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Soviet Strategic Air and Missile Defenses

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SOVIET STRATEGIC AIR AND MISSILE DEFENSES

THE PROBLEM

To estimate the capabilities and limitations of Soviet strategic air and missile defense forces through mid-1967, and general trends in these forces through 1975.

CONCLUSIONS

A. Confronted by powerful Western strategic attack forces, the USSR is sustaining its vigorous effort to strengthen its defenses. We believe that the Soviets are responding to those challenges to their security that they can now see or foresee from aircraft, ballistic missiles, and earth satellites. (*Paras. 1-5*)

Air Defenses

B. The Soviets have achieved a formidable capability against aircraft attacking at medium and high altitudes, but their air defense system probably is still susceptible to penetration by stand-off weapons and low-altitude tactics. The Soviets probably foresee little reduction in the bomber threat over the next ten years. To meet this challenge, they are improving their warning and control systems and are changing the character of their interceptor force through the introduction of new high-performance, all-weather aircraft. In addition, there are recent indications that the Soviets are now employing light AAA in some areas for low-altitude defense. (*Paras. 3, 4, 8-19*)

C. The Soviets probably will continue to improve and to rely on the SA-2 as the principal SAM system. We believe that they will develop an improved or new SAM system for low altitude defense; such a system would probably be deployed more extensively than the SA-3. Deployment of a long-range SAM system probably is now

underway in the northwestern USSR and probably will be extended to other peripheral areas and to some key urban locations in the interior.[1] [2] (*Paras. 20-26*)

Ballistic Missile Defenses

D. For nearly ten years, the Soviets have given high priority to research and development of antimissile defenses. We estimate that they have now begun to deploy such defenses at Moscow. These defenses could probably achieve some capability as early as 1967, but we think a more likely date for an initial operational capability is 1968. We do not yet know the performance characteristics of this system, or how it will function. (*Paras. 27-34*)

E. The Soviets will almost certainly continue with their extensive effort to develop ballistic missile defenses to counter the increasingly sophisticated threat that will be posed by US strategic missile forces. We cannot now estimate with confidence the scale or timing of future Soviet ABM deployment. We believe, however, that the Soviets will deploy ABM defenses for major urban-industrial areas. By 1975, they could deploy defenses for some 20 to 30 areas containing a quarter of the Soviet population and more than half of Soviet industry. (*Paras. 36-37*)

Antisatellite Defenses

F. The Soviets could already have developed a limited antisatellite capability based on an operational missile with a nuclear warhead and existing electronic capabilities. We have no evidence that they have

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[1] Lieutenant General Joseph F. Carroll, USAF Director, Defense Intelligence Agency, Major General John J. Davis, the Assistant Chief of Staff, Intelligence, US Army, and Major General Jack E. Thomas, Assistant Chief of Staff, Intelligence, US Air Force, believe that the many uncertainties stemming from analysis of available evidence does not permit a confident judgment as to the specific mission of the new defensive systems being deployed in northwest USSR. They acknowledge that available evidence does support a conclusion that the sites in the northwest may be intended for defense against the aerodynamic threat. However, on balance, considering all the evidence, they believe it is more likely that the systems being deployed at these sites are primarily for defense against ballistic missiles.

[2] Rear Admiral Rufus L. Taylor, Assistant Chief of Naval Operations (Intelligence), Department of the Navy, and Lieutenant General Marshall S. Carter, USA, Director, National Security Agency, do not concur in the degree of confidence reflected in this judgment. Although they concur that the deployment activity is more likely a long range SAM system than an ABM system, they believe that the evidence at this time is such that a confident judgment is premature.

done so. In any event, we believe that the Soviets would prefer to have a system which could track foreign satellites more accurately and permit the use of non-nuclear kill mechanisms. We estimate that the Soviets will have an operational capability with such a system within the next few years. We believe, however, that the Soviets would attack a US satellite in peacetime only if, along with a strong desire for secrecy, they were willing for other reasons to greatly disrupt East-West relations.[3] (*Paras. 38-41*)

[3] Mr. Thomas L. Hughes, the Director of Intelligence and Research, Department of State, believes that the Soviets would conclude that the adverse consequences of destroying or damaging US satellites in peacetime would outweigh the advantages of such an action. He therefore believes it highly unlikely that they would attack US satellites in peacetime.

DISCUSSION

I. SOVIET POLICY TOWARD STRATEGIC DEFENSE FORCES

1. Confronted by large and powerful Western strategic attack forces, the Soviets have made a sustained and vigorous effort to improve their defenses. In the past several years, surface-to-air missiles and new generations of interceptor aircraft have been widely deployed. Warning and control systems have been expanded and sophisticated. At the same time, the Soviets have pursued R and D on more advanced air defense systems. And for nearly a decade they have continued a large-scale, high-priority program to develop antimissile defenses.

