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MEMORANDUM TO HOLDERS

NATIONAL INTELLIGENCE ESTIMATE

Soviet Strategic Defenses

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The Director, Defense Intelligence Agency

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MEMORANDUM TO HOLDERS OF

NIE 11-3-72

SOVIET STRATEGIC DEFENSES

CONTENTS

	Page
PRECIS	1
DISCUSSION	4
I. STRATEGIC AIR DEFENSE	4
A. Current Forces and Capabilities	5
B. Future Developments	6
II. DEFENSE AGAINST BALLISTIC MISSILES	7
A. Early Warning	7
B. The Moscow Antiballistic Missile System	8
C. Antiballistic Missile Deployment Beyond Moscow	9
D. Research and Development	9
New Interceptor Missile	9
Discrimination Tests	11
New Optical Mount	11
III. ANTISATELLITE DEFENSE	11
IV. CIVIL DEFENSE	11
V. STRATEGIC DEFENSE AGAINST SUBMARINES	12
A. Offensive Operations Against United States Ballistic Missile Submarines	12
B. Protection of Soviet Ballistic Missile Submarines	13
VI. FUTURE STRATEGIC DEFENSES: MILITARY LASER PROGRAMS	13
A. Laser Radars	14
B. Laser Weapon Systems	14

SOVIET STRATEGIC DEFENSES

PRÉCIS

Over the past year, Soviet strategic defenses have evolved generally as estimated in NIE 11-3-72, and new evidence does not require that any of the basic judgments be changed.

The Soviets have a number of major programs underway which are designed to upgrade their existing strategic air defenses. For example, the range of the SA-5 system has been increased. They probably consider that continuing improvement of existing air defense systems represents the most economical way to enhance their strategic defensive capabilities over the next five years or so.

For the last several years, there have been no new strategic fighter interceptors or surface-to-air missile (SAM) systems under flight test at any of the various research and development (R&D) ranges and test facilities—a situation which is unique in the post-World War II period. We do not believe, however, that strategic air defense is being downgraded. Rather, it may be that, over the longer term, the Soviets will await more fundamental changes based on new technology, such as a look-down, shoot-down system, or different physical phenomena, such as an air defense laser, before undertaking any deployment of new systems.

The pace of Soviet antiballistic missile (ABM) R&D continues unabated since the signing of the ABM Treaty. The most significant new development has been the appearance at the Sary Shagan ABM test center of a new conical-shaped missile, indicating the Soviets may now be developing the projected system to intercept reentry vehicles (RVs) within the atmosphere after exoatmospheric penetration aids have been stripped away. However, it probably will not have an acceleration comparable to that of the US Sprint and has yet to be flight tested.

There continues to be no evidence of Soviet expansion of ABM defenses at Moscow or construction of intercontinental ballistic missile (ICBM) defenses as permitted by the Treaty, but construction continues to complete the ballistic missile early warning radar network around the European USSR.

We have detected no significant advances in Soviet antisubmarine warfare (ASW) capabilities which increase the threat to the US ballistic missile launching nuclear submarine force, although developmental work on new techniques is clearly being intensively pursued. The most modern Soviet nuclear submarines are still far noisier than those of the US. As noted in NIE 11-3-72, the Soviets continue to mount a considerable and vigorous research effort in the area of submarine detection by utilizing nonacoustic phenomena. In this area our information on Soviet R&D continues to be limited, and our uncertainties are great. However, none of the currently better understood nonacoustic detection techniques appear to offer a basic solution to finding US ballistic missile submarines in the open ocean.[1] The Soviets

[1] The Director of Naval Intelligence, Department of the Navy, is concerned that potential Soviet ASW capabilities appear to be understated. He believes that the Soviets are searching for fundamental solutions to their open-ocean detection problem. Further he believes that their intensive efforts in nonacoustic disciplines suggest the Soviets believe they may be able to cope with this problem at some time in the future. In addition to the advent of new Soviet longer range ASW weapons and ASW-capable nuclear submarines, Soviet interest and research in nonacoustic ASW applicable technology is large and expanding. A significant development could be manifested in any of the several nonacoustic disciplines, [redacted] it appears that Soviet technology may be ahead of the US in exploring or exploiting these approaches.

are also working at reducing the vulnerability of their own ballistic missile launching nuclear submarines (SSBNs) by modifying patrol areas and by deploying SSBNs with 4,200 nm missiles.

