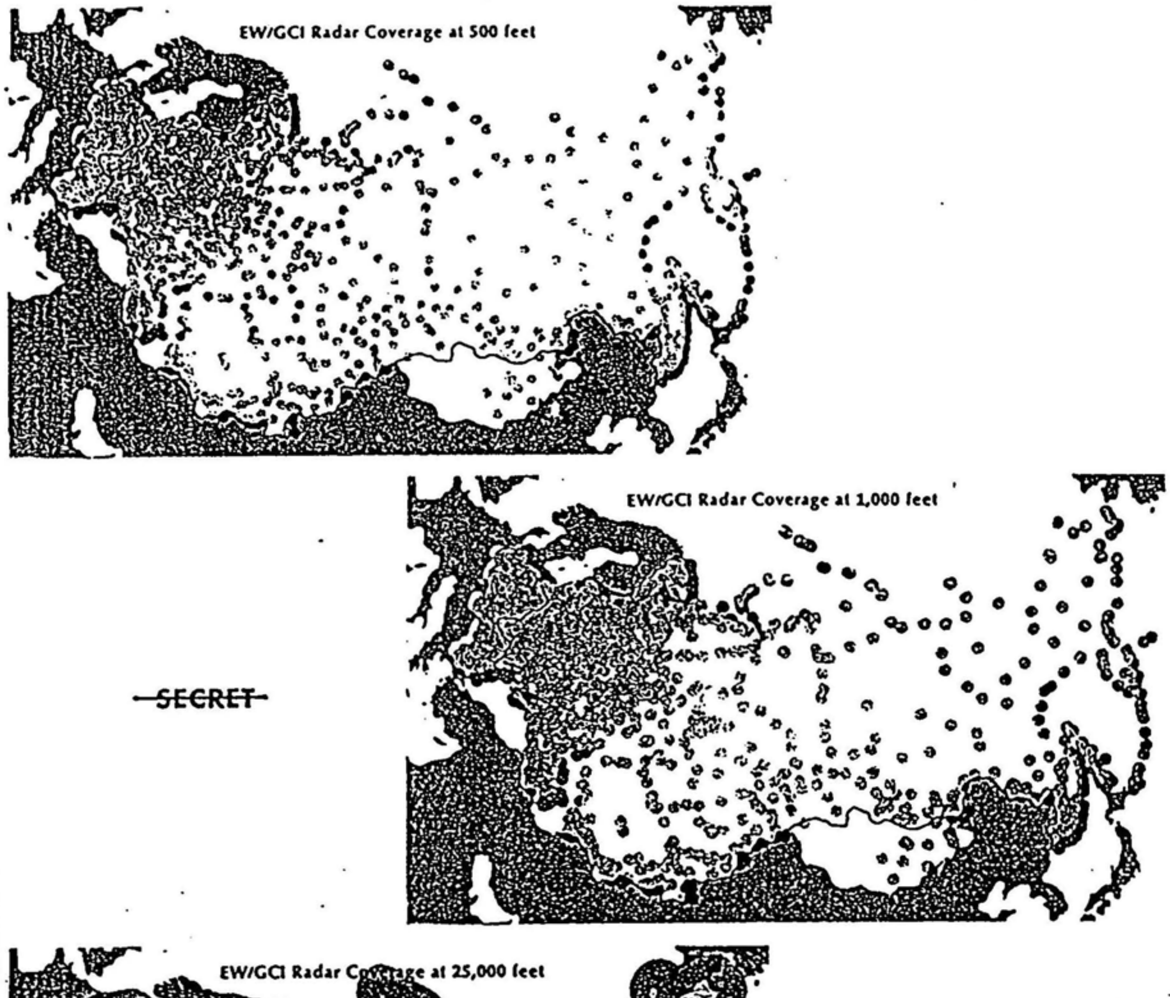
6. The PVO Strany (Air Defense of the Nation) is a branch of the Soviet armed services equal in status to the Ground Forces, the Air Forces, the Navy, and the Strategic Rocket Forces. It is commanded by Marshal of the Soviet Union P. F. Batitskiy, who is also a Deputy Minister of Defense. It is known to have three arms of service—the Radio-Technical Troops which operate the radars and associated electronic systems, the Antiaircraft Missile Troops who man the surface-to-air missile (SAM) units, and PVO Aviation (APVO) which operates the fighter-interceptors. A fourth arm, the PRO (the organization of antiballistic missiles forces), is believed to exist.

7. Elements of the three identified PVO arms of service are assigned to each of the 10 air defense districts (ADDs) and, in turn, to the air defense zones (ADZs). Each of the ADDs is probably manned by a PVO Army or Okrug (District), while each ADZ is manned by a PVO Corps or Division. Radio-Technical units operate the air surveillance radar stations which are subordinate to the various ADZs. All of these echelons are tied together by data and communications links which utilize radio, coaxial cable, open wire, and satellite equipment.

8. Air surveillance is conducted by ground-based radars located at about 1,000 air surveillance radar stations located throughout the Soviet Union. Each of these stations has several radar sets which not only serve distinct special purposes (e.g., early warning, ground controlled intercept, height finding, etc.) but also provide redundancy and frequency diversity. [redacted] dummy radar sites have also been noted recently. These have probably been constructed for deceptive purposes. Figure 1, following shows the general locations of radar sites and the coverage provided against aircraft penetrating at various altitudes.

Figure 1

Soviet and East European Air Defense Radar Coverage*



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*Radar coverage plotted without terrain obstructions and assuming a radar height of 25 feet.

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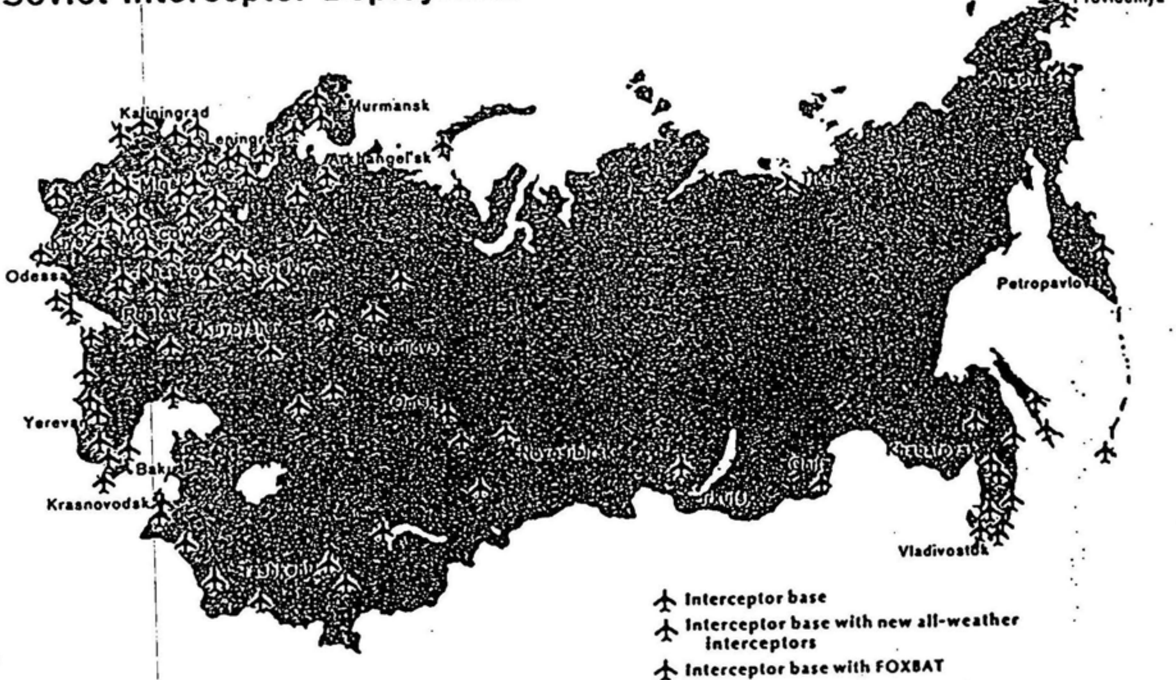
9. Ground-based radars are supplemented to a limited extent by air and seaborne equipment. The Soviets have developed an airborne warning and control system (AWACS) but have not deployed it extensively. Although it has the potential of extending aircraft detection range by about 200 nautical miles (nm) beyond that provided by land-based radars, the small number of AWACS aircraft available and their lack of a look-down radar capability for use over land limits their present potential. Radar surveillance ships subordinate to the Soviet Navy have been identified in the four fleet areas, and they probably have, on occasion, provided tracking data to PVO elements. Ships of the Moskva and Kresta II classes are also particularly well equipped to provide air surveillance information.

10. APVO fighter-interceptors are deployed throughout the Soviet Union to protect the peripheries and approaches to prime target areas. As shown in Figure 2, the force is most heavily concentrated in the area west of the Ural Mountains and in the southern maritime area of the Soviet Far East. There are about 3,000 fighters organized into about 90 regiments of three squadrons each. In addition, there are some 3,000 fighters in Soviet tactical aviation and over 2,000 in East European countries of the Warsaw Pact; most of these 5,000 or so aircraft were designed as interceptors,

Figure 2

Soviet Interceptor Deployment



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and about two-thirds of them are in fighter regiments having primary missions of air defense.

SOVIET AIR DEFENSE INTERCEPTOR AIRCRAFT AS OF 1 OCTOBER 1972

NEWER MODELS	
Foxbat (Mig-25)	85
Flagon (Su-15)	530
Fiddler (Tu-?)	160
Firebar (Yak-28)	360
OLDER MODELS	
Fishpot (Su-9)	770
Farmer (Mig-19)	310
Flashlight (Yak-25)	90
Fresco (Mig-17)	710
TOTAL	3,015

11. APVO forces are continuing the modernization program begun in 1963. Additional Flagon and Foxbat interceptors are being delivered to the force while older model interceptors are being withdrawn at a rate of about 250 per year. Production of the Fiddler, a long-range interceptor that was first deployed with APVO in 1966, was terminated in the second half of 1971.

12. The Soviets continue to expand and improve their SAM defenses but at a slower rate than in past years. The pattern of deployment has remained essentially the same—barriers in peripheral areas supplemented by point or vital area defense of major military, industrial, and governmental centers. At the present time there are some 10,000 SAM launchers deployed in about 1,100 operational sites and complexes throughout the USSR. (See Figure 3.)

13. There are now [redacted] dummy SA-2 and SA-3 sites spread throughout the USSR. [redacted] A similar program has been initiated at SA-5 complexes. [redacted] As in the case of the dummy radar sites, we believe these sites have been installed for deceptive purposes. While they might be of value in confusing low-altitude attacking aircraft, the full reasons behind their emplacement at this time remain obscure.

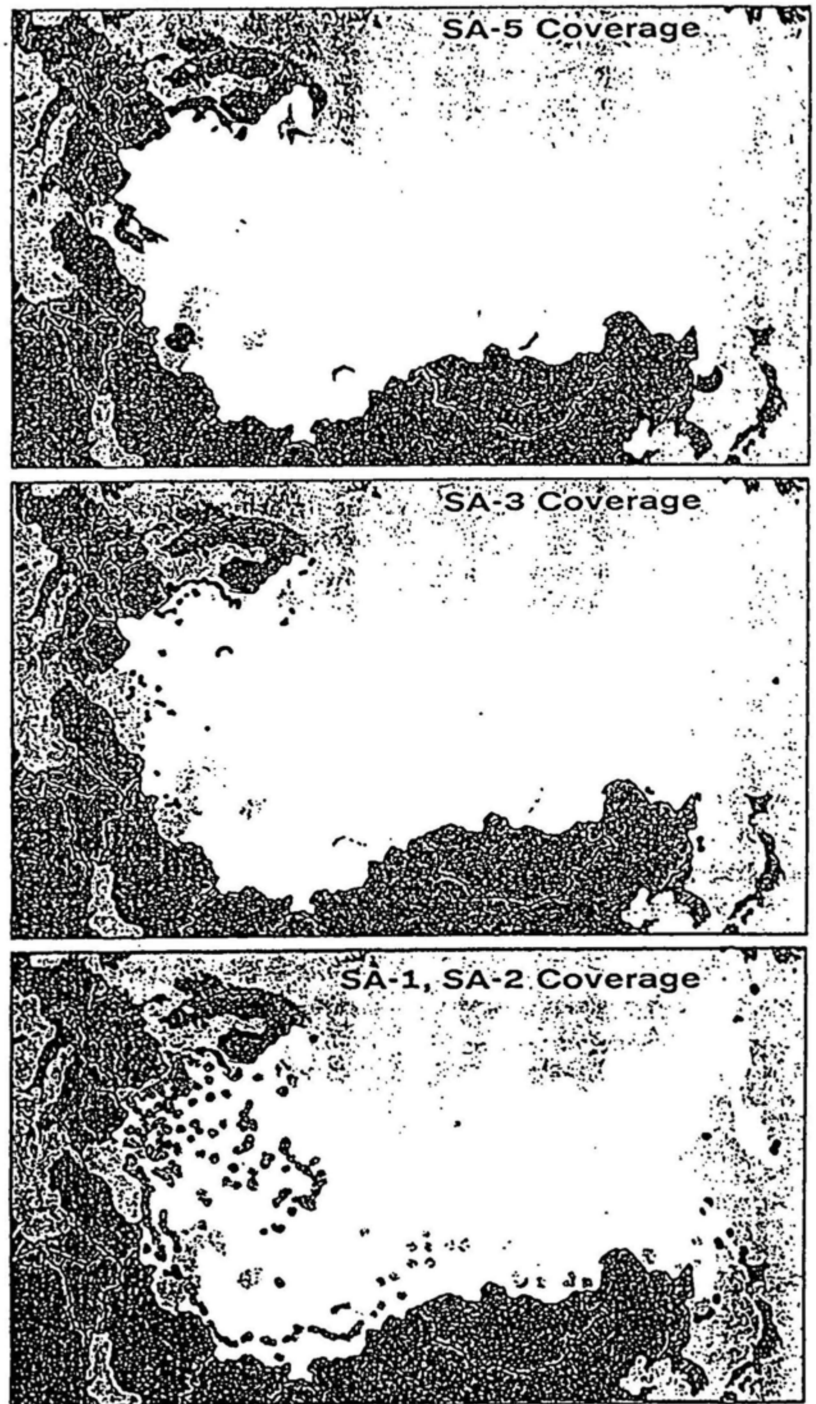
SOVIET SURFACE-TO-AIR MISSILE DEPLOYMENT AS OF 1 OCTOBER 1972

SA-5	
Operational Complexes	79
Launchers	1,368
Complexes Under Construction	13
SA-3	
Operational Sites	250
Launchers	1,000
Sites Under Construction	8
SA-2	
Operational Sites	720
Launchers	4,320
Sites Under Construction	8
SA-1	
Operational Sites	56
Launchers	3,241
Sites Under Construction	0

14. All of these elements—radars, fighter-interceptors, and SAMs—integrated into a single air defense system give the Soviets a formidable capability against bombers and aerodynamic ASMs such as Hound Dog penetrating at medium and high altitudes. This capability could be degraded by use of ECM, defense suppression by ballistic missiles and ASMs, and by proper selection of penetration routes. Defense against low-altitude (say 1,000 feet and below) penetration by bombers and ASMs and against new generation standoff weapons like the SRAM pose special problems which the Soviets have not yet solved. These weaknesses are of special concern to Soviet planners; what steps should be taken to overcome them probably constitute the central issues which must be resolved in future air defense planning.