2. Soviet expenditures for strategic defense have grown steadily since 1950. In recent years, these expenditures have roughly equaled those for strategic attack, when the major buildup of strategic missile forces was in process. The USSR devoted a much larger share of its military expenditures to strategic defense during the 1961-1964 period than did the US. Manpower allocated to the strategic defense mission has also increased markedly—from about 200,000 in 1950 to almost 500,000 men at present. This increase occurred during a period of large scale reductions in military manpower.

3. Despite impressive improvements, however, Soviet strategic defense capabilities have not overtaken increasingly sophisticated US attack capabilities. Thus, while the USSR has achieved a formidable capability against aircraft attacking at medium and high altitudes, its air defense system probably is still susceptible to penetration by stand-off weapons and to low-altitude tactics. Finally, the Soviets must realize that their surface-to-air (SAM) and interceptor forces and the supporting warning and control elements of their air defense system would be highly vulnerable to attack by missile strikes which they would expect to be coordinated with an air attack against the USSR.

4. While the bulk of Soviet expenditures for strategic defense in the past few years has gone to air defense, the character of the US threat has changed. In assessing the future threat, the Soviets undoubtedly consider the most pressing problem to be the threat posed by massive and growing US ballistic missile forces, because this threat cannot now be met adequately by either pre-emptive attack or active defense. In addition, the threat posed by bombers has probably not diminished in Soviet eyes. Considering the forthcoming introduction of advanced aircraft by the US, the Soviets probably foresee little reduction in the bomber threat into the 1970s. The Soviets are no doubt also concerned with US activities in space which have military applications.

5. The Soviets must feel pressed to respond to these US capabilities. Following a basically deterrent strategy, they are now strengthening their forces for strategic attack, but they are not, we believe, attempting to achieve a counter-

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force capability.[1] In building their forces for strategic defense, they appear to be responding to the challenges to their security that they can now see and foresee—aircraft, ballistic missiles, and earth satellites. The heavy Soviet expenditures for air defense in the past serve as a strong indicator that the Soviets will accept the continuing high costs for strategic defense in the coming years.

II. AIR DEFENSES

6. The Soviet air defense mission is the responsibility of the PVO Strany (Anti-Air Defense of the Country), whose commander-in-chief, a Deputy Minister of Defense, is ranked with the heads of the ground, naval, air, and strategic missile forces. The PVO Strany includes three major components, each of which performs one of the key functions of the air defense mission, i.e., early warning and control, interceptor, and SAM operations. The commander of the PVO Strany probably is also assigned the mission of ballistic missile defense. In addition to forces directly assigned to the PVO Strany, other Soviet forces which can contribute to the air defense mission are also operationally available to this command.

7. The air defenses of the East European countries of the Warsaw Pact, although separate national systems, are coordinated with each other and with the Soviet air defense organization. For most practical purposes, they constitute an extension of the Soviet system. The East European air defense forces are equipped almost exclusively with Soviet materiel, and the USSR will continue its policy of improving their capabilities. Although the Chinese Communist air defense system still maintains some contact with the Soviet organization, cooperation between them is minimal.

Warning and Control

8. There are now more than 5,000 radars deployed at well over 1,000 sites in the USSR. These sites have at least two radars and many are equipped with five to seven sets. This deployment provides overlapping radar coverage of most of the nation; coverage is particularly dense west of the Urals and in peripheral areas. The density of coverage heightens the probability of detection, and frequency diversification provides some defense against electronic countermeasures (ECM). But, at the same time, the redundancy of radar coverage increases the load on communications and filter centers.

9. *Early Warning.* The altitude coverage of the Soviet early warning (EW) system exceeds the combat ceiling of any US aircraft. Under optimum conditions, the Soviet EW system could detect and track aircraft flying at medium or high altitudes at least 200 n.m. away from Soviet territory, and under normal

[1] Major General Jack E. Thomas, Assistant Chief of Staff, Intelligence, USAF, would reword the sentence as follows: "We believe they will continue to adhere to the concept of deterrent force so long as they remain in a position of strategic inferiority, but the intensive Soviet Military R and D effort raises the possibility that Soviet leaders already are focusing on achievement of a strategic superiority which would enable more aggressive pursuit of their political aims, perhaps within the time frame of this estimate."

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conditions detection and tracking of enemy aircraft flying at such altitudes is virtually assured at about 135 n.m. However, an attack by supersonic aircraft and cruise missiles, because of their very high speeds, would reduce the warning time provided by this system. The detection range of the EW system is progressively reduced against aircraft penetrating at lower altitudes. Moreover, even when detection of low altitude penetrators occurs, the system is unlikely to be able to accomplish continuous tracking of an intruding enemy aircraft below 3,000 feet, and it has virtually no capability below about 1,000 feet.