Past evidence regarding the existence of major Soviet military laser R&D programs has been reinforced. The Soviets are now installing what may be a laser radar at Sary Shagan. If this in fact is the case, they could start testing the device by late 1974. We estimate that a laser radar for use against satellites and ballistic missile RVs could be operational by 1980. The Soviets are also believed to have a program to develop a laser weapon system. Air defense will probably be the earliest feasible strategic use of such a system. We continue to believe, as stated in NIE 11-3-72, that the first demonstrations of an air defense laser weapon system probably could not take place before 1977, and first deployment could not be before the early 1980s. Laser weapons for the destruction of satellites and ballistic missile RVs probably will not be available before the mid-1980s, although the Soviets now have some capability to interfere with photoreconnaissance satellites.

DISCUSSION

Since the publication of NIE 11-3-72, Soviet efforts to improve their strategic defenses have continued essentially as expected. Some new information has been obtained in the fields of air defense, ballistic missile defense, and strategic ASW which adds to our understanding of these elements. On the other hand, there is no new evidence which increases our grasp of the objectives and scope of Soviet antisatellite or civil defense activity. None of the new information, or lack thereof, has altered the basic judgments of the Estimate nor have any of the dissenting agency views been changed. This Memorandum to Holders reviews those recent developments which pertain to the major judgments in the Estimate, and it assesses their significance.

I. STRATEGIC AIR DEFENSE

1. The air threat, as perceived by the Soviets, is both large and technically sophisticated. While the bomber forces of the US Strategic Air Command have continued to decline in numbers, developments in electronic countermeasures, air-to-surface missiles (ASMs), and tactics have tended to increase their ability to penetrate strategic air defenses. In addition, the Soviets are faced with the nuclear threat posed by US tactical aircraft and missiles stationed in Europe, Asia, and at sea and with the air threat posed by the rest of NATO in the west and by China to the south. The Soviet effort to counter these threats continues as described in NIE 11-3-72.

2. Although the overall size of their fighter-interceptor force has decreased, its effectiveness against air attacks from medium and high altitudes continues to be enhanced. This is being done by making greater use of the latest air defense data transmission systems, by extending them into new areas, and by increasing the proportion of modern aircraft in the interceptor inventory. The number of SAM launchers has remained essentially the same as last year.

3. Although the recent Middle East war showed that the Soviets have improved tactical low-altitude defenses, the weaknesses of the strategic air defenses against low-altitude attacks and against modern standoff threats such as the US short-range attack missile (SRAM) remain. Soviet efforts to overcome these weaknesses have continued, but no fundmental

solutions to either of the problems appears near. The employment of nuclear warheads in air defense systems would be an important factor in meeting both of these threats. There is, however, still no conclusive evidence that nuclear warheads are available to the air defense forces.

A. Current Forces and Capabilities

4. As of the end of 1973 there were 2,650 fighter interceptors in the PVO Strany inventory. This number reflects a decline of some 360 aircraft since the publication of NIE 11-3-72 and results from the fact that aging interceptors (Fresco, Farmer, and Flashlight) are being withdrawn faster than Flagon and Foxbat are being deployed. There has been little if any change in the number of Fishpot, Firebar and Fiddler aircraft assigned to PVO Strany during the period.

SOVIET AIR DEFENSE INTERCEPTOR AIRCRAFT AS OF THE END OF 1973

New Models	
Foxbat (Mig-25)	120
Flagon (Su-15)	570
Fiddler (Tu-128)	160
Firebar (Yak-28)	360
*Older Models**	
Fishpot (Su-9)	750
Farmer (Mig-19)	260
Fresco (Mig-17)	430
Total	2,650

*The Yak-25 Flashlight has been phased out of PVO Strany during the last year.

5. The capabilities of PVO's fighter-interceptor force have improved somewhat over the last year. Soviet exercises and practice ground-controlled intercepts reflect their continuing effort to insure interceptor effectiveness. Perhaps the most striking improvements have been made in the Flagon, a new model of which has an increased combat radius at supersonic speeds and a new radar with increased range and possibly better low-altitude capabilities.