Figure 3

Surface-to-Air Missile Deployment



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B. Defense Against Standoff Threats

15. When faced with aircraft carrying ASMs, the defensive forces have two alternatives—they can engage the attacking aircraft before the ASMs are launched, or they can attempt to destroy the incoming missiles. The first requires long-range fighter-interceptors or SAMs capable of acquiring and engaging bombers beyond the range of their ASMs. Although seemingly much simpler than the second alternative, this task would be seriously complicated by aircraft approaching and launching ASMs from extremely low altitudes. Defense of peripheral targets would undoubtedly require the use of an AWACS. There would be a greater chance of engaging ASM carriers attacking interior targets, but low-altitude penetration and launch would still complicate the task.

16. The second alternative, the engagement of the ASMs after launch, is far less desirable. However, a very heavy volume of fire from both interceptors and SAMs could be directed at an ASM approaching at medium and high altitudes—particularly during the latter phase of its flight. And training by Soviet strategic defense forces has indicated some degree of success at engaging Hound Dog type ASMs.

17. SAMs would be heavily relied upon to destroy incoming ASMs. And SAM defense against high-speed, low cross section targets will be improved by the continued introduction of automated target-designation systems. The accelerated reaction times which these systems permit would offset, to some degree, the compressed engagement time available after detection of the incoming missile.

Defense Against Short-Range Attack Missiles

18. The introduction of the US nuclear-armed SRAM constitutes one of the most severe threats that the Soviet air defense system has to face. SRAM can be launched from either a B-52 or an FB-111 aircraft flying at any of their normal operational altitudes. [ ]

19. If the SRAM-equipped aircraft is allowed to launch its missiles, SAM systems are the only weapons in the current Soviet air defense inventory which can provide any measure of defense. And then, probably, only if the SAM interceptor carries a nuclear warhead. The SA-1, SA-2, and SA-3 systems—as they are presently deployed—would be unable to engage a SRAM successfully in either its low-altitude or semiballistic attack modes. The primary limiting factor is the short range at which the incoming SRAM would be detected. This would allow little time for operational system reaction. Even when minimum system reaction times are postulated, the time to complete the engagement with any of these systems is marginal at best. The lack of evidence of deployment of nuclear warheads for these systems further argues against their being highly effective in countering SRAM.

20. The SA-5 appears to be the only strategically deployed air defense system which could have even a very limited capability

against SRAM. This judgment is based on the probability that the Square Pair engagement radar can detect a small target like SRAM at greater ranges than any of the other systems. With reasonable reaction times, the SA-5 could engage a SRAM on a semiballistic trajectory at ranges sufficient to defend a small footprint including the launch complex itself. Its capability to intercept a SRAM on a low-altitude trajectory would be much more limited, and in many situations the site would be unable to defend itself. This is because radar horizon and ground clutter would reduce detection ranges. Even where intercept is possible, effective neutralization of incoming SRAM warheads would probably require the SA-5 to employ a nuclear warhead; there is no evidence that they are available at deployed SA-5 complexes.

21. The Soviets are not likely to let the SRAM threat go unanswered. Their response could take several forms. They could introduce new longer-range defense systems which would enhance their ability to engage ASM carriers before they can launch their missiles. Such a system could, for example, include a new, more capable AWACS operating in conjunction with advanced fighter-interceptors. They could also upgrade some existing systems to give them a better capability to engage the SRAM after launch. This might include wider use and more rapid introduction of automatic data transmission systems, higher performance engagement radars, and enhanced performance of the interceptor missiles. On the other hand, they could introduce new systems, such as laser weapons, specifically designed to combat SRAM and similar missiles.

C. Defense Against Low-Altitude Air Attack

22. A significant weakness of Soviet air defenses is their limited ability to engage attackers flying at very low altitudes (say 1,000 feet or less). The Soviets are, of course, very much aware of their vulnerability to this type of attack, and they realize that the US and its NATO allies plan to exploit this weakness in any future war. They have gone to extraordinary lengths over the years to close this defensive gap. Measures taken have included tower mounted radars, low-altitude interceptors, and massive deployment (250 battalions) of low-altitude SAMs. While Soviet defenses against low-altitude attacks have improved, their basic vulnerability to such attacks will probably continue to constitute the Soviets' most serious air defense problem in the future.

23. During the past year, the Soviets have continued their efforts to prevent penetration of the USSR at low altitude, chiefly through incremental improvements to all aspects of low-altitude air defense. Deployment of the ground-based Squat Eye radar, their major low-altitude set, continues. A new model of the Back Net precision search radar, with a new feed system probably intended to enhance detection of low-altitude targets, has been deployed in limited numbers. The Soviets have also been noted testing their radar coverage against air targets flying as low as 300 feet, and radar positions have been subsequently relocated to obtain the best low-altitude coverage.

24. There has been no increase in deployment of the Soviet Moss AWACS aircraft and no indication of improvements to the system which would give it a capability to detect and track low-flying targets over land. It is still believed to be limited to use over water and to have only a limited ability to perform interceptor control.

25. The Firebar continues to be the primary Soviet low-altitude interceptor. However, the Flagon A has also conducted low-altitude intercepts. We estimate that the Foxbat weapons system does not now have a look-down,

shoot-down capability. Further, there is, as yet, no evidence of such a system under development.

26. The low-altitude SA-3 SAM is still being deployed, with new sites now appearing along the China border and in other areas of the country where it had been previously deployed. Exercises against targets as low as 50 meters have been noted in Egypt and East Germany. Unlike the simulated cases reported in the Memorandum to Holders of NIE 11-3-71, some of the exercises in Egypt have involved actual aircraft targets. Command and control communications have been improved with further deployment of a probably automated target designation system. Such a system would make much more rapid assignment of targets to SAM units possible and thus lengthen the available reaction times.

D. Vulnerability to Countermeasures

27. US experience in Vietnam clearly illustrates that performance of Soviet air defense equipment can be degraded through the use of ECM, evasive maneuvers, and defense suppression techniques. For example, the efficiency of the SA-2 system has been severely degraded by target evasive maneuvers, site suppression, low-altitude attacks, and by jamming its target-tracking radar and its missile-tracking system. Further, the use of chaff to interfere with air surveillance radars has had a telling effect upon the efficiency of the radar reporting net. The techniques used against North Vietnamese air defenses would not have so devastating an effect against the more modern air defense systems employed in the Soviet Union—but their effect will be serious. In addition, more advanced US techniques and equipment such as extremely low-altitude penetration, the use of newer ASMs for defense suppression, and newer forms of ECM may balance out improvements in the more modern Soviet systems. Though the precise degree of degradation of Soviet air defense system performance under these conditions is difficult to predict, it will undoubtedly occur and will be a crucial factor in determining the outcome of a strategic bomber attack.

III. DEFENSE AGAINST BALLISTIC MISSILES

There is no evidence that the Soviets have deployed ballistic missile defenses beyond Moscow. They are, however, continuing to develop new antiballistic missile (ABM) systems at Sary Shagan.

This Section begins with a summary description of the Moscow ABM System and the supporting early warning radar network. It then focuses on the research and development (R&D) activities at Sary Shagan and discusses the implications of these programs. Tables VI-VIII, give estimated characteristics and performance of Soviet ABM radars and missiles. The definitions of technical ABM terms are found in the Glossary.

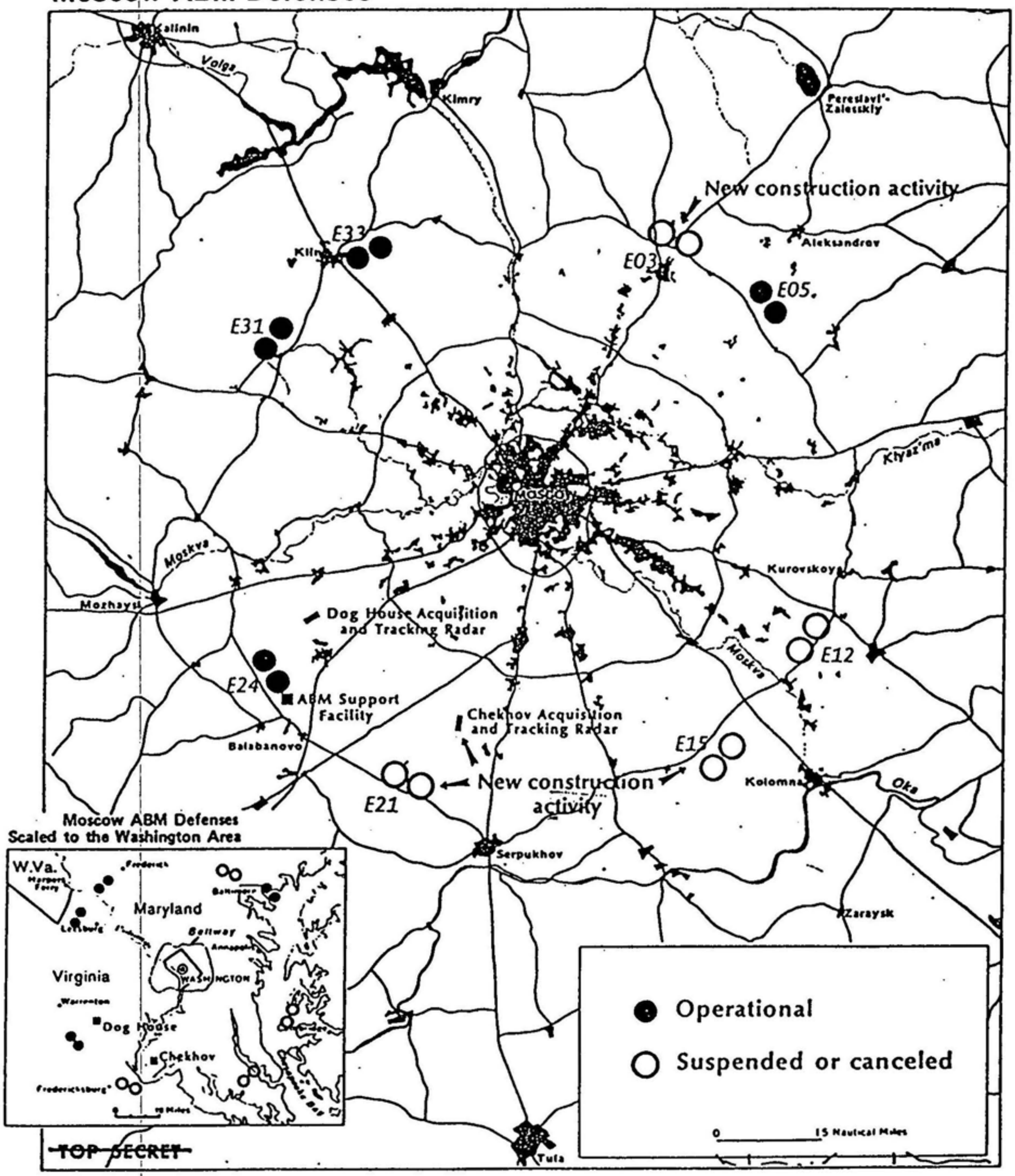
A. Current Capabilities: The Moscow Antiballistic Missile System

28. The Soviets have deployed an ABM system only at Moscow. It consists of a target acquisition, tracking, and battle management radar (which we call Dog House) located southwest of Moscow; another radar with similar functions under construction near Chekhov some 35 nm south of Moscow; engagement radars—which we call Try Adds—at four complexes to the north and west of Moscow; and 16 Galosh missile launchers deployed at each of these four complexes. (See Figure 4.) The full system can now be employed against intercontinental ballistic missiles (ICBMs) and SLBMs launched from some directions. Some portions of the system can be used for defense against missiles launched from China.

29. The Moscow system is provided early warning by a network of large array radars, called Hen Houses, all but one of which are

Figure 4

Moscow ABM Defenses



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operational. (See Figure 5.) Coverage against SLBMs will be enhanced by the operation of the new Hen House near Sevastopol and will be further improved by the acquisition radar under construction near Chekhov. Completion of this latter radar will also provide additional coverage against missiles launched from the People's Republic of China (PRC).

30. The Moscow System has significant weaknesses—so many that its deterrent value against a massive US attack can be considered insignificant. Assuming optimum conditions, and a shoot-look-shoot defense, our calculations indicate that the system with 64 interceptors could at best successfully engage about 45 targets (re-entry vehicles [RVs] and decoys) before running out of interceptor missiles. Under the same conditions, the system could handle an equal number of SLBM targets if they arrived from sectors covered by the large acquisition and tracking radars. When such coverage is not available, as in attacks from the western Mediterranean, the defenses would have to rely on engagement radars at the missile sites for target acquisition. As a result they could be saturated by a relatively light attack.

31. Tests of the Galosh interceptor show that it can attack an incoming missile outside the earth's atmosphere at long ranges, and probably within the atmosphere at shorter ranges. The use of both capabilities against a single target might permit the two-layer or shoot-look-shoot defense with improved probability of success. But the system cannot discriminate between RVs and penetration aids outside the atmosphere. Moreover, since the interceptor does not have very high acceleration (as does the US Sprint), the system cannot wait for atmospheric filtering to discriminate between RVs and penetration aids before interceptor launch. Therefore, decoys and chaff puffs would have to be engaged as separate targets, and the supply of available interceptors would be rapidly exhausted.

32. Because of its long range, the Moscow System has an inherent capability to defend regions outside the Moscow area, but it can protect such regions with only a thin, single-layer defense. This area defense would be more effective against attacks by a third country or an accidental or unauthorized launch because the number of RVs would be small, and several interceptor missiles could be sent against one target.

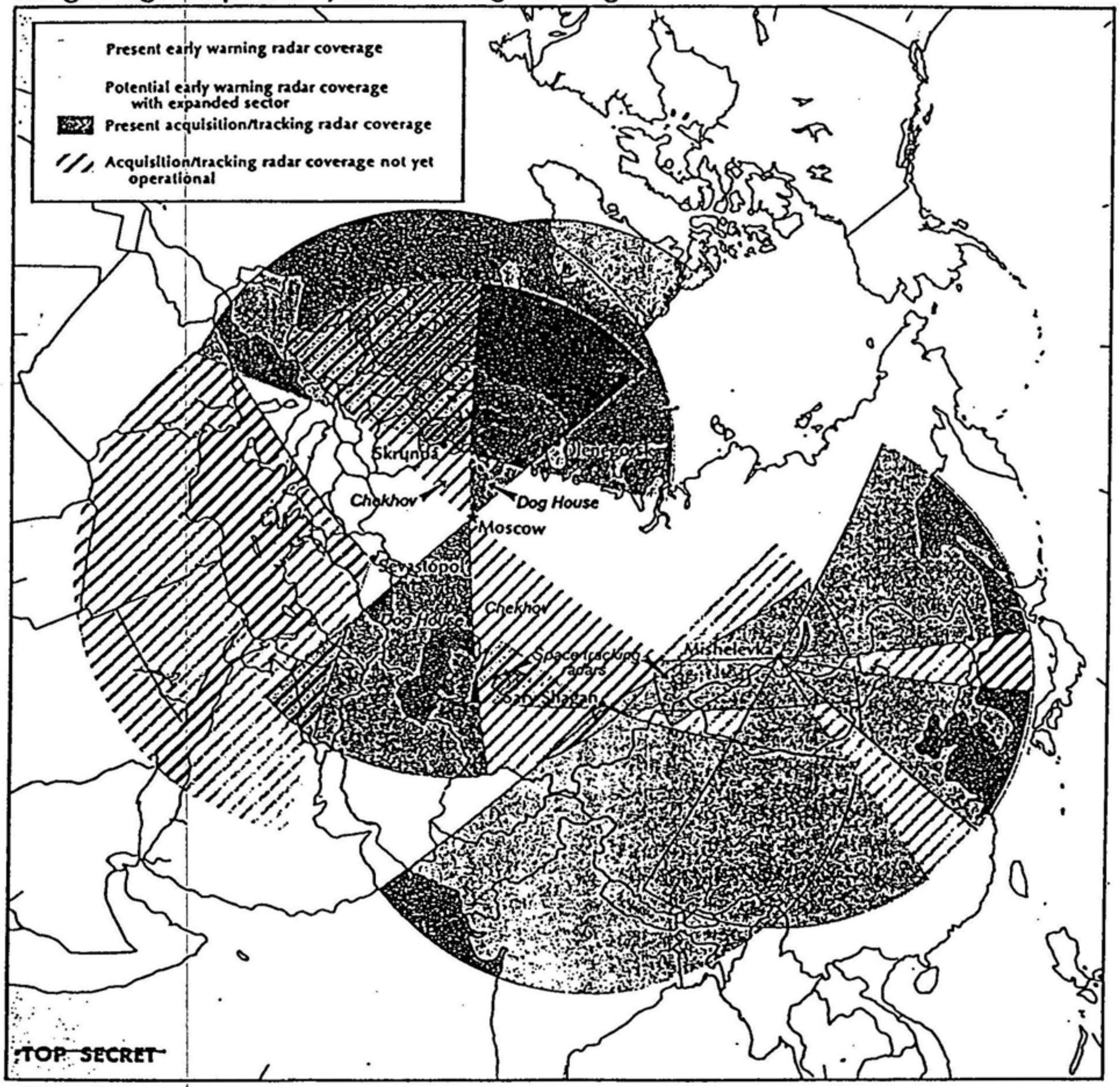
Command and Control

33. We believe that command and control communications for the Moscow ABM System have been operational for some time, and that the battle management center may be located near the Dog House target acquisition and tracking radar at Naro Fominsk. However, we have not identified an ABM command and control communications network, and we do not know how operational data are being passed between the various elements of the defense.