10. *Ground-Controlled Intercept.* About one-third of the Soviet radar sites are capable of conducting ground-controlled intercept (GCI) operations. The effectiveness of the GCI system varies with altitude, range, and speed of the target. Against medium and high altitude targets, we estimate that GCI range capabilities vary from about 85 n.m. to 200 n.m. depending on the radar employed at the site. We believe that most GCI radars employ moving target indicators or anticlutter techniques in order to improve low-altitude coverage. However, low altitude GCI capability probably drops off sharply below 3,000 feet and would be almost non-existent below 1,000 feet.

11. *Communications.* The Soviet air defense warning and weapons control structure employs a communications network which has a high degree of redundancy and flexibility. The most important development in air defense communications in recent years has been the spread of a semiautomatic data transmission system. The ground-to-ground link of this system has probably been deployed extensively in the USSR and in parts of Eastern Europe. Originally believed to be associated only with early warning and interceptor control, the system probably is now being used to support SAM operations in some instances. We believe that the ground-to-air link has been deployed extensively in the USSR and is being used by Soviet forces in East Germany, Poland, and Hungary. It is also probably being employed by one or two of the East European air forces.

12. *Outlook.* During the next ten years, the number of radar sites probably will remain steady or decline slightly. We estimate that the number of radar sets, however, depending on their age and serviceability, will be reduced from the present level, perhaps by as much as one-half. The Soviets will probably deploy new radars designed to enhance low altitude and antijamming capabilities. We estimate that deployment of the ground-to-ground link of the semiautomatic data transmission system will be extended, and SAM units will be fully incorporated in the system; the ground-to-air link will be standard equipment on all new interceptors. We believe that the Soviets are developing more fully automated systems for interceptor control which could become operational in the next year or two.

Interceptors

13. There now are about 3,800 operational interceptors in the PVO Strany, most of them deployed in western USSR. Roughly half of the interceptor

force is made up of all-weather models.[5] Only about one-fourth of the interceptors are capable of Mach 2, the remainder are older models, which entered service before 1959. The Soviets could also count on employing in the air defense mission many of the fighters assigned to Tactical Aviation. There are about 2,400 fighters in Tactical Aviation, the bulk of which are deployed in western USSR and in those Warsaw Pact countries where Soviet forces are stationed.[6]

14. *New Models.* The Soviets are now in the early stages of what appears to be a large-scale program to modernize the interceptor force. We believe that they now have two new interceptors in production; the Firebar, which entered service in 1964 and the Fiddler, which probably will enter service in 1966 or 1967. The Firebar probably is being used for low-altitude intercepts, and the Fiddler is best suited for long-range intercepts. A third new model, probably an improved all-weather interceptor of short or medium range, may go into production in the near future; this aircraft will probably have a maximum speed approaching Mach 3. About 1,000 of these three interceptors will probably be in service by the early 1970s.

15. In addition to the interceptors now in production or likely soon to be, we believe that the Soviets are conducting an extensive development program for very high performance aircraft. An advanced all-weather interceptor with cruise speeds in the Mach 3 region could be operational in the early 1970s.

16. *Armament.* Virtually all of the older Soviet interceptors and some of the current models are equipped with guns and rockets. Less than half of the currently operational Soviet interceptors are equipped with air-to-air missiles (AAMs). For the most part these aircraft are limited to effective attack ranges of less than five n.m., and all are restricted to tail chase attack tactics. We believe that the Firebar, Fiddler, and other new interceptors will be armed with improved AAMs and radars which will allow these interceptors to employ additional attack tactics at effective ranges of more than ten n.m.

17. *Capabilities.* The Soviet interceptor force has good capabilities against subsonic, and to a lesser extent against supersonic aircraft attacking at medium and high altitudes, in daylight or under clear air mass conditions. The force has, however, limited all-weather capabilities and poor low altitude capabilities. Despite increased training in low altitude intercepts and attempts to employ the Firebar in this role, the problems of lead pursuit and tail chase attack at altitudes below 3,000 feet, and particularly below 1,000 feet, remain severe. The Soviets probably also plan to use their interceptors against air-to-surface missiles, at least as an interim measure.

18. *Force Levels.* The old model Soviet interceptors (Fresco, Farmer, and Flashlight) are now being retired at a fairly rapid rate. We believe that replacement by newer aircraft is on a slightly less than one-for-one basis, and we

[5] For performance characteristics of Soviet interceptors and fighters, see Annex, Table 1.

[6] For a discussion of fighter aircraft not in PVO Strany units, see NIE 11-14-65, "Capabilities of Soviet General Purpose Forces" (Secret, 21 October 1965).

expect this trend to continue for the next few years. Thus, we look for a gradual reduction in the size of the force through mid-1967, as shown in the following tabulation:

ESTIMATED INTERCEPTOR FORCE LEVELS

	October 1965	Mid-1966	Mid-1967
Old Models	2,840	2,450-2,650	2,000-2,250
Current and New Models	950	975-1,075	1,090-1,225
Total	3,800	3,425-3,725	3,100-3,475

We believe that the size of the force will decline further over the next ten years; by 1970 the force probably will have been reduced to about two-thirds of the current level. After 1970, the force may level off or it may be reduced further, perhaps to about one-half the present force level by 1975.[7]

19. *Outlook.* As the number of newer aircraft in the force grows, its capabilities will increase significantly, particularly under all-weather conditions and against attacks by supersonic vehicles. The newer aircraft will be equipped with improved airborne intercept radars and missiles and Soviet EW and GCI capabilities will also grow, but low altitude intercept capabilities probably will remain limited throughout the period.