6. The Soviet strategic SAM forces have about the same number of launchers as last year. While they have inactivated some 50 SA-2 battalions, they have added over 40 SA-3 battalions and 10 operational SA-5 complexes. As of the end of 1973, the Soviets still had a total of some 10,000 operational SAM launchers of all types.

SOVIET AIR DEFENSE SURFACE-TO-AIR MISSILE FORCES AS OF THE END OF 1973

SA-5	
Operational Complexes	89
Launchers	1,482
Complexes Under Construction	10
SA-3	
Operational Sites (Battalions)	291
Launchers*	1,164
Sites Under Construction	8
SA-2	
Operational Sites (Battalions)	667
Launchers	4,002
Sites Under Construction	5
SA-1	
Operational Sites	56
Launchers	3,242
Sites Under Construction	0

*SA-3 launchers have two or four launch rails.

7. We continue to believe that some 100 to 110 SA-5 complexes will finally be deployed. Recent SA-5 complexes have, for the most part, been built containing only one or two sites instead of three. This suggests that the Soviets may have cut back the original program. Some of the latest deployments augment already existing coverage.

8. [

]

9. The continuing construction of new SA-3 sites and the re-equipment of old reflect the Soviet concern over low-altitude penetration. During the past year the Soviets have deployed a four-rail launcher to replace the typical two-rail launchers. So far the new four-rail launchers have appeared at about 60 sites. In most cases two of the new launchers have replaced four older ones, and the ready missiles on rail at each site have remained the same. At a few sites, however, four older launchers have been replaced by three of the four-rail launchers, providing a 50 percent increase in missile load. While it is too early in the program to make firm judgments regarding the change in launcher configuration, we believe that the basic purpose is to increase the ready firepower of the SA-3 sites.

B. Future Developments

10. The Soviets are developing a number of radars which could enhance Soviet air defense capabilities. The over-the-horizon detection (OHD) system being built near Kiev may be able to provide early warning against aircraft attacking from the Faeroes Gap region. If successful in this role, the Kiev radar could provide early warning against aircraft approaching at any altitude several hundred miles from the Soviet border. At the same time, radars continue to be developed at the Kapustin Yar Missile Test Center. In one area there is a new, large aperture, nodding height finder radar (Odd Pair) installed on a 325-foot tower. If deployed in this manner, the radar's horizon would be considerably extended, and low-altitude aircraft would be detected sooner. Several new, unidentified air surveillance radars are located in a second area, but their potential role is not known at this time.

11. The Soviets have had no new strategic fighter-interceptors or SAMs under test at any of the various R&D ranges and test facilities for several years—a situation unique in the postwar period. As it usually takes some five years from our first identification of a new system until its deployment, this means they probably will not deploy any new models of aircraft or SAMs developed specifically for PVO Strany before the late 1970s.

12. On the other hand, we have detected a continuous cycle of improvements in existing systems, designed largely to improve performance against the low-altitude bomber threat. A potentially significant development involving elements of the SA-5 system is underway at Launch Complex G, Sary Shagan.

[

]may indicate that some part of the SA-5 system is being modified and optimized to detect targets at greater ranges and to engage them at lower altitudes. It is also possible that Complex G is being used to develop a new strategic SAM, but until it receives more equipment, these activities will remain ambiguous.

13. In the past few years, the Soviets have added optical systems to tactically deployed

SA-2s and a television system to SA-3s in the field forces. These electro-optical aids, which can be used to perform some radar functions, counter to some degree the use of electronic countermeasures by attacking aircraft and, in certain cases, permit more effective engagement of low-altitude targets. The Soviets may also introduce such systems into strategic SAM defenses.

14. It is also possible that the Soviets will integrate SAM systems, normally associated with the field forces, into strategic defenses. Systems such as the SA-6 and SA-8 have some capability against low-altitude bombers, and, since they are mobile, they could complicate US SAM avoidance and suppression tactics. Further, the Soviets could introduce into PVO Strany new interceptors based on tactical fighters such as the Flogger, which has been deployed, or the Fencer, which is now being tested.