34. There is no firm evidence that a separate missile defense command has been established. In the early 1960s, however, Soviet statements suggested that their ABM forces might constitute a separate command within the PVO Strany called the PRO. From mid-1967 to the present, the name of Lt. Gen. of Artillery Y. V. Votintsev has appeared regularly with the names of the commanders of the three previously identified arms of the PVO Strany, suggesting that he heads an organization at a comparable level. There also is an indication that Votintsev has an office at the national command center, as do the other three commanders of PVO Strany arms.

Figure 5

Soviet Ballistic Missile Early Warning, Long Range Acquisition, and Tracking Coverage



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B. New Construction at Moscow

Large Antennas at Chekhov

35. The new radar antennas under construction at Chekhov are similar to the original Chekhov antennas, and we believe that they will have similar capabilities. If so, [redacted] coverage would allow detection of ballistic missiles launched toward Moscow from a large portion of China. (See Figure 5, page 19.) Ballistic missiles launched toward Moscow from Manchuria, however, would not be detected; this would require either additional radars or the electronic expansion of the Chekhov scan sector.

Work at Previously Abandoned Try Add Complexes

36. Work has been underway for over a year at three previously abandoned Try Add complexes. These are E-03, northeast; E-15, southeast; and E-21, southwest of Moscow. (See Figure 4, page 17.) Activity at E-03 has been limited. However, the large quantity of construction material at this site suggests that a major effort will get underway in the near future.

37. E-15 was apparently abandoned in 1964. However, in 1971 new construction activity was noted. It now consists of new buildings, several trenches, and a large paved excavation in which a building is apparently under construction. One of the new buildings is an extension of a previously abandoned Try Add radar building. Two other buildings are probably being prepared for installation of a radar.

38. Major new construction activity was also noted in 1971 at E-21, an ABM complex at which work was stopped in 1967. The Soviets are constructing about half a dozen buildings in the area. Four of the buildings have large parabolic dish antennas being constructed alongside. Thus, it now appears that these four buildings will support parabolic dish antennas. Additional buildings in various stages of construction will probably be operational support facilities.

39. The installation of dish antennas at what seemed to be a new ABM facility is surprising. Planar arrays, because of their better target handling capabilities, are clearly preferable to a dish. The new dishes being constructed at E-21 are probably larger than those at the Try Add complexes and are different in several other respects as well. In addition, we have recently discovered open trenches which probably connect the Chekhov radar with E-21 and possibly with other facilities in the Moscow area.

40. The purpose of the new construction is not at all clear. Our earlier judgment was that this activity involved the augmentation of the Moscow defenses. [redacted] It now appears that, instead of functioning in an ABM weapon system, the new dish antennas may have a space communication or satellite tracking function. Indeed, the new dishes are similar to those employed for deep space tracking at other locations in the USSR.

C. Antiballistic Missile Research and Development at Sary Shagan

41. We have noted before that a wide range of Soviet ABM R&D activity was continuing and that, although the specific purpose of

some of these developments was uncertain, it was clear that the Soviets were committed to a broad ABM R&D program. This judgment remains valid despite the fact that the ABM Treaty resulting from the strategic arms limitation negotiations will limit somewhat the direction of future R&D.

42. The present Soviet ABM R&D program is apparently directed toward development of two different ABM systems. One of these (ABM-X-3) utilizes components which are smaller than those used with the Moscow System. It may be designed to provide defense of ICBM silo launchers as is allowed by the ABM Treaty. The other system (ABM-X-2) has been under development for several years and is believed to be a follow-on to the Moscow System.

ABM-X-3

43. We believe the Soviets started to install and test components of the ABM-X-3 at Sary Shagan at least two years ago. Components of the system include a new type multiaperture radar and missile launchers. The new radar is probably the engagement radar for the system. Several postulations as to the use of the radars' various apertures are possible, but generally they include the use of a large planar array mounted on the set as a target tracker.[

]The missile launchers associated with the system are apparently designed for the vertical launch of interceptors about the size of the Galosh. An important aspect of the ABM-X-3 is the suggestion in some of our evidence that it can be deployed much faster than the Moscow System.

ABM-X-2

44. Components of the ABM-X-2 have been under development at Sary Shagan for a number of years. The radars for the system were built upon a previously abandoned Try Add site and a launcher area was constructed nearby. We do not believe that the Soviets have made much progress on the system, over the past year. We know that a large, flat octagonal antenna has been installed on top of an old, large Try Add building. This is likely a mechanically steerable planar array radar which should have considerably better target handling capabilities than those of the large Try Add radars deployed around Moscow. It may be capable of simultaneously searching for, and tracking, a number of targets within a relatively large sector—perhaps 30 to 50 degrees. Apparently a smaller radar has also been installed in the same area, but its type and function are unknown.

45. The relatively slow pace of activity on ABM-X-2 suggests that the Soviets are either experiencing some technical difficulties with the system or have reconsidered earlier plans to make improvements to the Moscow System, possibly because of the SALT negotiations. Nevertheless, this system continues to be the best candidate for additional deployment at Moscow.

Flight Testing

46. The characteristics of ABM flight tests at Sary Shagan indicate that the Soviets are experimenting with both exoatmospheric and endoatmospheric intercepts of targets.[

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47. Recent Soviet ABM tests are of particular interest because they differ from earlier tests and suggest that new interceptors are being developed. We cannot at this time, however, determine the ABM systems with which the new interceptors will be associated or the engagement modes which the Soviets might be developing.

Top Roost Radar Facility

48. The Top Roost radar—which is the prototype for the Chekhov radar near Moscow—is probably complete; it is a bistatic system.

IV. STRATEGIC DEFENSE AGAINST SUBMARINES

Section IV covers the Soviet capability to counter US nuclear-powered ballistic missile submarines (SSBNs) and protect their own. It utilizes a simplified, highly stylized example to provide a framework for the evidence which supports the key judgments. Tables IX-XV give estimated characteristics and performance of ASW ships, submarines, and aircraft and of the ASW sensors and weapons which they carry. The definitions of technical ASW terms will be found in the Glossary.

A. Introduction

49. Three developments have influenced the Soviet requirement for improved capabilities against submarines in the past decade and a half. The establishment by the US of a permanently patrolling fleet of ballistic missile submarines has created a Soviet need for seeking out US SSBNs. The evolution of a Soviet ballistic missile submarine force has engendered a requirement for protection of their own ballistic missile submarines. Finally, the growth of the USSR as a naval power has brought with it a Soviet requirement for improvements in traditional tactical ASW for protection of their general purpose naval forces and their merchant ships.

50. ASW clearly enjoys high priority in Soviet naval planning and in the design of newer operating forces, but most Soviet ASW deployments, operations and training are tactical in nature and directed toward defense of Soviet surface forces against submarine attack. Operations and training for defense of Soviet ballistic missile submarines against US interference are much less extensive. While we have not detected any Soviet effort specifically directed to countering the strategic SLBM threat, they appear to be conducting basic R&D across the broad spectrum of ASW technology. The two strategic ASW missions will be discussed here. Tactical ASW is discussed in the Memorandum to Holders of NIE 11-14-71, "Warsaw Pact Forces For Operations in Eurasia", dated 10 August 1972, SECRET.

B. Protection of Soviet Ballistic Missile Submarines

51. Soviet naval writers have indicated that the Western attack submarine force constitutes a major threat to Soviet ballistic missile submarines and by implication to the credibility of the naval portion of their strategic deterrent. They have had opportunities to learn of the capabilities of the US sound surveillance system (SOSUS) and the supporting ASW forces. They are probably most concerned that Western submarines will attempt to trail their SSBNs, and they may have reacted to these threats by escorting some of the deploying Y-class submarines.

52. From December 1970 and through 1971, the Soviets conducted at least five joint submarine transits of the Norwegian Sea, in which Y-class SSBNs proceeded to missile stations accompanied by C- or V-class submarines.

[redacted]

53. The best explanation of these joint transits is that the Soviets were practicing techniques to detect possible Western trail of their SSBNs. [redacted] Although it is possible the Soviets were practicing covert trailing of their own SSBNs, their known operating practices make this unlikely. They realize that use of attack submarines to protect their ballistic missile submarines could complicate the task of our surface and submarine ASW forces. It would have little effect, however, on airborne ASW.

54. The Soviets are more inclined than Western navies to operate submarines in groups. They have developed special underwater acoustic communications links which could facilitate coordinated operations between submarines. But until more definitive evidence appears—perhaps some indication of the communications and active sonar policy of the submarines in transit—the objectives of the transits will still be open to some question.

55. The Soviets could also protect their SSBNs by reducing noise levels to those of US SSBNs, thereby eliminating the ASW advantage currently enjoyed by the US. It is likely that the Soviets have embarked on a quieting program with the new D-class SSBN. To achieve the required quieting, however, requires a long, costly effort, and evidence to date suggests that the Soviets probably could not improve more than a fraction of their present force for at least a decade.

C. Offensive Operations Against United States Ballistic Missile Submarines

Present Capabilities

56. Up to the present time the Soviets have shown an ability to estimate reasonably accurately the number of US SSBNs on patrol, based largely upon their surveillance of SSBN bases. Their estimates of the general locations of patrol areas have been accurate only in part. But, most important of all, they have never shown an ability to detect or localize US SSBNs accurately enough for ASW operations. Further, there is no evidence the Soviets have conducted trailing operations against US SSBNs.

Problems of Detection

57. Developing a successful defense against US SSBNs poses a serious problem for the Soviets. The difficulty of detecting even a single SSBN in the open ocean is very great, but to have an effective defense the Soviets must be able to destroy or neutralize a major portion of US SSBNs on station within a very short period of time. Allowing even one submarine to launch its missiles could bring as many as 224 weapons down on the USSR. As all submarines on station are capable of launching quickly on receipt of command, the prolonged search and destroy methods utilized in the past are much too slow against the SSBN threat of today.

Figure 6

58. The primary factors which preclude successful strategic ASW are the size of the areas where US SSBNs operate and the extreme quietness of their operations. About one-half of the US force is on station at any one time, in the Norwegian Sea, the Pacific, the Mediterranean, and elsewhere. Keeping track of all US SSBNs at sea is a prerequisite to a totally effective Soviet strategic ASW capability. The several approaches to this problem include ocean surveillance to detect, identify, and track all submarines continuously and continuous trailing (overt and covert) of ballistic missile submarines by attack submarines. A third approach—open ocean search by ships, aircraft, or submarines—provides only intermittent detection and does not afford the continuity of contact required for timely neutralization of the greater part of the SSBN force unless followed up by some sort of trailing action. Present Soviet capabilities and future potential in each of these approaches are evaluated in the following paragraphs, and stylized and greatly simplified examples are included to illustrate the magnitude of the problem.[2]

Ocean Surveillance by Fixed Underwater Systems

59. The Soviets have not yet deployed any long-range fixed underwater systems for ocean surveillance. Moreover, environmental conditions on the Soviet littoral and the target characteristics of US SSBNs do not favor the establishment of long-range ocean surveillance systems on the scale of the US SOSUS. Soviet surveillance systems currently moored in restricted waters and coastal areas would be of no value in detecting SSBNs in the open ocean. Deployment of current Soviet surveillance systems, such as the Cluster Sand, [redacted] in sufficient numbers would be prohibitively expensive and perhaps technically impossible. Even to cover the Norwegian Sea—only one-tenth of the current Polaris patrol area—thousands of buoys or arrays would have to be emplaced and connected by tens of thousands of miles of cable for the Soviets to obtain even a minimal capability.

60. Although the Soviets continue to introduce improved passive fixed detection systems to enhance their overall capabilities, we believe they are unlikely to exceed the capabilities of the better Western systems by any significant degree during the 1970s. Indeed, they probably will not even match them. To detect patrolling US SSBNs they must considerably surpass them.

61. Estimates of the detection ranges of Soviet moored buoys and bottom-laid fixed arrays have been extrapolated to the late 1970s as a basis for evaluating Soviet ocean surveillance capabilities about 1980. [redacted]

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[2] It must be recognized, however, that in practice, the Soviets would employ several of these approaches simultaneously and would use all available supporting intelligence. At a minimum, this effort could reduce the wide-area random search requirement characteristic of each of the simplified examples. As a result, the numbers of specific sensors or platforms required to achieve the probability of detection postulated in the individual examples could be lessened.

We think it unlikely the Soviets would be able to achieve a detection range of more than 15 nm in deployed moored buoy systems by the late 1970s. Soviet bottom-laid fixed acoustic arrays might reach a detection range of 20 nm-

62. To illustrate the difficulty of ocean surveillance, we have used a greatly simplified model of one of the many Polaris operating areas, the Norwegian Sea, and have made other assumptions favorable to Soviet "solution" to the problem.[4] Easy access to this area by the Soviet's largest fleet should make this an optimum body of water for Soviet ASW operations. Yet even in the Norwegian Sea, an area only 10 percent of what the Soviets must cover as a prerequisite for effective strategic operations, we believe the problem is too great to solve during the 1970s.