Surface-to-Air Missiles

20. *SA-2 System.* We estimate that as of mid-1965, there were about 1,000 SA-2 sites in the USSR. We believe that some 800-900 of these sites are occupied by operational units, and that the remainder are not manned or equipped on a permanent basis. These sites probably are intended to augment existing defenses or to defend lower-priority targets. The Soviets will probably activate them in threatening situations, but we cannot determine which of these sites will be occupied at any given time. Although we expect the Soviets to construct additional sites of this type, we do not believe that they plan to increase SA-2 operational units above the present force level.

21. The Soviets have continued to improve the SA-2 system; both the missile and the guidance radar have either been modified or replaced several times.[8] These improvements increase the range of the system from 17 to about 25 n.m., raise the maximum intercept altitude from 80,000 to 90,000 feet, and lower the minimum intercept altitude from 3,000 to about 1,500 feet.[9] They have im-

[7] Major General Jack E. Thomas, Assistant Chief of Staff, Intelligence, USAF, believes the reduction in IA PVO fighter forces will not be as great as is estimated. He would substitute the following for the final two sentences: "We believe that the size of the force will decline further over the next ten years; by 1970 the force probably will have been reduced to approximately 3,000 aircraft. After 1970, the force may level off, but if a long-range interceptor is introduced in significant numbers, the total size of the IA PVO may continue to decline somewhat."

[8] For performance characteristics of SAM systems, see Annex, Table 2.

[9] Most SA-2s exported by the Soviets to countries outside the Warsaw Pact are earlier models, and thus have performance characteristics which equate to the system's original capabilities.

proved the accuracy and the detection capability of the system and its performance in an ECM environment. Modifications are still being made and operational units continue to be reequipped with advanced models of the missile and guidance radar. SA-2s deployed in peripheral areas in the USSR, and probably most of those in the interior, employ improved versions of the missiles and guidance radars.

22. *SA-3 System.* We believe that deployment of the SA-3 system has also come to a virtual halt, and that only a few new sites were constructed in 1965. We estimate that total deployment of this system now stands at about 110 sites. Deployment, usually in conjunction with SA-2 sites, is largely restricted to the peripheral areas of the USSR and the cities of Leningrad and Moscow. The slow and small deployment of the SA-3 strongly suggests that it does not provide a much better low altitude capability than that of the modified SA-2 or of existing antiaircraft artillery (AAA). In addition, there are recent indications that the Soviets may be employing light AAA in some areas for low-altitude defense. Such employment would serve as an interim measure until development of improved or more advanced systems.

23. *SA-1 System.* The SA-1 system, deployed only at Moscow, remains operational. There are no indications that the Soviets intend to phase out the system in the near future. The SA-1, deployed during the 1950s at 56 large sites in two rings around Moscow, was designed as a defense against mass bomber attacks. The Soviets have since modified it, probably improving its range and high altitude capabilities. In addition to the SA-1, Moscow's air defenses include some SA-2 and SA-3 sites, and the Soviets may provide additional SAM defenses for Moscow. In any event, we believe that the SA-1 system will not be phased out during the next few years and possibly not until the 1970's.

24. *Long-Range System.* The Soviets are deploying a new defensive system in northwestern USSR. It is probably a SAM system with a range several times that of the SA-2. We cannot, however, discount the possibility that this deployment is intended for ballistic missile defense.[10] [11]

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[10] Lieutenant General Joseph F. Carroll, USAF, Director, Defense Intelligence Agency, Major General John J. Davis, Assistant Chief of Staff, Intelligence, US Army, and Major General Jack E. Thomas, Assistant Chief of Staff, Intelligence, US Air Force, believe that the many uncertainties stemming from analysis of available evidence does not permit a confident judgment as to the specific mission of the new defensive systems being deployed in northwest USSR. They acknowledge that available evidence does support a conclusion that the sites in the northwest may be intended for defense against the aerodynamic threat. However, on balance, considering all the evidence, they believe it is more likely that the systems being deployed at these sites are primarily for defense against ballistic missiles.

[11] Rear Admiral Rufus L. Taylor, Assistant Chief of Naval Operations (Intelligence), Department of the Navy and Lieutenant General Marshall S. Carter, USA, Director, National Security Agency, do not concur in the degree of confidence reflected in this judgment. Although they concur that the deployment activity is more likely a long range SAM system that an ABM system, they believe that the evidence at this time is such that a confident judgment is premature.