15. We doubt that the Soviets will deploy, over the next five years, any wholly new air defense weapon systems which provide merely incremental improvements over present weapons. They probably consider that continuing improvement of existing defense systems represent the most economical way to enhance their strategic defensive capabilities. It may be that the Soviets will await more fundamental changes based on new technology, such as a look-down, shoot-down system, or different physical phenomena, such as an air defense laser, before undertaking any deployment of new systems. Both could be demonstrated in the late 1970s, as indicated in NIE 11-3-72. They probably are working now on components of a laser system, as indicated in Section VI of this Memorandum. Based on evidence to date, we continue to believe that the Soviets have not developed an integrated look-down, shoot-down system—that is a system incorporating compatible radars and missiles which permit a fighter interceptor to engage targets well below its own altitude.

16. While there will probably be no wholly new strategic air defense weapon systems deployed at least until late in the decade, and numbers of weapons will probably decline, there are at least two factors which militate against any major phaseout of present defenses. The first is the fact that these defenses are a complicating element in US strategic strike planning. As long as they exist they must be avoided, degraded, or suppressed. Whether this is accomplished with ballistic missiles, by the penetrating air forces, or both, it means that a portion of a US attack must be used to neutralize defenses. A second factor is the requirement for maintaining air defenses sufficiently strong that they could not be suppressed and penetrated on a large scale by a third country.

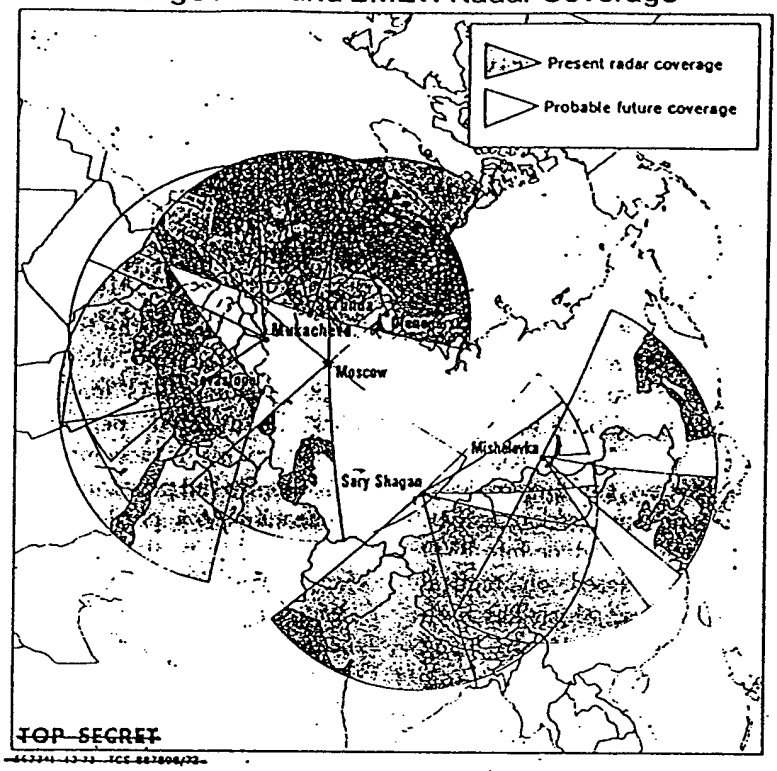
II. DEFENSE AGAINST BALLISTIC MISSILES

A. Early Warning

17. The Soviets have started transmitting from the Hen House ballistic missile early warning radar located near Sevastopol. The two radar faces [ ] thus providing substantial coverage of potential Polaris/Poseidon launch areas in the Mediterranean Sea.

18. In the past year, the Soviets have started construction on a new Hen House radar in the vicinity of the town of Mukachevo near the Hungarian border. When the new radar becomes operational, possibly by late 1976, it will eliminate the last remaining gap in early warning coverage of the Mediterranean Sea and will further enhance warning against ballistic missiles launched from France. Com-

Soviet Large ABM and BMEW Radar Coverage



pletion of this radar will provide the European portion of the USSR with essentially complete early warning coverage against ballistic missiles. (See Figure 1.)

19. The OHD radar near Kiev could be intended to detect submarine-launched ballistic missiles (SLBMs) launched from the Norwegian Sea. If this is the case, it could increase warning time of such an attack by one or two minutes. While the OHD radar is oriented toward the central US, we do not believe it is intended to detect ICBMs. It would be required to look through the auroral zone and, as a result, the probability of detecting ICBMs would be less than 10 percent.