63. *Under the assumptions stated, the Soviets would require a distributed system of about 500 moored acoustic buoys having a detection range of 15 nm, connected to the nearest point in the USSR by at least 25,000 nm of cable. (See Figure 7.) Should they achieve 20 nm detection ranges using bottom-laid arrays, they would still need at least 300 arrays connected to the nearest point in the USSR by at least 25,000 nm of cable.*

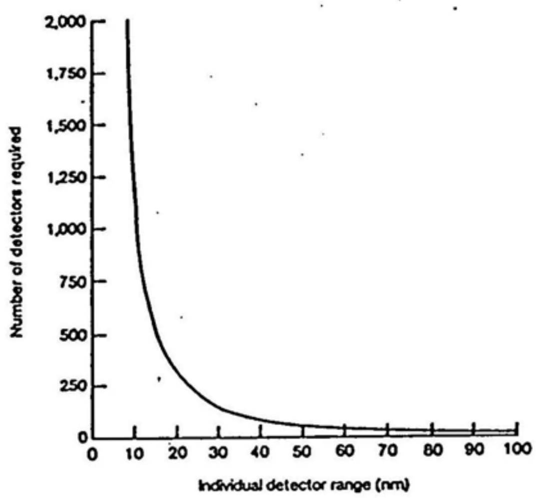
[4] For this discussion it was assumed that the water conditions critical to acoustical detection ranges are the most favorable that occur in the Norwegian Sea. In fact, such conditions vary widely by season and even by time of day and can become highly unfavorable within hours. We further assumed that the Soviets would accept a 50 percent probability of detecting one patrolling SSBN in a 48 hour period. Given four SSBNs in the Norwegian Sea, this means that there are 15 chances out of 16 of missing at least one. This is almost certainly a lower reliability than the Soviets would be satisfied with.

Figure 7

Number of Bottom-Laid Arrays and Moored Buoys vs. Detection Range

Norwegian Sea Example

Target: US SSBN on patrol



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64. It can thus be seen that, even with the projected level of Soviet technology in the late 1970s, ideal sound propagation conditions, and a minimal Soviet detection requirement, the Soviet task of installing a distributed moored buoy system or a bottom-laid hydroacoustic array with a surveillance capability in only the Norwegian Sea is immense. More realistic conditions would require many more buoys—each of which would have a reduced detection range—than indicated in the example. Even granting such surveillance systems, operations by ASW forces using other equipment would be required to localize the target sufficiently for engagement.

65. Thus, we estimate that effective broad ocean surveillance systems probably will not be available to the Soviets for use against US SSBNs during the period of this Estimate. They will have to continue to rely on COMINT, high-frequency direction-finding, intelligence

ships near US SSBN bases, and other intelligence sources, which probably can give them some idea of the number of SSBNs on patrol but no reliable location information.

Long-Term Submarine Trailing

66. An alternative to the establishment of an ocean surveillance system with its attendant cost and complexity is the assignment of a submarine force to trail US SSBNs, from home ports or from choke points along their transit routes, either overtly or covertly. At the present time, however, the existing differences between US SSBNs and Soviet submarines renders this alternative unlikely also. US SSBNs are extremely quiet when operating at patrol speeds. This is the result of two decades of costly effort to reduce the machinery noise generated within the submarine and to minimize the flow noise caused by its passage through the water. By contrast, Soviet SSNs and SSBNs are not nearly as quiet. Thus, a US SSN can trail a Soviet SSBN, but it is extremely difficult if not impossible for a Soviet SSN to trail a US SSBN. Soviet SSNs trying to trail face two problems. They must have sensors sufficiently sensitive to detect and, when necessary, to redetect evading target SSBNs. And they must operate in the presence of a high level of "self noise" against targets much quieter than they.

67. *Overt.* The almost endless variety of plausible measure-countermeasure scenarios which could be postulated makes it difficult to arrive at a quantitative measure of Soviet potential for overt trail using active sonars. Since it is unlikely that trail could be maintained for extended periods, even on individual SSBNs, the prospect of having an active trail on all or nearly all of the SSBN force at the proper time to prevent the force from launching its SLBMs is extremely unlikely.

68. *Covert.* Covert trailing involves the use of passive devices by the trailing submarine. To be effective, the trailing submarine must be very quiet and have good passive sonar. US SSNs have attempted during exercises to trail covertly our own SSBNs, but generally contact has either been lost or the SSN was counter detected. [redacted] The noise advantage of US submarines is important in two ways: our sonars operate in a less noisy situation, thereby improving their own performance, and the Soviet submarine is confronted with trying to detect a quieter target. Thus [redacted] quieting advantage of US submarines results in a relative advantage over Soviet submarines of [redacted]

69. Empirical data [redacted] indicate that before they could pose a covert trailing threat even to current US SSBNs, the Soviets would require, assuming target motion analysis[6] equal to US standards, a submarine quieter than their V-class [redacted]

[6] Target motion analysis is the process whereby the course and speed of the target are plotted and predicted so as to allow trail to be maintained. It results from a complex of equipment and human operators and cannot be simply translated into equivalent sonar improvements.

70. Based on our present knowledge of Soviet submarine sonars, the required improvements could probably be achieved by a relatively high priority effort lasting several years. Submarine quieting of the magnitude indicated above would be extraordinarily difficult to accomplish, however, and almost certainly could not be achieved through modifications to the existing V-class submarines.

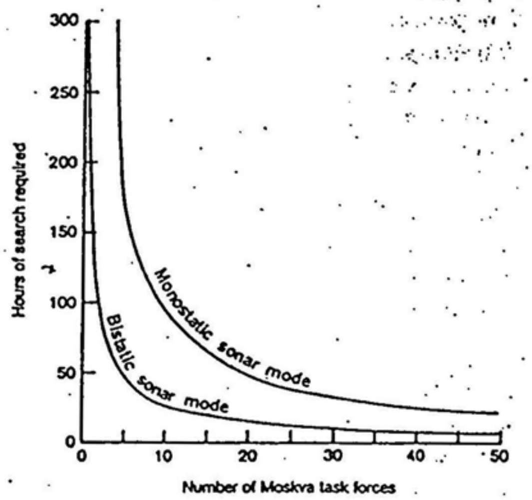
Figure 8

Search by Ships, Submarines, and Aircraft

71. *Ships.* While open ocean ASW search for SSBNs using ships, submarines, or ASW aircraft is technically feasible, limited sensor performance, and the force levels available preclude any meaningful Soviet capability. Most of their major ASW surface ships have older sonars which provide little capability for making and maintaining contacts. Fewer than 15 of their major surface ships are equipped with newer active sonars having a reliable search range [7] of up to about 8,000 yards, and only the Moskva and the Leningrad have reliable ranges of up to 16,000 yards under good conditions.

72. An ASW group consisting of a Moskva-class helicopter carrier with its helicopters and two Kashin-class frigates is the most effective submarine detection force utilized by the Soviets. Assuming the best water conditions (convergence zone propagation where feasible, with no problems such as shallow water and reverberation) and possible future perfection of a bistatic search capability, the Moskva task group might, at best, sweep a path 60 nm wide at a speed of 25 knots. *Under the ideal conditions posited (see footnote 4, page 26) it would require five Moskva task groups using bistatic search to have a 50 percent probability of detecting a non-evading US SSBN in the entire Norwegian Sea area in 48 hours. This would mean that there would be six chances out of 100 of detecting all four target submarines within the time limit. Using presently demonstrated monostatic search techniques, and estimates of current sonar capabilities, the path width and sweep speed would be so reduced that about 20 such*

Figure 9



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task groups would be required as shown in Figure 9. To increase the probability of detection from 50 percent to 75 percent, the number of task groups would have to be doubled. Moreover, taking into consideration the large amount of shallow water where convergence zone propagation does not occur, additional ASW groups would be required. The equipment requirements alone thus preclude an effective open ocean search capability in the Norwegian Sea, let alone other open ocean patrol areas, in the time frame of this Estimate.

73. *Submarines.* Using submarines to conduct an SSBN search is likewise not promising. Improvements as described under covert trailing would be required to detect units on patrol, and these have been judged to be unlikely. However, detection of US SSBNs during the higher speed transit between base and the patrol area would be possible if the Soviets were to match US attack submarines in quiet-

[7] Reliable range refers to direct path propagation; convergence zone propagation gives greater range, but the conditions favoring such propagation vary with area, season, weather, etc., so that they cannot be considered reliable.

ness and sonar performance. *Alternatively, using active sonars equivalent to the best US submarine suits (not yet demonstrated by the Soviets), and assuming ideal sound propagation conditions and a sweep width of about 60 nm at a speed of about 14 knots, 10-12 submarines would be necessary to search the Norwegian Sea within 48 hours.* Such tactics would be subject to the degrading effects of US countermeasures as described in overt trail. Under more realistic environmental conditions the requirement would be about 75 late model nuclear submarines to sweep the Norwegian Sea.

74. Another possible detection means would be linear hydrophone arrays towed by surface ships or submarines, although we have no evidence that the Soviets have developed or deployed such arrays. *Nevertheless, if they had arrays with a detection range equal to the best achieved by US experimental arrays* [ ] *it would require at least 250 platforms moving at 15 knots to search the Norwegian Sea within 48 hours.* As is the case in other Soviet hydroacoustic systems, these towed arrays far exceed Soviet capabilities today, and they probably will not be attained during the period of this Estimate.

75. *Aircraft.* The major Soviet ASW aircraft is the Il-38 (May), which carries sonobuoys and magnetic anomaly detection (MAD) equipment. The 40-50 May aircraft are limited to a radius of about 1,350 nm, with 3 hours on station, carrying a full load of ASW stores. They therefore cannot reach potential US SSBN patrol areas, except parts of the Norwegian Sea and parts of the Pacific. Most May training exercises involve efforts to localize the position of a submarine probably on the basis of a contact report; only a few sweeping operations have been noted. While MAD equipment is used in sweeping operations, its short range (1,500-2,000 feet) precludes its applicability to open ocean search.

76. Soviet MAD equipment might achieve by 1980 a detection range twice that now estimated for the May. *With this range, it would require some 400 9-hour May sorties (averaging 3 hours on station) to cover the Norwegian Sea in 48 hours against a randomly moving SSBN.* The real conditions, involving an SSBN operational area 10 times that of the Norwegian Sea example, preclude MAD as a means of open ocean airborne searches for US SSBNs in the period of this Estimate.

77. In the past few years the Soviets have deployed an ASW variant of the Bear, which has sufficient range to reach all Polaris operating areas. It carries sonobuoys whose detection range is limited to less than 1,000 yards against a patrolling SSBN, but it probably does not carry MAD equipment. Therefore, the ASW Bear can be used in localization efforts in the open ocean but not for broad open ocean search.

Coordinated Operations

78. We have also considered the use of the above systems in coordinated efforts to detect US SSBNs, since this is what we would expect in actual operations. The systems used in a joint effort would complement each other. However, owing to the limited effectiveness of each individual detection system, the forces available, and the magnitude of the SSBN patrol area, we believe that the overall results would still be ineffective.

Other Approaches to Submarine Detection

79. The Soviets almost certainly also recognize that detection of US SSBNs is far beyond their present capabilities using hydroacoustic and MAD equipment and techniques. They

have consequently been investigating other non-acoustic approaches to the problem.[8] In contrast, however, to our knowledge of Soviet progress in systems described above, we have very little evidence of the direction R&D is taking in these other non-acoustic areas, and little knowledge of Soviet progress. [ ]

80. So far, with the exception of the use of radar to search limited areas for snorkeling diesel submarines, the Soviet Navy has employed non-acoustic methods only in localization operations. R&D on some non-acoustic detection techniques has now progressed to the point that some methods may offer sufficient detection range and search capability to be of limited usefulness against submerged nuclear submarines. However, these non-acoustic methods are expected to continue to complement, rather than to replace, acoustic detection systems for at least the next decade.

V. ANTISATELLITE DEFENSE

The Soviets have continued to test an orbital antisatellite system. This Section discusses the antisatellite program and some of the related activities which have been observed. Definitions of technical antisatellite terms are given in the Glossary.

A. Introduction

81. The use of earth satellite vehicles (ESV) for military support and other activities has been a cause of concern to the Soviets. This was reflected in 1963 when they began to construct a network of space surveillance radars designed to provide orbital data on non-cooperative ESVs. The Soviets have deployed an ABM system which has the potential to engage satellites in low-earth orbit, and they have developed an orbital antisatellite system which has the capability of attacking targets in higher orbits.[9]

B. Detection, Tracking, and Orbit Prediction

82. The primary means of detecting tracking, and predicting the orbits of US satellites is the Hen House radar network (see Figure 5, page 19). These radars are capable of providing all of the data necessary for successful engagement. The Hen House network could be supported by the acquisition and tracking radars of the Moscow ABM System, various ABM R&D radars, and deep-space tracking radars in the Crimea.

C. Intercept Techniques

83. There are two intercept techniques by which a target satellite may be engaged—direct ascent and coorbital. In the direct-ascent mode the interceptor is launched and guided directly to the target in much the same way as a SAM or ABM. The orbital mode is more complex. It requires that the satellite interceptor be launched into an orbital plane which is the same or nearly the same as that

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[8] Non-acoustic detection methods exploit changes in the ocean environment caused by the presence or motion of the submarine. These changes include magnetic, thermal, optical, chemical, and radioactive effects as well as water turbulence and waves. Among the potential detection methods are those which exploit thermal effects through the use of infrared (IR) sensors, the detection of turbulent wakes to assist in trailing, the detection of nuclear and chemical materials in the submarine wake, and the use of radar to find exposed effects from deep-running submarines.

[9] The technical problems involved in attacking satellites in near-earth orbit are less severe than those of ballistic missile defense. Satellites appear as much larger targets to early warning radars than do missile RVs, and the future position of non-maneuvering satellites, if tracked on successive orbits, can be predicted with precision. In addition, satellites are essentially "soft" targets which are vulnerable to a wider variety of weapon effects.

of the target. The orbit of the interceptor is then adjusted to bring it within engagement range of the target satellite.

84. Though we have not seen it tested against satellites, the Galosh ABM interceptor could be used in a direct-ascent mode against ESVs in low-altitude orbits because of its ability to fly under power and guidance all the way to intercept. This would permit refinement of the interceptor trajectory throughout the engagement. Based on reasonable estimates of Try Add radar and Galosh missile performance, non-nuclear kill probably could be attained against satellites up to about 300 nm altitude and at slant ranges of a few hundred nm. The Galosh could also be used in a ballistic intercept mode against satellites as high as 450 nm. However, there would be some reduction in accuracy, and a nuclear warhead might be required.

85. Notwithstanding the inherent capability of the Galosh ABM interceptor to conduct an antisatellite mission, the Soviets have developed an orbital system. Because it is undergoing an active test program and will probably constitute the USSR's primary antisatellite capability, it is treated in detail here.

D. The Orbital Intercept Test Program

86. In the past, we have estimated that three types of satellites have been associated with the orbital intercept test program. These are a series of heavy maneuverable satellites, the interceptor satellites, and some satellites used for calibration and checkout. They are all included in the discussion here because they provide considerable insight into the details of the Soviet antisatellite effort.

The Heavy Maneuverable Satellite Program

87. In previous estimates we indicated that the heavy maneuverable satellites were related to the antisatellite interceptor program. This judgment was based on the fact that the heavy satellites, like the interceptor satellites, were launched by SL-11 space boosters and had considerable orbital maneuver capability. New information regarding the operations of two heavy maneuverable satellites, Cosmos 469 and 516, has cast doubt upon these earlier estimates.

88. The heavy maneuverable satellite program was initiated in 1967. Since then a total of eight have been launched, including Cosmos 516 which was placed in orbit from Tyuratam on 21 August 1972. Its orbit and estimated payload weight of 9,500 pounds were similar to each of the previous heavy satellites.

89. Cosmos 469 remained in an initial low orbit for 10 days instead of maneuvering during the first day to a near circular higher orbit as had all previous "heavies." Cosmos 516 stayed in its low orbit for 32 days. [

]

90. [

[redacted] the heavy maneuverables may have a reconnaissance mission.

91. [redacted]

The Interceptor Satellite Test Program

92. The Soviets have conducted seven orbital intercept tests since the fall of 1968, [redacted] The 5,000 pound vehicles used in these tests were, like the heavy satellites, launched by SL-11 space boosters. All reflected a capability to attack targets in a variety of low-earth orbits. The latest test (Cosmos 459/462), with launches in November and December 1971, was conducted at much lower altitudes than ever before and demonstrated the ability to change the plane of the orbit by some 5½ degrees.