25. We believe that the system is a change from an earlier system which the Soviets began to deploy at Leningrad in 1960; the earlier system probably was intended to have a capability against a small unsophisticated ballistic missile threat and against aerodynamic vehicles as well. This concept apparently was abandoned prior to completion of the three Leningrad complexes, and deployment of the new system was undertaken.[10] Although we think that the Griffon missile was intended for use with the original Leningrad system, we cannot determine whether this new system will employ a Griffon-type missile or some other which we have not as yet identified. We believe that deployment of the same system is underway at a few other locations in the Soviet northwest, e.g., Tallin on the Baltic coast and Cherepovets about 200 miles north of Moscow. Two of the Leningrad complexes could be operational by early 1966. The third Leningrad complex and the other deployments in northwestern USSR could become operational during 1966 and the following year.

26. *Outlook.* Although the present Soviet SAM defenses provide good all-weather, medium- and high-altitude protection against aircraft and air-to-surface missiles, they are deficient in long-range and low-altitude capabilities. Over the next few years the Soviets will attempt to overcome these deficiencies. They will probably expand the deployment of their new long-range SAM system to provide a barrier defense against bombers and long-range air-to-surface missiles in the peripheral areas of the USSR and at some key urban locations.[10 11] Such deployment would probably involve a total of 25-45 complexes and could be completed before 1970. The Soviets may seek to meet their requirement for very low-altitude capabilities with improved AAA. We believe it more likely, however, that they will develop an improved SA-3 or a new SAM system, although we have no evidence of such development. Deployment of a new system could begin as early as 1968 and would probably be more extensive than that for the SA-3 system.

III. BALLISTIC MISSILE DEFENSES

27. For the past decade, the Soviets have been assiduously working to develop defenses against ballistic missiles. The R and D activities associated with the Soviet program continue to be conducted at the large Sary Shagan missile test center in central Asia. A number of missiles, radars and other system components have been developed and tested over the years for both tactical and strategic systems. We believe that the Soviets have conducted an atmospheric intercept test program, and they have probably investigated exoatmospheric intercept techniques as well. It seems likely that they have studied both point and area defenses and examined the feasibility of precision and barrage type intercepts. In the field of electronics, they have explored the advantages of using relatively low frequencies as well as those higher in the spectrum; they have worked with large dish-type and phased-array radars. Thus, the scope and diversity of the program have been impressive, but the Soviets have evidently experienced many failures and frustrations.

28. Despite the limitations of our collection, we believe that the Soviets could not have conducted more than a few antimissile missile (AMM) firings to exoatmospheric altitudes without our knowledge. They probably have not attempted full system tests involving intercepts at these altitudes. Furthermore, we estimate that the Soviets are likely to carry out full antiballistic missile (ABM) system tests (perhaps excluding use of nuclear warheads) against targets having or simulating ICBM characteristics. Although the Soviets could conduct some such tests without our knowledge, we believe that the chances are good that we would acquire sufficient evidence to identify such testing in advance of the achievement of an operational capability.

29. The Soviets almost certainly have not as yet tested AMMs with nuclear warheads. Although the nuclear tests conducted at Sary Shagan in late 1961 and 1962 were not of this nature, the Soviets may have derived some data on the destructive effects of exoatmospheric nuclear bursts from them. We know of no tests that they have conducted specifically for this purpose, but they could have acquired some information on these effects without our knowledge from underground tests.

Defense of Moscow

30. We estimate that the Soviets are now deploying an ABM system for the defense of Moscow. We do not yet know the characteristics of this system, or how it will function. We believe, however, that we have identified some of its key elements. There are several large radars in the northwestern USSR and facilities in the Moscow area which probably serve the functions of early warning, target acquisition and tracking, and missile guidance. In addition, it is possible that the Galosh missile, which the Soviets displayed in 1964, is associated with the system.

31. The Soviets are constructing very large radars in the northwest, which probably are intended to function as part of a ballistic missile defense. These dual Hen House radars are being installed at Olenegorsk on the Kola Peninsula and at Skrunda on the Baltic coast, and could be operational in 1966. These radars, developed at Sary Shagan, probably are phased-arrays transmitting at a relatively low frequency, i.e., in the VHF band. They are oriented in such a fashion as to be able to detect ICBMs launched from the US toward most targets in western USSR; they will probably also be capable of detecting ballistic missiles launched by submarines in the Norwegian Sea and the North Atlantic at targets in the Soviet northwest. We believe that these radars will serve a ballistic missile early warning function, and may provide some tracking and prediction data for use by AMM launch units. They will probably have a secondary task of satellite detection and tracking.