20. Analysis of two satellites recently launched by the Soviets (Cosmos 520 in September 1972 and Cosmos 606 in November 1973) suggests that they were prototypes of a high-altitude surveillance system designed to be placed into a semisynchronous orbit with apogee over the northern hemisphere. The PVO Strany appears to be the authority responsible for these vehicles. Based on the limited data available and our perception of Soviet needs, early warning of missile launches seems to be their likely role.

B. The Moscow Antiballistic Missile System

21. There is still no evidence that the Soviets plan to expand the present Moscow defenses as permitted under the Treaty to Limit ABM Systems. Construction at the three previously abandoned Try Add complexes near Moscow still appears unrelated to ABM weapons de-

ployment. No launch areas are being built at Complex E-21, and the Soviets are continuing to install the 82-foot parabolic dish antennas mentioned in NIE 11-3-72. Possible functions to be served by this site include communication via satellites; satellite tracking; or command and control of, and data acquisition from, high-altitude SIGINT or ballistic missile early warning satellites.

22. There has been no evidence of modifications to the Moscow ABM System which would increase its capabilities over those described in the NIE. The Soviets have apparently made no move to incorporate components under development at Complex D, Sary Shagan, into the Moscow defenses.

23. While Hen House coverage of the Mediterranean provides early warning against SLBMs launched from that area, there is still a serious deficiency in local acquisition and target tracking capability. Neither the Dog House radar at Naro Fominsk nor the Chekhov radar, [redacted] is oriented to provide the necessary coverage. Thus, without additional Dog House or Chekhov radars, the Moscow ABM defense could still not cope with more than a few SLBMs launched from the Mediterranean. Although more such radars are permitted under the ABM Treaty, none are now under construction, and it would require 3 to 5 years to bring a new radar up to its initial operational capability.

C. Antiballistic Missile Deployment Beyond Moscow

24. There is no evidence that the Soviets are preparing to deploy ballistic missile defenses outside the Moscow area. Continuing analysis of activities in the vicinity of ICBM deployment areas fails to reveal any preparation for their defense as permitted under the terms of the ABM Treaty.

D. Research and Development

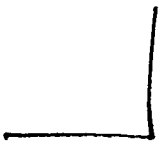
25. The pace of Soviet R&D in the field of ballistic missile defense continues unabated since the signing of the ABM Treaty.

New Interceptor Missile

26. The most significant new development has been the appearance, in October 1973, of a conical-shaped missile [redacted] Its conical shape is probably required to enable it to withstand the severe aerodynamic stresses of high velocity maneuvering in endoatmospheric flight. Its relatively larger size [redacted] indicates it will not have a high acceleration performance comparable to that of the US Sprint. It may, however, represent an initial Soviet effort to develop a high acceleration, endoatmospheric ABM interceptor.

27. The new missile will require at least a three-year flight test program before being ready for operational use. No launches have taken place, and a firm assessment of missile performance will necessarily have to await the acquisition of flight test data.

28. The missile may eventually become a component of the system under development at Complex F and/or of the Moscow ABM system. Neither the ABM 1b nor the [redacted] exoatmospheric interceptor has the acceleration performance required to permit a delay in their launch until atmospheric slowdown of lightweight penetration aids, such as chaff, reveals the incoming RV. Without a high acceleration interceptor, the Soviets would have



to consider every chaff cloud a valid target—a tactic which would lead to the rapid exhaustion of their interceptor force.

29. Other developments[ ] are proceeding at a relatively slow pace. Two tests of[ ] interceptor missile have taken place since December 1971. These tests[ ] represent a new phase of testing activity. In addition, a new engagement radar[ ] hardstand required only 5-6 months to complete, and the radar itself was installed within, at most, 6 weeks, thus tending to confirm the judgment in NIE 11-3-72 that the[ ] system could be deployed in about a year.

Discrimination Tests

30. There are indications that the Soviets have underway an active program to develop radar techniques for dealing with penetration aids.[ ] However, we still do not believe the Soviets have a radar capability to detect RVs hidden in chaff, and they will not have such a capability for many years.

New Optical Mount

31. A possibly related development is a large optical mount which has been constructed at Complex D, Sary Shagan, during the past year. The size, configuration,[ ] indicate that it may house a laser radar. If this is in fact the case, it could be in operation by the end of 1974. There are several possible uses of such a system which include satellite tracking or imaging and RV discrimination and tracking. However it is not yet possible to assess the specific function intended. It could be part of an R&D program to investigate several potential applications. (For a general discussion of lasers, see Section VI below.)