93. [redacted]

94. The Soviets could use any of several trajectories to engage satellites with an interceptor. The number of orbits to intercept in an operational situation would depend upon the desired timing and location of the intercept. The Soviets have conducted most intercept attempts at altitudes of 130-550 nm and over regions where they could be viewed by instruments in the Moscow area. The last, Cosmos 459/462, was beyond Moscow viewing (over West Germany) but was observable from the western USSR. Although the Soviets probably could not intercept a US satellite without our knowledge, they could conduct an intercept attempt in such a fashion as to deny the US detailed information regarding the intercept operation.

95. [redacted] We do not know what type of sensor is used by the interceptor homing system. It is most likely a radar, a view supported by the fact that the intercept tests have been conducted apparently without regard for lighting conditions.

96. We are unable to determine, with certainty, whether or not a warhead has been carried by the interceptor. However, the

guidance scheme used results in very small miss distances, and the non-nuclear warhead technology necessary to assure kill at these distances is well within Soviet reach.

Calibration Satellite Program [11]

97. The calibration satellite program was started in early 1966, and there have been a total of 12 launches since then—four of which are clearly associated with the orbital intercept program. The calibration satellite is a 700 pound vehicle launched by the SL-7. The purposes of the program are still not fully understood. We have noted that calibration satellites are launched prior to heavy maneuverable and interceptor satellite tests. Further, we have confirmed that the calibration satellites also have the high capacity command system on board, although we have not observed it being used to control the satellite's operations. As a result, we believe that one function of the program is to check out the high capacity command system ground facilities prior to the launch of heavy maneuverable and interceptor spacecraft.

E. Resulting Antisatellite Capabilities

98. We estimate that satellites which pass over the USSR at altitudes below about 1,000 nm are now vulnerable to non-nuclear attack by orbital interceptor. In addition, the Galosh ABM interceptor, appropriately equipped with a non-nuclear warhead, and possibly modified to include a homing system, would appear to provide an attractive direct-ascent antisatellite capability against targets at altitudes below 300 nm. Although we have not noted Galosh testing against satellite targets, it could provide faster reaction, little susceptibility to countermeasures and perhaps a better chance for clandestine intercept than would be provided by an orbital system.

99. In order to use the orbital interceptor against targets at altitudes greater than about 1,000 nm, an improved launch vehicle would be required. The only operational Soviet space launch system that could place the tested interceptor into synchronous orbit is the SL-12. Cosmos 382 was an engineering test of the capabilities of the SL-12 fourth stage to perform maneuvers over a period of several days, and it included a 15 degree orbital plane change. One of the purposes of this test may have been to check out propulsion and guidance systems when they are used in a manner similar to that required to deliver a payload to the geostationary corridor—i.e., roughly in the plane of the equator and at an altitude of 19,300 nm. On the basis of this flight we believe that the Soviets can place the existing orbital interceptor into geostationary orbit with the accuracy required for non-nuclear kill. However, to date, they have conducted no tests of such a capability.

F. Other Types of Interference

100. There are several means of interfering with satellites and disrupting their missions which do not require that the target vehicle be intercepted by another vehicle. These include the use of lasers, electronic intrusion and active security programs.

101. Soviet capabilities in lasers are generally on a par with those of the US. When coupled to suitable optics with appropriate pointing and tracking equipment, lasers now available could produce a "cloud" on photographic film that would cover a small individual target area. These lasers also have power potentials sufficient to produce physical damage to the film, the optical system, and other sensitive components of a reconnaissance satel-

[11] Satellites in this program are apparently used to check out and calibrate ground instrumentation and support facilities. For convenience in the discussions which follow they will be referred to as *calibration satellites*.

lite. While there is no evidence that the Soviets have attempted to utilize lasers against US satellites, they have the components, and they could assemble a system at any time. Further, the Soviets are probably developing laser weapon systems, but we believe their initial employment most likely would be for air defense rather than countering satellites.

102. Opportunities for electronic intrusion might include the jamming of satellite receivers and control links. This approach would depend upon an ability to monitor satellite traffic and to establish critical frequencies to be jammed. Insertion of false data into a satellite control system not protected by communications security equipment would depend upon knowledge of frequencies, coding, and operational procedures. Even in cases where communications security equipment designed to prevent spoofing is used, jamming could deny use of the satellite.

103. The Soviets are capable of jamming satellite receivers and could probably insert spurious information into an unprotected satellite control system. Their ability to overcome a secured satellite communications and control system is not known, but it is probably not significant. In any case, we have no evidence that the Soviets have ever jammed or attempted to transmit false data to any US satellite.

G. Likelihood of Direct Soviet Interference

104. The Soviet attitude toward satellite reconnaissance systems has undergone considerable change over the years. Initially, the USSR maintained that reconnaissance from space was merely another form of espionage and as such was illegal. However, by about 1964, the Soviets themselves had developed a considerable satellite reconnaissance capability, and their attitude began to change. For example, during the negotiations which led to the 1967 treaty governing the peaceful uses of outer space, the Soviets carefully avoided raising the issue of satellite reconnaissance. Since then, they have come to accept reconnaissance from space as a necessary national function in the nuclear age, and they have agreed that it is a vital element in the national means for verification of the treaty to limit ABMs and the accompanying Interim Agreement on Offensive Missiles.

105. We have, for the past several years, estimated that the Soviets are unlikely to take any direct action against US satellites. This judgment was based upon a number of political and military considerations, including the US reaction. The Soviets have launched about 35 reconnaissance satellites in the last year and are almost certainly heavily dependent on this source of intelligence, particularly for information on China's growing strategic nuclear capabilities. US retaliation could seriously jeopardize the effectiveness of these Soviet collection programs.

106. The signing of the agreement to limit ABMs and the Interim Agreement on Offensive Missiles reinforces our judgments. The Soviets recognize that any attempt to prevent the US from gathering intelligence on their strategic programs by taking direct action against our satellites would constitute so serious a violation of these agreements that it could only be justified by an attempt to change the established strategic relationship. Considering the importance of space reconnaissance to the viability of the SALT agreements, we continue to believe it highly unlikely that the Soviets would actively interfere with US reconnaissance satellites.[12]

[12] Paragraph 2, Article XII of the ABM Treaty, provides that each Party agrees not to interfere with the national means of verification of the other which are operating in accordance with the verification provisions of the Treaty. This provision would, for example, prohibit interference with an orbiting satellite used for Treaty verifications.

107. There remain, of course, other types of satellites not implicitly protected by the SALT agreement, including military support and scientific satellites, which the Soviets might find reasons to attack. We find no basis, however, for changing our earlier judgments about the likelihood of the Soviets interfering with them. Short of preparation for actual war or retaliation in response to what they believed was prior US action against their satellites, we believe it is unlikely the Soviets would interfere with those of the US.

VI. SOVIET CIVIL DEFENSE

108. Formerly, the Soviet civil defense effort was directed by a joint civil and military organization, headed by Marshal of the Soviet Union V. I. Chuykov and under the general direction of the Council of Ministers, USSR. The chain of command followed civil administrative channels from Moscow through republic, oblast, city, city ward, and rural rayon government centers. At each level of government, the responsibility for the operational aspects of civil defense rested with the Military Staff of the Civil Defense, although the local chief executive bore a second title of Chief of Civil Defense for that respective territory.

109. Recent organizational changes have apparently been made which directly subordinate the civil defense organization to the Ministry of Defense. The new head of civil defense, Col. Gen. A. Altunin, is a deputy minister of defense. Military district authorities probably will assume closer control over the civil defense activities of local executive and party organizations. The relationship with the industrial, agricultural, and other institutions, at which the director or chairman of the local enterprise is the responsible authority for civil defense, has not been determined. The fact that the new chief of civil defense is now a deputy minister of defense suggests an upgrading of the civil defense organization. It remains to be seen, however, what effect the resubordination of civil defense to the Ministry of Defense will have on the program.

110. Present Soviet civil defense policy relies on urban evacuation and the use of improvised fallout shelters as the principle means for protecting most of the population of likely target areas. This policy makes Soviet civil defense critically dependent on several days' warning time for maximum effectiveness. Under the most favorable conditions—good weather, sufficient transportation, accessible dispersal areas, and a disciplined population—3 to 4 days would be required to evacuate the non-essential personnel from most Soviet cities. It would almost certainly require more time to evacuate Moscow and Leningrad. If a decision to evacuate were made, the Soviets would probably attempt to relocate about 70 percent of the population of the large cities. The remaining 30 percent would stay in the immediate vicinity to man key industries. Blast shelters are being built for their protection.

111. Evacuation of major urban areas would create complications that would almost surely delay the process beyond the 3 or 4 days mentioned above. In addition, military requirements during any period of emergency would undoubtedly have a higher priority in the competition for transportation facilities. Because of their reliance on urban evacuation as the principal means for protecting most of the population of likely target areas, the ability of Soviet civil defense measures to reduce casualties substantially appears to be significantly limited. This is true despite a relatively large commitment of resources—25,000 to 30,000 full-time personnel and annual expenditures of 150 million to 450 million rubles.

112. Most of the school age and adult population have undergone compulsory training in the extensive civil defense training program. The chief objectives of the training are to create a general awareness of protective measures against effects of nuclear, biological, and chemical weapons; to provide leaders and specialists for the civil defense organizations; and to prepare most of the working population for rescue and recovery units. Besides reducing the likelihood of panic and minimizing the probable number of casualties, the training provides a convenient vehicle for political indoctrination. Evidence at hand suggests, however, that this program is apathetically received by the Soviet population.

VII. THE FRAMEWORK OF FUTURE SOVIET STRATEGIC DEFENSIVE POLICY AND PLANNING

A. Soviet Strategic Defenses and the Arms Limitation Agreements

113. The Treaty on the Limitation of ABMs and the Interim Agreement on Offensive Missiles will constitute two of the more important elements in Soviet strategic defensive planning for the next several years. The ABM Treaty has the more immediate and direct impact on future Soviet strategic defenses, but the Interim Agreement is also significant in that it does not limit aircraft and aircraft-delivered weapons.

114. If the Soviets judge the prospects for further agreements between the US and the USSR to limit strategic offensive systems to be favorable, and we believe they do, they will probably move slowly in building their defenses. If they further believe that in the long run the US will reduce its forces, they might do little more than complete programs already under way and continue essential R&D activities.

115. However, the Soviets are faced with a growing strategic threat from the PRC. If they were not able to resolve their differences with the Chinese in the next few years, they might feel impelled to continue to improve their defenses across the board within the limits of the present agreements. Or they might see improved air defenses and major R&D programs on ballistic missile defense and ASW as important to their future security vis-à-vis the US and to their bargaining position in the SALT negotiations.

116. The Soviets might be prepared to break off negotiations if they came to believe that their present position of "equal security" with the US was threatened. And failure to reach further agreements on offensive weapons within the next 5 years would certainly cast doubt on the viability of the ABM Treaty. Should such doubts be aggravated by the unconstrained growth of third country powers such as the PRC, the Soviets might face a situation in which one or both parties to the ABM Treaty favored its termination in 1977 when it is due for review. Thus the Soviets might deploy allowed new air defenses and ASW systems while the Treaty is in effect but prepare for a wider deployment of offensive and defensive systems after 1977. Finally, it is possible that difficulties in negotiating a permanent agreement on offensive systems would be accompanied by the deterioration of political relations with the US to the extent that the Soviets or the US might abrogate the ABM Treaty prior to 1977 and commence major new defensive efforts in addition to programs in progress.

117. Within the framework of these possibilities, many varying courses of action are open to the Soviets. The actual course they follow will depend not only upon the future course of negotiations, but also upon a com-

plex of continuing policy and planning considerations, the foremost of which is the Soviet view of the future threat to their country.

B. The Future Threat to the USSR

118. Exchanges between US and Soviet delegates to the SALT have underscored the fact that Soviet planners consider any weapon system capable of striking their territory to be part of the strategic offensive threat. This includes the US and NATO theater strike forces—carrier based aircraft, fighter bombers, and tactical missiles deployed in areas near Soviet borders—as well as ICBMs, bombers, and submarine-launched missiles.

119. Soviet planners are well informed about current US forces and about probable changes in these forces over the next few years. The US strategic forces presently programmed for mid-1977 will be able to mount an attack with about 3,500 bomber weapons and more than 7,000 missile-delivered nuclear warheads. There will also be more than 1,000 aircraft deployed aboard US aircraft carriers and at bases in forward areas. Other NATO countries will have about 2,000 aircraft and a few hundred missiles capable of mounting nuclear attacks against Soviet targets. Further, the Soviets must be prepared to counter new, technically advanced, US offensive systems which would greatly complicate their defensive problem and which could be extensively deployed in the 1980s. These include new RVs, longer range SLBMs, SSBNs with greater missile carrying capacity, the B-1 strategic bomber, advanced air-launched cruise missiles and decoys, and quieter, more sophisticated submarines.

120. In addition to the threat from the West, Soviet planners must continue to deploy forces to deal with the growing and imposing threat from China. China is deploying medium-range ballistic missiles and intermediate-range ballistic missiles, and the Soviets probably expect this force to be substantially augmented over the coming decade. In addition, the Chinese will probably reach initial operational capability with an ICBM in the mid-1970s. All of these missile systems could have warheads in the megaton range. China will increase its capabilities for air attack along contiguous borders of the USSR and into some areas of the Soviet heartland. At least for most of the period of this Estimate, however, this capability will consist of older model aircraft.

C. Technology

121. Most of the options open to Soviet planners in meeting these threats will depend heavily upon the ability of the USSR to utilize its present technology and to develop new technologies for strategic defense. This has been particularly difficult in the past, and strategic offensive innovations since World War II have usually exceeded the limits of available defensive capabilities. Moreover, the increasing complexity of defensive technology imposes longer planning lead times than those faced by offensive systems.

122. Soviet defensive planners have recognized these problems. They have maintained an extensive R&D program on strategic defensive weapons which not only upgrades existing systems and readies for deployment new systems utilizing present technologies, but broadly explores new technological approaches.

123. Sensor technology is perhaps the most difficult area to advance and accounts for a major share of the lag in defense effectiveness. Sensors must provide timely information on the target's position and course. Without adequate data on the target location, other elements of the defensive problem become more critical. Weapons technology and good

command and control techniques can offset shortcomings in sensor technology to some degree. For example, system inaccuracies can be compensated for by using nuclear devices with large lethal radii; faster missiles and aircraft can make up for some delays in target acquisition; and prompt decision making can minimize the engagement delays.

D. Resource and Bureaucratic Constraints

124. Resource considerations and the interplay of bureaucratic interests also exert an influence over the course of major defensive force development. Soviet policy makers must balance their concerns for strategic defense against other needs, both civilian and military, and allocate money, manpower, and scarce technical resources accordingly. We cannot place precise limits on the extent to which those resources will be devoted to future defensive programs. Plant capabilities, for example, are a constraint in some aircraft and submarine programs—and perhaps in some electronics products as well—but they can be expanded. Military expenditures can be, and have been, redirected within the defense budget, and the defense budget itself has been increased. Even so, past weapon programs provide useful yardsticks for putting bounds on the likely pace and magnitude of future programs.