32. The Soviets are constructing a huge radar (Dog House) of a different configuration about 30 miles southwest of Mocow. Although we know of no prototype for this radar, we think it evolved from developmental work at Sary Shagan and that it too is a phased-array. It is situated so that the northern

face could scan the ICBM threat corridor to Moscow; a southern face may be added which could scan the Polaris threat from southern launch points. We think that this radar is intended to serve as a long-range acquisition and early target tracking facility for any ballistic missile defenses in the Moscow area, and could be operational in 1967. As with the Hen Houses, the Moscow radar may have a secondary function as part of a satellite detection and tracking system.

33. In addition to the Dog House, the Soviets are continuing to work on a series of "triads" located at some of the outer ring SA-1 sites in Moscow. A triad consists of one large building and two smaller ones, each probably having a dish-type radar atop. We believe that the triads will provide final target tracking and missile guidance for the Moscow ABM system.

34. If Galosh or a similar missile is to be used, the system is likely to be intended to perform exoatmospheric intercepts at ranges up to some 300 miles. On the other hand, the Moscow system may be designed to use another type of missile and to achieve atmospheric intercepts of incoming warheads. It is even possible that both types of missiles and intercepts are planned for the system. Regardless of the system's characteristics, we estimate that ballistic missile defenses at Moscow could achieve some capability as early as 1967, but we think a more likely date for an initial operational capability is 1968.

Other Possible Deployment

35. We have previously discussed defensive deployments at Leningrad which may have originally been intended as a dual-purpose system to defend against both aerodynamic vehicles and ballistic missiles (see paras. 25 and 26). We presently estimate that the system now under deployment at the Leningrad complexes and the other similar complexes in the northwestern USSR is intended for air defense, but we cannot exclude the possibility that its purpose is ballistic missile defense.[12] Considering the locations of these complexes, such an ABM system would be designed for area defense using a barrage-type, exoatmospheric intercept.

Prospects for Missile Defenses

36. The USSR will almost certainly continue its extensive R and D effort on antimissile defense. This effort will be directed generally toward countering the increasingly sophisticated threat that will be posed by US strategic missile forces. Whatever the present characteristics of the Moscow system, we believe that future defenses will provide for both long-range exoatmospheric intercept and short-range intercept within the atmosphere.

37. We believe that over the next ten years the USSR will extend its antimissile defenses beyond the Moscow area. The evidence is insufficient for us to estimate with confidence the scale or timing of such deployment or to determine whether point or area defenses will be emphasized. We believe, however, that the Soviets will deploy ABM defenses for major urban-industrial areas.

[12] For dissenting views to this judgment, see footnotes 10 and 11 to paragraph 24.

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By 1975, they could deploy defenses for some 20 to 30 areas containing a quarter of the Soviet population and more than half of Soviet industry.

IV. ANTISATELLITE DEFENSES

38. The Soviets continue to accuse the US of employing its space vehicles mainly for reconnaissance and espionage purposes, and their traditional concern for military secrecy gives the Soviets an incentive to develop defenses against US satellites. In addition, the Soviets are probably concerned that the US will eventually develop space weapon systems. They could already have developed a limited antisatellite capability based on an operational missile (e.g., the SS-4) with a nuclear warhead and on existing electronic facilities. We have no evidence that they have done so. In any event, we believe that the Soviets would prefer to have a system which could track foreign satellites more accurately and permit the use of non-nuclear kill mechanisms.[13]

39. The Soviets are constructing a series of large Hen House radars, most of which will probably be completed in the next year or two. The locations and orientations of these radars indicate that they are intended for a space surveillance system. The Hen House radars at Olenegorsk and Skrunda and the Dog House radar associated with ABM deployment at Moscow probably have a secondary role of space surveillance, and they are likely to be linked together with the other Hen Houses to form a satellite detection and tracking system. Such a system would enable the Soviets to observe and track satellites during most of the passes over the USSR. It probably would allow the Soviets to predict the orbits and positions of non-Soviet satellites and space vehicles with a high degree of accuracy after a few crossings over the USSR, and thus could provide the information required by an antisatellite system.

40. An antisatellite system employing these radars could use an existing missile with a nuclear warhead. Non-nuclear kill, on the other hand, would require a homing missile capable of exoatmospheric maneuver which could be developed in about two years after a decision to do so. Although we have no evidence of such development, it could be well under way without our knowledge. We believe, therefore, that at about the time the Hen Houses become operational the Soviets could have an antisatellite capability with either nuclear or non-nuclear kill. We consider the latter more likely because the capabilities of the Hen House radars appear to exceed that required for a nuclear kill.