III. ANTISATELLITE DEFENSE

32. During the past year the Soviets have tested no antisatellite systems, and judgments in NIE 11-3-72 regarding Soviet antisatellite (ASAT) capabilities and intentions remain valid.[3] There is now strong evidence that the "heavy maneuverable" satellites are part of a program leading to a system for ocean reconnaissance, as suggested in the NIE. We no longer believe they are associated with the ASAT program.[4]

IV. CIVIL DEFENSE

33. There have been no developments in Soviet civil defense which cause us to revise our judgments regarding its missions or capabilities.

[3] For a discussion of the potential use of lasers in the antisatellite role, see Section VI.

[4] For further discussion see NIE 11-1-73, "Soviet Space Programs" dated 20 December 1973, TOP SECRET ALL SOURCE.

V. STRATEGIC DEFENSE AGAINST SUBMARINES

34. Judgments regarding Soviet strategic ASW capabilities remain essentially as stated in NIE 11-3-72.[5]

35. In this connection, data collected against units of the latest Soviet nuclear submarine, the D-class, indicate that its noise characteristics are similar to those of other modern, nuclear-powered units—the C-, V-, and Y-class submarines. We believe that if new quieting techniques were available, they would have been used on the D-class.

A. Offensive Operations Against United States Ballistic Missile Submarines

36. Over the last year we have obtained evidence that the Soviets have conducted area searches in the Mediterranean Sea using V- and C-class nuclear-powered attack submarines. The Soviets probably hope that this tactic will eventually enable them to detect and trail a Polaris submarine—something which they have thus far not been able to accomplish. Because Soviet attack submarines are handicapped by their relatively high radiated noise levels and poor passive sonars, their chances of even randomly detecting a Polaris submarine are small, and their ability to conduct a covert acoustic trail remains practically non-existent.

37. Advances in Soviet ASW-equipment include two new ASW capable nuclear submarines and several longer-range ASW weapons. The new submarines are a lengthened variant of the V-class SSN, which has been designated the U-class, and a longer variant of the C-class. Both submarines are some 30 feet longer than their predecessors, but the reason for the increased length has not been determined. It could be for improved sensors, weapons, habitability, or some combination of factors. Preliminary evidence suggests that the noise level of the U-class is about the same as that of the V-class. The U-class probably carries a towable VLF communications buoy. These new submarines represent an improved ASW capability insofar as they incorporate enhanced Soviet capabilities to communicate with submarines on ASW patrol and carry weapon systems that can engage enemy submarines at somewhat longer ranges.

38. A recently identified ASW weapon is a submerged-launched rocket with a depth bomb payload. It may have a maximum range as great as 24 nm, and at this range it would probably deliver a nuclear warhead. No launch platform has been identified, but its development is coincident with the introducton of the C-, V-, and Y-classes.

39. The Soviets have also tested at least two new weapons—the SS-NX-14 and [ ] that appear to be for ASW. The SS-NX-14, a surface ship launched cruise missile, apparently carries a torpedo payload to a maximum range of about 30 nm. It could now be operational on the Kresta II and Kara CLGMs. [ ] a submerged-launched rocket, carries a payload—probably a homing torpedo—to a maximum range of perhaps as much as 30 nm. A similar rocket-boosted homing torpedo, but surface-launched, may have begun tests in the Black Sea this year.

40. No new classes of surface ships have appeared since the previous estimate of Soviet ASW capabilities was published. However, the Soviets have started construction on a second unit of the Kuril class aircraft car-

[5] For the views of the Director of Naval Intelligence, Department of the Navy, see his footnote on page 2.

rier. In addition, a program to equip Kashin class frigates with variable-depth sonars has been identified.

41. New information has been obtained on three Soviet sonobuoys during 1973. The Soviets apparently have added a low frequency detection capability to their older BM-1 sonobuoys. A second sonobuoy—designated the BM-2—has a short-range acoustic direction finding capability. This sonobuoy has been used with the Bear F and May aircraft in conjunction with a barrier line of omnidirectional BM-1 sonobuoys. A third type of sonobuoy is being developed, but we do not yet understand its capabilities.