125. Policy decisions in the USSR today are the product of a collective leadership in which each of the principal leaders weighs the alternatives against his individual views and interests. This policy environment is conducive to the interplay of conflicting bureaucratic interests, among which military interests—the man in uniform, system design bureaus, and production facilities—carry considerable weight. But little is known of the balance of competing elements within the Politburo or the implications of the competition for future defensive developments.[13]

E. Considerations of Defense Effectiveness

126. Soviet evaluation of the effectiveness of current and planned defense systems will impact heavily upon their planning of the future defensive force structure. This evaluation must be done not only in the light of projections of enemy forces, their capabilities and of development and deployment of new defensive systems, but also of the distribution, vulnerability, and relative importance of critical target areas.

127. Since World War II, Soviet forces and defense-related industries have been dispersed throughout the USSR making them less vulnerable to attack. To protect them the Soviets have deployed widespread defended strong points within a series of defensive barriers. Most PVO Strany forces are concentrated in the USSR west of the Ural Mountains, along the Trans-Siberian Railroad to Irkutsk, and in the region of Vladivostok.

128. In their writings and in their deployment patterns, Soviet planners have emphasized the protection of the 150 or so political and administrative centers upon which wartime control of the country depends. Defenses are also situated to protect military command and control centers. Defenses for Soviet strategic strike forces emphasize the protection of "reuseable" military bases; these are the bases housing weapons and military supplies which Soviet military thinkers see either as decisive at the outset of a nuclear war, or as needed to support a continuing war-making capability. The amount of protection accorded defense industrial centers supporting the mili-

[13] The framework within which decisions are made is discussed in NIE 11-8-72, "Soviet Forces for Intercontinental Attack", dated 26 October 1972, TOP SECRET, RESTRICTED DATA.

tary-economic potential of the USSR—i.e., transportation, and about a dozen types of defense-related industries—varies with the importance of the center and the engagement effectiveness of the defensive systems.

129. Much of the effectiveness of the deployed forces depends upon the tactics employed. And these are constantly in a state of flux in response to offensive tactics. In peacetime the tactical interplay normally develops rather slowly. US bomber strike forces, for example, adopted tactics to neutralize key SAM sites and open a corridor to inland targets. In response, Soviet air defense forces employed long-range interceptors to attack bombers before they reached Soviet frontiers, and they set up dummy and alternative SAM sites to complicate effective offensive planning.

130. In wartime the tactical interplay develops much more rapidly. When forces go into combat they meet a variety of unforeseen situations, and tactics must be developed to meet them. ECM and electronic counter-countermeasures (ECCM) tactics, in particular, are important to strategic defensive force effectiveness. But tactics are limited to what the weapon system can achieve, and the tactical options open to future Soviet strategic defensive forces are a direct reflection of the capabilities of new defensive systems.

VIII. DEVELOPMENT AND DEPLOYMENT OF NEW DEFENSIVE SYSTEMS

131. The extent of known R&D facilities and the succession of new systems deployed testify to the steady, high level of the Soviet R&D effort in support of strategic defense. Major advances in weapons technology must be anticipated over the next decade. Some advances will result in significant upgrading of current systems, while others will be utilized in new systems. The thrust of currently observable R&D programs, and the problems they are intended to overcome have been described in relevant sections above. This Section summarizes the nature and pace of these developments and constitutes a basis for the postulations of new weapon systems projected in the illustrative force models.

A. Air Defenses

132. The key air defense requirements, highlighted in the discussion of current systems, are better radar surveillance at altitudes below 1,000 feet, and all-weather weapons which can engage attackers effectively at low altitudes. These requirements are made critical by the threat posed by such systems as the SRAM, now being deployed, and the subsonic-cruise armed decoy planned for future deployment. New ASMs will not only present extremely difficult targets to current Soviet air defense weapon systems, but will also tend to saturate Soviet early warning and command and control systems.

Air Surveillance and Control

133. Low-altitude air surveillance can be enhanced by the improvement of ground-based radar networks and by the introduction of an airborne radar system which can detect targets against a land background. Improvements to the ground-based network are likely to be the continued deployment of mast-mounted Squat Eye radars, the introduction of new height finders, and perhaps an increase in fixed radar sites in some areas. In addition, we continue to believe the Soviets will develop an overland AWACS. They have not developed the required technology as fast as we anticipated, however, and we do not expect the introduction of the required overland look-down radar before the late 1970s.

Interceptors

134. An advanced long-range, all-weather interceptor, with look-down, shoot-down capabilities and a combat radius of 700-1,000 nm

could be available in the late 1970s. If the Soviets should not wish to wait for this interceptor, they could bring in a new, low-altitude fighter in the mid-1970s. Alternatively, the Soviets could deploy a version of the Flogger, which is now being deployed to Frontal Aviation.

135. The Foxbat could also be improved with a new fire-control system. Although we have little information regarding the Foxbat's present system, and no signals have been intercepted from its air intercept radar, we do not believe that it now has a look-down, shoot-down capability. However, the development of a pulse doppler air intercept radar and a compatible "shoot-down" air-to-air missile (AAM) could lead to the addition of this capability sometime in the future. DIA differs, however, as to the present air intercept radar technology on the Foxbat, and consequently in their judgments of the speed with which a look-down, shoot-down capability is likely to be incorporated into the Foxbat.

—DIA believes that the present Foxbat has a new air intercept radar, possibly a pulse radar with continuous wave injection or a first generation pulse doppler. [redacted] DIA further believes that the general level of Soviet engineering competence, the availability of Western technical literature on pulse doppler radar development, and the possible availability of Western pulse doppler radars for exploitation has given the Soviets the capacity for developing the necessary techniques. Considering all of these factors they believe the Foxbat could be given a look-down, shoot-down capability by the mid-1970s.

—CIA, NSA, State, Army, Navy and Air Force do not believe that the present Foxbat air intercept radar is a pulse doppler device. [redacted] They also point out that the availability of Western literature and components, while helpful, would not necessarily result in a look-down, shoot-down capability, and that Western developments in this area are still limited despite years of research. For these reasons they are led to believe that Soviet development of a complete overland look-down, shoot-down system is unlikely before the late 1970s.

Surface-to-Air Missiles

136. The Soviets will continue to improve the capabilities of deployed SAMs for operations against low-altitude targets and against targets using ECM. These improvements will probably result from continuous modification programs to existing equipment but may also involve deployment of new equipment at existing sites.

137. The introduction of high-speed, air-launched missiles with small radar cross

section like the US SRAM is so severe a threat that a new strategic SAM may be required to cope with it. If so, the new system might employ pulse doppler acquisition radars, continuous wave fire-control radars, and a high acceleration missile possibly equipped with semiactive homing guidance. Unless testing were to begin immediately such a system probably could not be deployed before 1976.

138. A SAM system capable of dealing with the SRAM, whether an entirely new SAM or an extensively modified existing system, would require a high data-rate surveillance system able to update target position information at least once per second. A compatible data link system to convey this information to the site engagement radar would also be required.

B. Ballistic Missile Defense

139. The Soviets have agreed to limit deployment of ABM components and systems to the Moscow area and to one ICBM deployment area.[14] They also accepted a prohibition on the development and testing of sea-based, air-based, space-based, and mobile land-based ABM systems. Thus ABM development will probably be directed primarily toward improving the Moscow defenses and developing new fixed systems for deployment in defense of ICBM fields.

140. Improvements to the Moscow defenses would probably include additional acquisition and tracking radars, steerable phased-array engagement radars, and improved missiles. Deployment of these elements would result in a system with greater surveillance and target handling capability and more flexibility.

141. [ ] the Soviets suggested they intended to deploy a new system for defense of ICBM silos, and that it may incorporate such characteristics as hardening, high acceleration missiles, and smaller radars which have not yet been developed. There is no indication yet of the development of such a hard point defense system. If ICBM defenses are deployed in the near future, they would probably incorporate a phased-array engagement radar, a missile tracking radar, and a long-range missile (this we refer to as ABM-X-3). They might eventually develop a new, high acceleration terminal interceptor and deploy it with the system. Large acquisition and tracking radars would probably be deployed as a part of the ICBM defenses.

142. If the Treaty to limit ABMs were to be abrogated and the Soviets were to deploy ABMs widely in an attempt to provide a national defense, they might utilize a Top Roost type radar and some of the components mentioned above. This follow-on ABM system is postulated to cover uncertainties regarding the nature of the Top Roost at Sary Shagan. The presence of a separate face at one end of the receiver antenna raises a possibility that large radars of the Top Roost type could function as both acquisition and engage-

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[14] Article III of the ABM Treaty reads in part: "Each party undertakes not to deploy ABM systems or their components except that:

(A) Within one ABM system deployment area having a radius of 150 kilometers and centered on the party's national capital, a party may deploy: (1) No more than 100 ABM launchers and no more than 100 ABM interceptor missiles at launch sites, and (2) ABM radars within no more than six ABM radar complexes, the area of each complex being circular and having a diameter of no more than three kilometers, and (B) Within one ABM system deployment area having a radius of 150 kilometers and containing ICBM silo launchers, a party may deploy: (1) No more than 100 ABM launchers and no more than 100 ABM interceptor missiles at launch sites, (2) Two large phased-array ABM radars comparable in potential to corresponding ABM radars operational or under construction on the date of signature of the treaty in an ABM system deployment area containing ICBM silo launchers, and (3) No more than 18 ABM radars each having a potential less than the potential of the smaller of the above-mentioned two large phased-array ABM radars".

ment radars. If so, the number of interceptors associated with an ABM complex could vary widely—perhaps up to 50—and they could be located as far as 50 nm from the large radar. A smaller engagement radar would be required to control terminal interceptors from these locations.

C. Strategic Antisubmarine Warfare

143. *Fixed Acoustic Arrays.* Initial detection will continue to be the critical ASW problem. Fixed acoustic arrays for large area surveillance will probably be developed. However, a fixed acoustic array system which could consistently detect US ballistic missile submarines on station at ranges on the order of a hundred miles is not likely even with greater than expected improvements in Soviet sensor capabilities in the coming decade.

144. *Non-acoustic Detection.* Our information on Soviet research on non-acoustic detection is extremely limited, and our uncertainties are greater than for any other system discussed in this Estimate. We feel reasonably certain that the Soviets are mounting a considerable effort in this area. And to the extent that they are successful, the result might be a significantly improved system for search of the open ocean. However, none of the better understood methods offer a basic solution to the problem of finding US SSBNs in the open ocean. Even if the Soviets were to develop improved sensors, there would still remain the problem of incorporating these techniques into an integrated system to provide an effective counter to the US SSBN force. We believe we would recognize the deployment of new detection systems as well as the development of anti-SSBN forces employing them.

145. *Submarines.* Further technical progress is expected in the development of submarines and their sensor suits. A vigorous quieting program could enable the Soviets nearly to match present US quieting achievements by the end of the decade. A determined effort to improve both sonar design and processing could, by the late 1970s, also result in considerably improved capabilities. Some quieting and sonar improvements could be brought together as early as the mid-1970s in a new advanced attack submarine. Even with the improvements projected for the end of the decade, however, a new Soviet submarine could not gain a figure of merit advantage over Polaris sufficient [redacted] to assure maintaining covert trail for an extended period of patrol.

146. *Surface Forces.* The Soviets are continuing to build more advanced surface ships. The new Kara-class cruiser and Krivak-class destroyer will probably be evaluated in the ASW role, and they may be followed in the late 1970s by new ASW cruiser and ASW destroyer classes. The new aircraft carrier under construction at Nikolaev will probably be operational by the mid-1970s. This ship could be capable of a number of roles—including ASW, reconnaissance, air defense, and tactical strike—depending upon the final configuration of the ship, the aircraft supplied, and the operational situation. We believe its ASW capabilities would be at least equal to those of the Moskva-class, and that it will probably be fitted with the most advanced sonar suit available.[15]

147. In addition to advanced sonars, other developments in the surface forces will yield marginal improvements in strategic ASW capabilities. ASW missiles with ranges up to 30 nm will probably emerge in the mid-1970s to give surface forces an improved attack capability. Coordinated ASW helicopter operations could further extend search and attack ranges.

[15] See Memorandum to Holders of NIE 11-14-72, "Warsaw Pact Forces for Operations in Eurasia", dated 10 August 1972, SECRET, for a discussion of this ship.

Nonetheless, we do not expect, even by the late 1970s, any significant ability on the part of open-ocean ASW task groups to detect evading nuclear submarines.

148. *Aircraft.* Although we cannot, at this time, predict specific airborne sensor developments, Soviet activity in this field is of sufficient scope to indicate continued development of ASW aircraft over the next decade. The appearance of the ASW Bear indicates that the Soviets will concentrate on area coverage and aircraft payload. Late in the decade the Soviets may deploy a more advanced ASW aircraft system.

149. *The Use of Satellites in Antisubmarine Warfare.* Satellites may constitute integral elements of some ASW systems by the late 1970s. The most significant developments to be anticipated are the use of satellite relay systems to monitor moored sonobuoys or possibly remote surveillance systems and to provide secure communications for ASW forces. The use of satellites in low-earth orbit in such a role is possible, but unless a large number of satellites were employed, they would be capable of only sporadic monitoring. Synchronous satellites (including those in geostationary orbits) with very large antennas would, on the other hand, offer a means for the continuous surveillance of many sensors with a real-time return of data and continuous communications. The Soviets have yet to orbit a geostationary satellite, however. Systems involving the use of satellites to search ocean areas for submerged submarines with radar, laser, or IR sensors might be under development, but not operational, within the next 10 years.

D. Antisatellite Systems

150. The Soviets will almost certainly maintain their present non-nuclear capability to engage satellites at altitudes below about 1,000 nm. As their orbital interceptor program develops, they will probably improve their launch vehicles sufficiently to engage targets at altitudes above 1,000 nm, and they are expected by the late 1970s to be capable of disabling satellites in orbits up to geostationary altitudes (19,300 nm).

IX. ILLUSTRATIVE FUTURE FORCES [16]

A. Alternate Force Models

151. The four alternative force models presented in this section are intended to illustrate, in general terms, how differing outcomes of the SALT, US and Chinese force and political postures, and Soviet strategic goals and levels of effort might impact on the structure of future defensive forces. Other assumptions are possible, of course, and differing judgments of weapons technology and force levels could be projected. Nevertheless, we believe the models chosen are representative of a range of possible Soviet courses of action. It should be emphasized, however, that we consider no one of the force models to be an estimate that

[16] Vice Adm. Vincent P. de Poix, USN, the Director, Defense Intelligence Agency; Maj. Gen. William E. Potts, the Assistant Chief of Staff for Intelligence, Department of the Army; and Rear Adm. Earl F. Rectanus, the Director of Naval Intelligence, Department of the Navy, are in fundamental disagreement with several aspects of this Section. They believe the force levels in Model I are so unrealistically low as to be of little use to planners, particularly in the case of SAMs, aircraft interceptors, and the absence of strategic ASW forces. They further believe that the key assumptions in Force Models III and IV concerning the ABM Treaty being terminated/abrogated are not adequate bases upon which to project future forces unless more detailed assumptions are given with respect to the time of the decisions, the reason, which side acts first and the events which lead to termination and/or abrogation. They believe that the Defense Intelligence Projections for Planning (DIPP) provide a more useful portrayal of the options available to the Soviets for future strategic weapons deployment than do the Illustrative Force Models contained in this Section. For further expression of their views see their footnotes throughout this Section.

Soviet strategic defense forces will be necessarily composed of the particular weapon systems in the numbers listed.

152. Summary tables follow the discussion of the force models. The first summarizes the key differences between the forces. The second compares force levels in 1977. The year 1977 represents the end of the near-term period of about 5 years for which we are able to project with some confidence. It also represents a time when—upon expiration of the Interim Agreement on Offensive Weapons—failure to negotiate a permanent offensive agreement could lead to withdrawal from the ABM agreement. The subsequent tables illustrate possible year-by-year changes in key weapon systems for each of the force alternatives. They are carried to 1982 so as to show more clearly the different trends resulting from major qualitative improvements and alternative force planning assumptions; many of these do not become significant until after 1977.