41. On the basis of the foregoing considerations, we estimate that the Soviets will have an operational antisatellite capability with a sophisticated system

[13] Mr. Thomas L. Hughes, the Director of Intelligence and Research, Department of State, believes that the rationale presented in this paragraph for a Soviet antisatellite program places undue emphasis on the Soviet concern over US peacetime satellite operations. He believes that the Soviets have been concerned more generally with the future of space as a military environment. Moscow would wish to develop a contingency capability for wartime use against the broad spectrum of possible military space missions. These would include systems for military support, such as reconnaissance, communications, and navigation satellites, as well as the possibility of spaceborne weapons systems.

within the next few years. The decision to use this capability in peacetime would, however, confront the Soviet leaders with very serious problems. Although they have displayed growing concern over US satellite operations, the Soviets would recognize that damaging or destroying a US satellite could stimulate Western military programs and expose their own satellites to attack. Attacking a manned US satellite would carry even graver consequences, including the risk of US retaliatory action against any manned Soviet satellite. We therefore believe that the USSR would attack a US satellite in peacetime only if, along with a strong desire for secrecy, the Soviets were willing for other reasons to greatly disrupt East-West relations.[14]

V. CIVIL DEFENSE

42. Military control of Soviet civil defense has increased steadily since 1960, when the program was shifted to the Ministry of Defense. The ranks of the military officers assigned to civil defense staffs have also been upgraded, and the curent head of the program is a Marshal and a Deputy Minister of Defense. During the same period, the Soviets have continued to implement compulsory training courses for the general public; we estimate that as many as one hundred million Soviets have been exposed to instruction, and that many have been highly trained in basic civil defense procedures. In their training, the Soviets have been emphasizing ways to conduct strategic urban evacuation and construction of simple homemade fallout shelters. They have also created mobile units, or rescue columns, to provide post-attack assistance both in urban and rural areas. The effectiveness of these procedures depends on strategic warning. Furthermore, apathy on the part of the public has tended to reduce the planned effectiveness of this training.

43. We calculate that there are about 25 million fallout shelter spaces available for the urban population, or roughly one space for every five city-dwellers. Most of these shelters were built during the 1950s, when new public buildings and apartment houses were constructed with special basements for civil defense purposes. Since the late 1950s the Soviets have severely curtailed their urban shelter construction program, and we have no evidence to indicate that they are planning a resumption of a major shelter construction program. They have, however, probably made some provisions for including shelters in certain public facilities now under construction. In view of the program's emphasis on urban evacuation and rural self-reliance, we believe that the Soviet leadership does not expect the present civil defense program to provide significant protection for more than a small portion of the population. Although the Soviets might during the decade resume large-scale shelter construction, we think that other demands of Soviet resources, particularly those for advanced weapon systems, will prevent such a development.

[14] Mr. Thomas L. Hughes, the Director of Intelligence and Research, Department of State, believes that the Soviets would conclude that the adverse consequences of destroying or damaging US satellites in peacetime would outweigh the advantages of such an action. He therefore believes it highly unlikely that they would attack US satellites in peacetime.

ANNEX

TABLE 1: SOVIET INTERCEPTORS AND FIGHTERS:
ESTIMATED CHARACTERISTICS AND PERFORMANCE IN AN AIR DEFENSE ROLE

TABLE 2: SOVIET SAM SYSTEMS:
ESTIMATED CHARACTERISTICS AND PERFORMANCE

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TABLE 1*

SOVIET INTERCEPTORS AND FIGHTERS: ESTIMATED CHARACTERISTICS AND PERFORMANCE IN AN AIR DEFENSE ROLE

MODEL	ENTERED SERVICE	MAXIMUM SPEED AT OPTIMUM ALTITUDE (KNOTS)	COMBAT CEILING (FEET) [a] [b]	OPTIMUM COMBAT RADIUS (N.M.) [a] [c]	ALL-WEATHER CAPABILITY	RADAR RANGE SEARCH/TRACK (N.M.)	MAIN ARMAMENT	MAXIMUM EFFECTIVE ATTACK RANGE (N.M.)	ATTACK CAPABILITY
FRESCO A (MIG-17)	1953	605	53,400	540	No	...	Guns/Rockets	0.5	Tail
									Attack
FRESCO B (MIG-17)	1953	605	53,400	540	No	...	Guns/Rockets	0.5	Tail
									Attack
FRESCO C (MIG-17)	1954	620	54,500	510	No	2/1 [d]	Guns/Rockets	0.5	Tail
									Attack
FRESCO D (MIG-17)	1955	620	54,500	510	Yes	6/1	Guns/Rockets	0.5	Tail
							AAMs	2-3 [e]	Attack
FRESCO E (MIG-17)	1954	605	53,400	540	Yes	6/1	Guns/Rockets	0.5	Tail
							AAMs	2-3 [e]	Attack
FLASHLIGHT (YAK-25)	1955	610	49,400	575	Yes	12/8	Guns	0.5	Tail
									Attack
FARMER A (MIG-19)	1955	755	54,500	520	No	2/1 [d]	Guns/Rockets	0.5	Tail
									Attack
FARMER B (MIG-19)	1957	755	54,500	520	Yes	8/4	Guns	0.5	Tail
									Attack
FARMER C (MIG-19)	1957	755	54,500	520	No	2/1 [d]	Guns/Rockets	0.5	Tail
									Attack
FARMER D (MIG-19)	1957	755	54,500	520	No	2/1 [d]	Guns/Rockets	0.5	Tail
									Attack
FARMER E (MIG-19)	1959	745	54,900	520	Yes	8/5	AAMs	3-4	Tail
									Attack
FITTER (SU-7) [f]	1959	1,205	57,600	580	No	4/3 [d]	Guns/Rockets	0.5	Tail
							AAMs	5-6 [e]	Attack
FISHPOT (SU-9)	1959	1,205	58,000	540	Yes	12/8	AAMs	3-4	Tail
									Attack
FISHBED C (MIG-21) [f]	1960	1,150	61,500	450	No	4/3 [d]	AAMs	5-6 [e]	Tail
									Attack
FISHBED D (MIG-21) [f]	1962	1,150	61,500	450	Yes	15/10	AAMs	5-6	Tail
									Attack
FISHBED E (MIG-21) [f]	1961	1,150	61,500	450	No	4/3 [d]	AAMs	5-6 [e]	Tail
									Attack
FIREBAR	1964	1,100	56,100	500	Yes	28/20	AAMs	10-12	Tail
									Attack