42. As important as these developments are to the general Soviet ASW program, they will have little impact upon the Soviet Union's ability to conduct strategic ASW as long as the open ocean detection problem remains unsolved. During the past year there has been no new information which indicates any substantial improvement in Soviet open ocean detection capabilities by acoustic means. Our information on Soviet research in non-acoustic detection is extremely limited, and our uncertainties are greater than for any other technology discussed in NIE 11-3-72. As we said in that 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 currently 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.

B. Protection of Soviet Ballistic Missile Submarines

43. There are indications that the Soviets may be showing more concern over the security of their ballistic missile submarine fleet. At an informal arms control seminar held at a US university in March 1973, Georgiy A. Arbatov, Director of the Institute of USA, was most emphatic about the necessity of ASW limitations in conjunction with other limitations on strategic armaments. Arbatov indicated particular concern that Soviet submarines were forced by geography to negotiate relatively narrow and restricted passages in order to gain access to their open ocean patrol areas. Specifically, he mentioned the area around Spitzbergen as an example of what the Soviets face in this regard.

44. It is, of course, not possible to determine whether Arbatov was presenting official concerns or his own private assessment. However, the Soviets are undoubtedly aware of our ASW activities in and around egress routes used by their SSBNs. They have made some attempt to protect their SSBNs through changes in operational procedures and deployment patterns. [redacted]

[redacted] In the case of the D-class SSBN, the SS-N-8 ballistic missile with its 4,200 nm range will permit a vast increase in potential patrol areas. In addition, [redacted] could permit the D-class to operate with a reduced number of contacts with external navigation aids, thus potentially increasing SSBN security.

VI. FUTURE STRATEGIC DEFENSES: MILITARY LASER PROGRAMS

45. Over the past year there have been a number of important developments that re-

inforce previous evidence of major Soviet military-related laser R&D programs. We have received an increasing number of indications that their high energy laser research effort is expanding. [redacted]

The types of lasers and the power sources being developed by the Soviets suggest that these programs are related to the development of laser weapon systems. However, the development of laser radars is apparently also among Soviet objectives.

A. Laser Radars

46. As indicated in paragraph 31, preliminary analysis indicates that the Soviets may now be in the process of installing a laser radar for use in conjunction with an antimissile or antisatellite system. [redacted]

47. While laser radars will not replace conventional radars, their development could offer the Soviets a number of attractive advantages. Most laser radar advantages over microwave radars stem from their higher resolution, which is a result of the short laser wavelengths. Laser radars offer the capability for highly accurate measurements of target range, angle, and velocity, with accuracies at least an order of magnitude better than conventional radars. Because of their small angular beamwidths, laser radar beams scattered from targets can be used to guide homing type weapons to their targets more precisely. Their disadvantages include lack of an all weather capability and inability to search large volumes of space because of their small beamwidths. Precision tracking conventional radars must be used to provide target acquisition by the laser.

48. Soviet laser radars could be used for air defense, antisatellite, and ABM applications by the late 1970s. As part of an air defense system they could be used to illuminate targets to provide precision tracking and a beam to guide semi-active homing-type missiles. In an antisatellite role they could provide accurate ephemeris data, "photographic" type images for satellite identification, and also a beam to guide a homing interceptor to a satellite target. Possible applications to ABM functions include precise measurements of position, size, shapes, velocities, and movements of incoming objects to permit tracking and discrimination of RVs. The laser could also be used as a target illuminator for interceptor homing on scattered target radiation reflected from the target.

B. Laser Weapon Systems

49. The use of lasers to project energy sufficient to destroy targets is also possible. Air defense appears to be the earliest feasible strategic use of such a laser weapon system. The system could be used to combat low-altitude aircraft and to provide defense against SRAM—the two most serious air defense problems faced by the Soviets. The use of laser weapons would still require a responsive command and control system and an extensive radar early warning and target acquisition network. The laser's "zero" time of flight, however, would considerably relieve the time constraints which inhibit current surface-to-air and air-to-air missile systems. We still

believe that the first weapon system demonstration tests are unlikely before 1977. The first deployable laser air defense system probably could not be available until the early 1980s.

50. The first laser weapon systems for destruction of satellites and ballistic missile RVs probably could not be available before the mid-1980s. On the other hand, a laser system capable of interfering with photoreconnaissance satellites by damaging film or optical train components is presently within Soviet capabilities and could become operational at any time.

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