ILLUSTRATIVE FORCE MODEL I

Key Assumptions

153. This force model assumes a minimum Soviet response to low levels of strategic offensive arms development in the US and in China, and Soviet reliance primarily upon retaliatory forces to deter nuclear attack. In this force model:

—The Soviets would abide by the ABM Treaty, which continues; the Interim Agreement on Offensive Missiles would result in a permanent agreement and improved US-Soviet relations; the US force developments would be less than presently programmed; Chinese strategic forces would grow slowly; and Soviet relations with China would not worsen.

—The Soviets would recognize the ineffectiveness of strategic air defenses in the face of a nuclear missile attack and in the absence of nation-wide ballistic missile defenses. Air defenses would therefore be maintained at levels sufficient to limit damage in a conventional attack or a small, third country nuclear attack.[17] Consequently, some savings in resources devoted to strategic defenses would be realized when compared to recent years.

Force Rationale and Composition

Ballistic Missile Defense

154. It is assumed that ABM defenses at Moscow would be built up to the limits of the Treaty by 1978. Under the assumptions in this model, if the US deploys at only one location, the Soviets would limit their deployment to Moscow, i.e., would not deploy at an ICBM complex.[18] R&D efforts would be directed toward the qualitative improvement of the Moscow defenses to cope with the threat of accidental, unauthorized, or provocative third country attack.

[17] Vice Adm. Vincent P. de Poix, USN, the Director, Defense Intelligence Agency; Maj. Gen. William E. Potts, the Assistant Chief of Staff for Intelligence, Department of the Army; and Rear Adm. Earl F. Rectanus, the Director of Naval Intelligence, Department of the Navy, do not believe that Soviet air defenses would be based upon these assumptions. In their view this would require a major change in traditional Soviet defense doctrine which they believe unlikely.

[18] Vice Adm. Vincent P. de Poix, USN, the Director, Defense Intelligence Agency; Maj. Gen. William E. Potts, the Assistant Chief of Staff for Intelligence, Department of the Army; Rear Adm. Earl F. Rectanus, the Director of Naval Intelligence, Department of the Navy; and Maj. Gen. George J. Keegan, Jr., the Assistant Chief of Staff, Intelligence, USAF, consider that the assumptions in this subsection regarding ballistic missile defenses tie Soviet ABM deployment options much too closely to US actions on ABM deployment.

155. The following improvements would take place under Force Model I:

—In the Moscow defenses, two or three additional acquisition and tracking radar complexes would be constructed to give full coverage; steerable phased-array radars would supplement the large Try Adds as the engagement radars for the Moscow defenses; and an improved long-range missile would replace the present interceptor in the Moscow system. These defenses would be completed by 1978.

—If the US did not limit its deployment to one area, the USSR would deploy ICBM defenses in the same manner as in Force Model II.

Air Defenses

156. This force model assumes a gradual de-emphasis on strategic air defense. Some of the more difficult technological problems associated with low-altitude defense and defense against advanced ASMs would not be addressed, and no new model interceptors would be deployed. Soviet air defenses would, however, continue to be adequate to protect the USSR from accidental, unauthorized, or third country air attacks which were not accompanied by significant ballistic missile attacks.

157. As adequate warning would be important even in a small attack, air surveillance capabilities would be maintained, and improved against low-altitude penetrations. This improvement would take the form of a slightly expanded number of early warning sites located on approaches to key target areas, continuing emplacement of new radars at existing sites, and improvements in the rapidity of reporting. This force model would not include an AWACS with look-down capability over land.

158. Older Fresco, Farmer, and Flashlight interceptors would be phased out by 1977, and numbers of Fishpot and Firebar would decline in the mid- and late-1970s. By the 1980s, Fiddler, Flagon, and Foxbat, would be the mainstay of the interceptor force. No new interceptors would be deployed, but Foxbat would be retrofitted with a look-down, shoot-down system at the end of the 1970s.

159. SAM defenses would also be reduced substantially. SA-1 would be phased out by the end of the 1970s. Older Fan Song C models of the SA-2 would also be phased out, but Fan Song E models would be retained and in a number of cases supplemented with an additional radar. Deployment of SA-3 and SA-5 would be completed at about current levels; a slow-paced program to extend the range of the SA-5 would be undertaken. In this force model there would be no new SAM system.

Antisubmarine Warfare

160. Research on ASW technology would continue at current rates, and focus on ASW more useful for defense of Soviet forces at sea than for detection of SSBNs on patrol. Fixed acoustic arrays with a range of about 20 nm would be installed near the major naval bases of the Northern and Pacific Fleets, but these installations would have no direct application to the anti-SSBN mission.

161. Procurement of new ASW ships and aircraft would proceed at a reduced pace. Forces would continue to be improved for the coastal defense and self defense ASW missions, but the Soviets would not assemble any forces for the specific purpose of challenging SSBNs at sea. The aircraft carrier under construction is, in this model, assumed to have only a self defense ASW capability.

Implications for Strategic Defenses

162. The key problems of strategic defense—ballistic missile attack, low-altitude air penetration, or ASW—would not be solved. The composition of the Soviet forces and their overall capabilities would have changed only slightly. The combined strategic defenses would receive fewer resources in the late 1970s, as increasing reliance would be put upon strategic arms limitation as a means of stabilizing the strategic balance.

163. Force Model I depicts a force in which current programs are completed, but few new ones are introduced. It represents a rough lower limit on possible Soviet defense choices, and would be at variance with Soviet behavior in the past when large defenses have been considered necessary, even if not totally effective.

ILLUSTRATIVE FORCE MODEL II

Key Assumptions

164. This force model assumes that the Soviets would rely primarily upon mutual deterrence under strategic arms agreements as the basis for their strategic relations, but that they would also continue to maintain substantial air defenses. This model assumes essentially the continuation of the Soviet approach of the past few years under détente and SALT.

—As under Force Model I, the Soviets would abide by a continuing ABM agreement, and subscribe to an agreement on offensive weapons. This force model, however, assumes that US forces would continue to develop generally as now programmed, and that Chinese strategic forces would grow to about 200 missiles and a similar number of bombers in the late 1970s.

—The traditional Soviet attitude of exploiting technical progress would govern their attitude to air defenses. Air defenses would consequently be maintained and improved as new developments become available in an attempt to deal with improvements in US strategic air attack. The effort expended for strategic defense would continue at approximately present levels.

—Military R&D would emphasize improved capabilities against air-launched missiles and SSBNs.

Force Rationale and Composition

Ballistic Missile Defense

165. In this model, the ABM Treaty would limit ABM defenses to a National Command Authority defense and one ICBM defensive area. Moscow ABM defenses would be expanded as in Force Model I, but they would be improved and upgraded to a greater extent. In the ICBM defenses, acquisition and tracking radars would be installed as would engagement radars and long-range missiles. A terminal interceptor would replace some long-range missiles starting in 1978. Vigorous R&D would continue in the ABM field, but the results would not be so promising as to induce the Soviets to abandon the ABM Treaty for additional deployment of a considerably improved ABM system.

Air Defenses

166. In this model, Soviet air defenses would continue to be maintained and upgraded throughout the next decade. Greater emphasis would be placed on more effective defenses against low-altitude attack by both aircraft and advanced ASMs.

167. In addition to the improvements in land-based radars during the mid-1970s, noted in Force Model I, a new AWACS capable of detecting low flying targets over land would be deployed in the late 1970s as an effective and economical substitute for the further proliferation of land-based radars. Sufficient

AWACS aircraft would be deployed by 1980 to support about eight on continuous patrol, in periods of crisis, over the Baltic and northern approaches to Moscow, and possibly the eastern maritime provinces.

168. Older model aircraft would be retained in the force longer than in Force Model I, and newer model aircraft would be deployed in greater numbers. Foxbat deployment would continue into the mid-1970s, and would be retrofitted with a look-down, shoot-down system at the end of the 1970s. In addition, the Soviets would in the late 1970s bring in a new advanced all-weather interceptor with look-down, shoot-down capabilities to work with the new AWACS.

169. Old SAMs would be phased out as in Force Model I, but at a slower pace, and some SA-2 sites would receive new equipment. Deployment of SA-3 and SA-5 would soon be completed. But programs to upgrade these systems would be more vigorous than in Force Model I. The main difference from Force Model I would be the introduction in the late 1970s of a new longer-range, low-altitude SAM, which would be deployed in limited numbers around key locations.

Antisubmarine Warfare

170. The Soviets would continue to press for an ocean surveillance or trailing capability through increased attention to acoustic and non-acoustic R&D. They would install additional fixed detection systems in the Northern and Pacific Fleet coastal areas of the USSR. But improvements in submarine quieting would be insufficient to provide an effective trailing capability.

171. Naval construction programs would continue at their current rate. New ASW light cruisers, destroyers, and patrol aircraft would be introduced in the 1975-1980 timeframe. The new large aircraft carrying combatant would have about the same ASW capability as the Moskva-class and enter the fleet at a rate of one every 2 years. But Soviet capabilities to employ general purpose ASW forces for operations against Polaris would remain very low.

Implications for the Strategic Defenses

172. The key problems of strategic defense—ballistic missile attack, low-altitude air penetration, and ASW—would not be solved, but some advances would be made. The composition of the Soviet forces and their overall capabilities would have changed, but the USSR would remain vulnerable to a US retaliatory missile strike.

173. New weapon systems for the late 1970s, which promise enhanced capability against low-altitude air attack, would be deployed, but this is the only critical area in which progress would be discernible. Even here the air defenses would be subject to disruption by missile attack. The combined capabilities of the strategic defenses would continue to grow in the late 1970s, even though the force levels would decline.

ILLUSTRATIVE FORCE MODEL III

Key Assumptions

174. This force model differs from Models I and II in that it assumes that discussions regarding an offensive systems treaty would break down after some 5 years, and the ABM Agreement would be terminated.[19] It is assumed that:

—The strategic competition between the US and the USSR would return to the pre-

[19] For the views of Vice Adm. Vincent P. de Poix, USN, the Director, Defense Intelligence Agency; Maj. Gen. William E. Potts, the Assistant Chief of Staff for Intelligence, Department of the Army; and Rear Adm. Earl F. Rectanus, the Director of Naval Intelligence, Department of the Navy, see their footnote 16 page 44.

SALT tempo; both countries would deploy additional strategic offensive weapons,[20] and both countries must also concern themselves with a China which is rapidly deploying ICBMs and additional medium bombers.

—The pace of military R&D would step up, with emphasis upon improved systems which could be deployed rapidly.

—The initial sites of a national ABM defense would become operational in 1978, and improved air and submarine defenses would move forward at a faster pace than in Models I and II, but not so rapidly as to cause expenditures for strategic defensive forces to grow faster than the gross national product.

Force Rationale and Composition

Ballistic Missile Defense

175. Even with the termination of the ABM Treaty, ABM defenses would be built at an ICBM area as in Force Model II. But in contrast to Force Model II, additional deployment would take place starting in 1978. The nature of this additional deployment would depend on the Soviet view of the defense requirement and the performance of the ABM system.

176. The Soviets might establish a defense redoubt in the northwestern USSR—an integrated system including the defenses at Leningrad, Moscow, and Gorkiy—in conjunction with improved ASW, as a means of limiting damage to the key administrative and control centers of the USSR at a price of leaving the rest of the country unprotected. They would probably see the need for a high acceleration ABM in such a defense and deploy it along with an improved long-range missile.

177. On the other hand, the Soviets may believe that such an ABM system, perhaps because of its lack of hardness, is not equal to this task, and deploy instead a light area defense of a larger region in the western USSR with launch complexes at Leningrad, Arkhangelsk, Yaroslavl, Gorkiy, Dnepropetrovsk, Kiev, Minsk and other key locations. Such a defense would be less sophisticated and would provide some protection against a light attack or accidental launch, but would require greater expansion of the large acquisition and control radar network than would a concentrated defense of a redoubt area.

Air Defenses

178. Intensive Soviet programs for air defense would continue throughout the decade. As in Force Model II, defenses against bombers flying at low altitudes and armed with advanced ASMs would be stressed. A greater effort would be made to counter the electronic warfare capabilities of potential attackers. In general, Force Model III would represent a vigorous air defense program; both R&D and deployment would be somewhat more extensive than in Force Model II.

179. The same efforts would be made in air surveillance and warning as in Force Model II, but these would be supplemented by larger numbers of new radars designed to operate more effectively in an ECM environment. Deployment of an overland AWACS would reach numbers sufficient to support continuous patrol over 12 areas for short periods, thereby covering major approach routes more adequately.

180. The Soviets would retire older model interceptors at a tempo slower than in Force Model II. They would continue to deploy Fox-

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[20] For the US, this force might by 1980 differ from the programmed force in that Minuteman III would be retrofitted to all silos, Poseidon missiles replaced by ULMS, and most B-52s retained in the force. [

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bat and Flagon interceptors into the mid-1970s. An advanced all-weather interceptor would be deployed earlier as a result of a more intensive R&D effort to develop a look-down radar, and would consequently reach higher numbers by the early 1980s.

181. As in Force Model II, Fan Song C SA-2s would be replaced by newer models, SA-3 and SA-5 would be improved, and a new low-altitude SAM would be deployed. But in this force model, the pace and extent of modernization and new deployment would be considerably greater after 1977.

Antisubmarine Warfare

182. In this force model we assume the Soviets would assign certain ASW forces specifically to deal with the SSBN threat. We call these collective forces "dedicated strategic ASW forces".[21] A greater degree of success in developing new, quieter submarines and new ocean surveillance ASW systems would encourage the Soviets to deploy either a submarine trailing force or a force of ASW aircraft to prosecute contacts from the new ocean surveillance system. Thus two options are presented in this force model representing different assumptions about the area of technological progress: a trailing option in which the production of submarines is increased markedly beginning in about 1975, and an ocean surveillance option in which the production of a new ASW aircraft is initiated in 1976 and proceeds rapidly.

183. Within the projected 10 year period, these forces could harass US SSBN units in some instances, and possibly deny certain small patrol areas to them. But neither capability is likely to alter substantially the effectiveness of the SSBN force during this time. Although naval construction programs in support of tactical ASW would increase, they would provide only negligible strategic ASW capabilities.

Implications for the Strategic Defenses

184. Forces projected in Force Model III would provide a higher level of defense against ballistic missile attack and low-altitude penetration by bombers with ASMs. However, the improved forces would remain vulnerable to US retaliatory missile strikes using multiple warheads and advanced penetration aids.

185. The ABM deployment which occurred would provide only limited defense against missile attack. Because the ABM defenses would have limited capabilities, the air defenses would still be subject to disruption by missile attack. Moreover, ABM deployment on a significant scale together with continued growth of air defense programs would require that the overall level of effort be increased.

ILLUSTRATIVE FORCE MODEL IV

Key Assumptions

186. Like Force Model III, this model assumes the breakdown of arms limitations talks, but assumes that it takes place more rapidly and in an atmosphere of greater mu-

[21] Vice Adm. Vincent P. de Poix, USN, the Director, Defense Intelligence Agency; Maj. Gen. William E. Potts, the Assistant Chief of Staff for Intelligence, Department of the Army; and Rear Adm. Earl F. Rectanus, the Director of Naval Intelligence, Department of the Navy, do not agree with the way in which ASW forces are identified and categorized in any of the illustrative force models. They believe it is inappropriate to identify specific platforms as "dedicated strategic ASW forces"—as is done in Illustrative Models III and IV—when many of these units could engage in other than anti-SSBN operations. They further believe that it is equally inappropriate to exclude from each of the illustrative force models a number of platforms, e.g., Kotlin-class destroyers, Echo- and Foxtrot-class submarines, which have been noted in ASW exercises and could logically be included as "other ASW forces".

tual distrust. Moreover the threat of the rapid growth of China as a strategic power appears greater. It is assumed that: [22]

—The ABM Agreement would be abrogated in a few years, and the arms competition with the US and China would step up to a level above that which existed prior to SALT. Although the actual threat would not exceed the levels assumed in Force III, US and Chinese R&D efforts would reinforce Soviet conclusions that the arms race is about to resume.