* See footnotes at end of table.

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TABLE I (*Continued*)

MODEL	ENTERED SERVICE	MAXIMUM SPEED AT OPTIMUM ALTITUDE (KNOTS)	COMBAT CEILING (FEET) [a] [b]	OPTIMUM COMBAT RADIUS (N.M.) [a] [c]	ALL-WEATHER CAPABILITY	RADAR RANGE SEARCH/TRACK (N.M.)	MAIN ARMAMENT	MAXIMUM EFFECTIVE ATTACK RANGE (N.M.)	ATTACK CAPABILITY
FIDDLER	1966–1967	1,175	54,000	1,050	Yes	40/30	AAMs	10–16	360° Attack
IMPROVED ALL-WEATHER INTERCEPTOR [e]	1967–1968	About 1,600	70–75,000	Supersonic: up to 400 Subsonic: up to 600	Yes	22/16	AAMs	10–12	Tail or Head On Attack
IMPROVED TACTICAL FIGHTER [f]	1967–1968	About 1,450	About 65,000	About 550	Yes	22/16	AAMs	10–12	Tail or Head On Attack

[a] Maximum speeds and combat ceilings have been calculated independently and cannot be achieved on the same flight profile.

[b] Soviet Mach 2 interceptors equipped with search/track radars have the capability to make intercepts, with limited effectiveness, in dynamic climb against subsonic targets at altitudes on the order of 70,000 feet when under close GCI direction.

[c] With external fuel.

[d] Search and track performances denote ranges only.

[e] Infrared missiles do not require radar guidance; therefore, visual attack can be made at the effective range of the missile.

[f] There are few Fitters and no Fishbeds in the PVO Strany; both aircraft, however, are deployed in large numbers in Tactical Aviation units. These models, along with the Improved Tactical Fighter, are included in the table because of their capabilities as interceptors.

[g] NOTE: In addition, an advanced all-weather interceptor with cruise speeds in the Mach 3 region and a 360° attack capability could be operational in the early 1970s.

TABLE 2

SOVIET SAM SYSTEMS: ESTIMATED CHARACTERISTICS AND PERFORMANCE

SYSTEM [a]	SA-1	SA-2	SA-3
Launchers Per Site	60	6	4 (dual)
Maximum Operational Range (nm) [b]	20-25 [d]	About 25 [g]	About 12
Maximum Effective Altitude (ft)	60,000 [d]	90,000 [f]	25,000-35,000
Minimum Effective Altitude (ft) [c]	3,000	1,500 [e]	1,000 [h]
Simultaneous Target Handling Capacity Per Site	20	1	1
Rate of Simultaneous Fire Per Site	20	3	4
Warhead	HE [i]	HE [i]	HE

[a] For discussion of the long-range SAM system, see paras. 24-25 and the footnotes thereto.

[b] Range will vary with size, altitude, speed, and approaching direction of target.

[c] Such factors as siting conditions and target speeds influence low altitude capabilities.

[d] Recent information indicates that the SA-1 range and altitude capabilities probably have been improved. Thus, the capabilities of this system could be greater than shown above.

[e] This range is estimated for sites equipped with the "C" Band Fan Song fire control radar. For those sites equipped with "S" Band radar, the range is 17 n.m.

[f] The SA-2 has some effectiveness above this altitude.

[g] This low-altitude capability is for sites equipped with the "C" Band radar or modified "S" Band radar. For those sites equipped with the original "S" Band radar, the low-altitude capability is 3,000 feet.

[h] We have no evidence as to the minimum effective altitude capabilities of this system.

[i] The Soviets almost certainly will provide some of these missiles with nuclear warheads, and may have begun to do so.

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