—Resources allocated to military R&D would be increased sharply, with a consequent cutback in civilian programs. R&D would not only develop new systems for deployment, but also allocate considerable resources to develop new technologies which permit in the latter part of the decade deployment of substantially improved ABM, ASW, and air defense systems.

—Deployment of strategic defense forces would increase to the point that, even though achievable without major new increases in productive capacities, they strain these capacities, and resources must be diverted to the extent that the rate of growth of the civilian economy is threatened.

Force Rationale and Composition

Ballistic Missile Defense

187. This force model postulates still more extensive ABM deployment throughout the Soviet Union than does Force Model III. We assume that such a program, when completed, would emphasize protection of about 18 principal Soviet target areas and would defend a significant portion of the Soviet strategic offensive force.

188. The pace of a national deployment program would depend upon the timing of needed technological advances. If significant advances have been made in the development of new ABM components and if the Soviets decide within the next few years to deploy a system utilizing these advances, they may field a system, which utilizes a large phased-array radar with a separate pulsed radar incorporated into the receiver, to perform all the acquisition and engagement tasks required of the system. This would permit more rapid and less expensive deployment of improved long-range missiles and high-acceleration terminal interceptors. Deployment of such a system could start immediately after termination of the ABM Treaty. The first complexes would become operational in 1978 and the entire system completed in the mid-1980s.

Air Defense

189. As the prospects for an effective national ABM system grow, air defense programs in general would be pursued more vigorously. As before, emphasis would be placed on defense against bombers attacking at low altitudes and on countering offensive electronic warfare capabilities. The achievements of this program would be somewhat above those of Force Model III.

190. Sufficient AWACS aircraft would be deployed by 1980 to support about 14 on patrol continuously for short periods. Major AWACS operating areas would include the Baltic and Barents Seas coastal areas, and possibly the southwestern areas, the Bering Straits, and the far eastern maritime provinces.

191. In this force model older fighters would be phased out more slowly, and an

[22] For the views of Vice Adm. Vincent P. de Poix, USN, the Director, Defense Intelligence Agency; Maj. Gen. William E. Potts, the Assistant Chief of Staff for Intelligence, Department of the Army; and Rear Adm. Earl F. Rectanus, the Director of Naval Intelligence, Department of the Navy, see their footnote 16, page 44.

interim low-altitude interceptor would be introduced. An advanced all-weather fighter would be extensively deployed and would give this force model a total of more than 700 aircraft with a look-down, shoot-down capability by 1980.

192. SAM forces would be considerably increased, compared to only a marginal increase in Force Model III. This would be accomplished by maintaining the SA-2s at a constant force level, increasing deployments of SA-3 and SA-5, and deploying large numbers of the new low-altitude SAM. Existing SAM systems would be upgraded more extensively than in the other force models.

Antisubmarine Warfare

193. In this force model we assume the Soviets would assign certain ASW forces specifically to deal with the SSBN threat. We call these collective forces "dedicated strategic ASW forces".[28] We assume that there would be deployments of new submarines or an ocean surveillance system based on improvements in sensor technology, as in Force Model III. Forward basing rights would be required to support either of these options. Soviet capabilities to harass US SSBNs would be somewhat improved, but not sufficiently to affect the security of the entire US force. Soviet trailing capabilities would still be susceptible to countermeasures. A future Soviet ocean surveillance system would be of marginal capability against transiting SSBN units and of no value in detecting patrolling submarines.

[28] For the views of Vice Adm. Vincent P. de Poix, USN, the Director, Defense Intelligence Agency; Maj. Gen. William E. Potts, the Assistant Chief of Staff for Intelligence, Department of the Army; and Rear Adm. Earl F. Rectanus, the Director of Naval Intelligence, Department of the Navy, see their footnote 21, page 50.

Implications for the Strategic Defenses

194. Significant technical improvements in ABM sensors, and the deployment of nationwide ABM defenses would give impetus to the increased deployment of other defensive systems. Resource constraints would require that some programs be scheduled more slowly than technically feasible. Even so, substantial progress in defense against ICBM attack, low-altitude air attack, and submarine-launched missile attack would be made.

195. The strategic defenses posited in this alternative are expensive, but possible. The simultaneous acquisition of the above defenses, and of large strategic offensive forces, would require the extensive redirection of existing civilian priorities and possibly military programs. Consumer programs and civilian space programs would probably be hit hardest.

B. Likely Soviet Courses of Action

196. We do not consider either the low or the high illustrative cases (Models I and IV) to be likely Soviet courses of action. It seems improbable that, if the US went ahead with something like its programmed forces, the Soviets would accept the deterioration in their strategic position implicit in Force Model I.

197. On the other hand, we consider it unlikely that the Soviets will wish to make the effort represented by the Force Model IV, except possibly under a conviction that an agreement would not be reached and that a massive buildup in US forces well beyond currently proposed forces would occur. In such a case, the Soviets would almost certainly wish to parallel the high effort in strategic defense with a parallel effort in strategic offense. We think the Soviets would consider the combined costs of high strategic offensive and

defensive programs too heavy for peace time, and the requisite disruption of other programs too great.

198. If the ABM Treaty is continued past 1977, we think the level of effort and technical progress generally represented by Force Model II would be the most likely. It would permit maintaining, and in some areas improving, Soviet capabilities for strategic defense under conditions in which the threat did not grow appreciably, and do this at a cost not much different from the current level of effort.

199. We think that should a strategic offensive agreement not be reached and the ABM Treaty was terminated after 1977, something like the level of effort and technical progress represented by Force Model III would be a likely Soviet course of action. This force would maintain, and in some areas improve, Soviet capabilities against their probable view of the likely threat. It would require resources over the next decade almost one-half more than what they have expended in the past decade, but is certainly within Soviet capabilities should they determine that their strategic position required it.

200. These force models are necessarily illustrative. They represent different SALT outcomes, Soviet reactions to US force levels, and levels of effort. They show in general our view of what the Soviets might do with regard to developments in specific weapon systems and forces under these differing conditions. They are presented as illustrative courses of action, in the full awareness that our confidence in the projections decline as they move further into the future, and that the Soviets are certain in the course of the next 5 or 10 years to embark on some strategic programs of which we presently have little or no inkling. As in the past, the Soviets will doubtless make strategic program decisions on a year-to-year basis. Their forces will grow and change in gradual increments in response to their view at the time of the balance between the threat, technological developments in weapon systems, resource and bureaucratic constraints, and the general national policy aims of the leadership.

SUMMARY COMPARISON OF FORCE MODELS*

	FORCE MODEL I	FORCE MODEL II
Policy Aim......	Mutual deterrence is the basis. ABM Treaty and Interim Agreement on Offensive Missiles are in effect. Gradual decline in strategic defense after current programs are completed.	Mutual deterrence is the basis. ABM Treaty and Interim Agreement on Offensive Missiles are in effect. Soviets see opportunity to improve air defense against limited offensive forces.
ABM..........	No development in ABM technology to make it effective against heavy attack. NCA defense filled out to Treaty limit and retrofitted with new components under development. If the US were not to deploy an NCA defense, the USSR would not add defense for an ICBM area.	No development in ABM technology to make it effective against heavy attack. NCA defense and one ICBM defense retrofitted with new components under development. High acceleration terminal interceptors supplement a new long-range interceptor in the late 1970s at high value targets.
Air Defense.....	No overland AWACS capability developed. Moss AWACS kept at current levels.	New AWACS with capability to look-down over land operational after 1976; by 1980 covers about eight patrol areas in Baltic and Barents Seas in the west, and Bering Strait and maritime provinces in the east.
	Look-down air intercept radar developed in 1978 with complementary shoot-down missile system. Retrofitted into all 12 squadrons of Foxbat deployed along key approach routes.	Look-down/shoot-down capability developed in 1978. Retrofitted into all 18 squadrons of Foxbat deployed along key approach routes.
	No new interceptors deployed, but Foxbat does get retrofit of new weapons system after 1976. Some older aircraft would be phased out rapidly.	An advanced all-weather interceptor is introduced in 1977.
	Many existing SAM systems would be modified and their performance improved. Some older units would be phased out by the end of the 1970s.	Current SAMs modified throughout decade for improved performance and improved ECCM. New low-altitude SAM developed by 1977.
ASW...........	No effort to create anti-SSBN systems. Minimal effort to maintain a tactical ASW capability for general purpose naval forces.	Major R&D efforts underway to establish an anti-SSBN capability. Progress is insufficient to deploy any dedicated forces. Emphasis on building stronger tactical ASW capabilities continues.

* For the views of Vice Adm. Vincent P. de Poix, USN, the Director, Defense Intelligence Agency; Maj. Gen. William E. Potts, the Assistant Chief of Staff for Intelligence, Department of the Army; and Rear Adm. Earl F. Rectanus, the Director of Naval Intelligence, Department of the Navy, see their footnote 16, page 44.

SUMMARY COMPARISON OF FORCE MODELS*

	FORCE MODEL III	FORCE MODEL IV
Policy Aim......	Strategic competition with the US continues in 1977 after termination of the ABM Treaty and the Agreement on Offensive Missiles. Vigorous R&D programs produce systems sucessful enough to warrant widespread deployment.	Arms race resumed with vigor after termination of the ABM Treaty and the Agreement on Offensive Missiles. Successful R&D programs produce new systems which warrant widespread deployment.
ABM..........	ABM technology develops sufficiently to warrant further deployment after 1977, using high acceleration terminal interceptors and a new long-range interceptor, in either light defense of western USSR or heavier defense for Moscow-Leningrad-Gorkiy area.	Large, new phased-array radar used as ABM acquisition and engagement radar. High acceleration terminal interceptors supplement a new long-range interceptor in the late 1970s at high value targets. Widespread deployment covers the populated areas of the USSR.
Air Defense.....	New AWACS with capability to look-down over land operational after 1976; by 1980, covers about 12 patrol areas in Baltic and Barents Seas in the west, and Bering Strait and maritime provinces in the east.	New AWACS with capability to look-down over land opertional after 1976; by the early 1980s, covers about 14 patrol areas in Baltic and Barents Seas in the west, and Bering Strait and eastern maritime provinces in the east. It works with Foxbat and new interceptor.
	Look-down/shoot-down capability developed in 1977. Retrofitted into all 24 squadrons of Foxbat deployed along forward approach routes.	Look-down/shoot-down capability developed in 1977. Retrofitted into all 26 squadrons of Foxbat deployed along forward approach routes particularly in the northwest.
	An advanced all-weather interceptor is introduced in 1977.	An advanced all-weather interceptor is introduced in 1977. Interim low-altitude interceptor could be available as early as 1973 if adopted from a current design like Flogger, or by 1975 if based on designs currently being tested. About 20 squadrons could cover forward areas and key approaches to the Soviet heartland.
	Current SAMs modified throughout decade for improved performance. Improved kill in presence of electronic jamming in all areas of SAM coverage. New low-altitude SAM developed by 1976.	Current SAMs modified throughout decade for improved performance. Improved kill in presence of electronic jamming in all areas of SAM coverage. SA-2 system improved, but kept close to current levels. New low-altitude SAM developed by 1976.
ASW...........	Some improvements in acoustic sensors prompt the Soviets to deploy either an ocean surveillance system in the Norwegian Sea and the North Atlantic by the end of the decade or to introduce a trailing capability in a fleet of quiet, new SSNs.	Some improvements in acoustic sensors prompt the Soviets to deploy either an ocean surveillance system in the Norwegian Sea and North Atlantic by the end of the decade or to build a trailing capability in a fleet of quiet, new SSNs.

The Illustrative Force Models presented in this Section represent possible directions that Soviet strategic defense forces could take. It should be emphasized that we consider no one of them an estimate that Soviet strategic defense forces will be composed of the particular weapon systems in the precise numbers listed. They are intended only to be illustrative models of possible trends and differing emphases, and are developed primarily for broad policy use at the national level. They are not intended for defense planning purposes; projections developed for planning in the Department of Defense are included in the Defense Intelligence Projections for Planning (DIPP).

COMPARISON OF ILLUSTRATIVE FORCE MODELS FOR MID-1977[1]

	MODELS			
	I	II	III	IV
Hen House Radars				
Missile Early Warning	8	11	11	11
Satellite Tracking	6	6	6	6
ABM Systems				
NCA Defense:				
Regional Radar Complexes	3	3	3	3
Try Add Engagement Radars	8	8	8	8
New Engagement Radar Complexes	2	2	2	2
Launchers: Long Range	100	100	100	100
ICBM Field Defense:				
Regional Radars	..	2	2	2
Engagement Radars	..	12	12	12
Launchers: Long Range	..	100	100	100
SAM Systems (Operational Sites)				
SA-1	42	56	56	56
SA-2	400	550	675	700
SA-3	260	260	275	300
SA-5	245	250	265	300
Follow-on SAM	..	5	25	25
Interceptor Systems				
Fresco	..	..	250	370
Farmer	..	..	120	100
Fishpot	520	650	675	675
Firebar	290	310	330	340
Fiddler	160	160	160	160
Flagon A	660	700	750	800
Foxbat	95	150	200	210
Interim Low-Altitude Interceptor	..	..	..	200
Advanced All-Weather Interceptor	..	..	30	75
Air Surveillance Radar Systems				
Existing Types	3975	4105	4105	4005
New Types	70	275	445	350
Total Radars	4035	4380	4550	4355
Total Sites	1050	1150	1150	1150
Airborne Warning and Control Radars				
Flat Jack (Moss AWACS)				
Number of Radars	9	9	9	9
Improved Overland Radar				
Number of Radars	..	5	5	5
ASW Forces				
	General Purpose		Dedicated	
Il-38	60	60	60	60
ASW Bear	20	20	20	20
V-Class SSN	14	14	14	14
A-Class/New Class	11	17	17	17

See footnotes at end of table.

COMPARISON OF ILLUSTRATIVE FORCE MODELS FOR MID-1977[1] *(Continued)*

Alternative Options	MODELS I	MODELS II	MODELS III	MODELS IV
			Trailing Option	
Additional A-Class/New Class	..	..	5	6
			Surveillance Option	
New ASW Aircraft (Medium Range)	..	..	25	50
			Other Forces	
Moskva CHG	2	2	2	2
New Class Aircraft Carrier[2]	..	2	2	3
Kresta II CLGM	7	7	7	7
Kara CLGM/Follow-on	6	8	11	12
Krivak DDGSP	19	27	30	34
New DLG	3	5	5	5
Kanin DDG	8	8	8	8
C-Class SSGN	16	16	16	16
P-Class/New Class SSGN	8	S	8	8
Be-12 Mail	100	100	100	100

[1] For the views of Vice Adm. Vincent P. de Poix, USN, the Director, Defense Intelligence Agency; Maj. Gen. William E. Potts, the Assistant Chief of Staff for Intelligence, Department of the Army; and Rear Adm. Earl F. Rectanus, the Director of Naval Intelligence, Department of the Navy, see their footnote 16, page 44.

[2] Assumes it is for ASW.

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