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19 February 1964

ORR POSITION ON SOVIET MANNED LUNAR LANDING PROGRAM

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FOREWORD

The purpose of this ORR position paper is to provide background information for the forthcoming USIB consideration of the need for a Memorandum to Holders of NIE 11-1-62 on the subject of a Soviet manned lunar landing program. In this paper, we have undertaken to present and discuss only that portion of the evidence and those considerations which bear most directly and most importantly on our judgment. The information presented in this paper is current as of 14 February 1964.

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SUMMARY

Current evidence on the Soviet space effort does not permit firm conclusions to be drawn concerning the status of a manned lunar landing program and is not an adequate basis for judging whether it is competitive with the US program, or indeed whether such a program even exists in the USSR. The strongest indication that a very large booster capable of performing this mission is under development and that the Soviets may intend to land a man on the moon in this decade is provided by photography of Tyuratam, where an unprecedented expansion of physical facilities has occurred since the preparation of NIE 11-1-62. Although we have had no high quality coverage of Tyuratam for about five months and only tentative judgments can be made concerning some of the facilities, it seems unlikely that ICBM programs account for all of the new construction. On the basis of the photography now available, we believe there is a distinct possibility that a very large booster capable of the lunar mission will be forthcoming and perhaps an interim space booster as well. The size, location, and extent of construction equipment at a new support facility between Complexes A & E make this area particularly suspect as a new launch complex which might be intended for a lunar mission booster.

Photography of test stands and production facilities has revealed no new installations which can be clearly associated with development of a very large booster. However, we have no assurance that such installations will be required and our evidence is not sufficient to rule out the use of existing facilities for this purpose. The only other body of evidence available, Soviet statements, suggests that the USSR is engaged in a manned lunar landing program, but gives no clear indication of its time phasing or current status.

It is clear that the Soviets have not accomplished many of the missions which would be prerequisite to a manned lunar landing. However, our analysis of a reasonably paced Soviet lunar landing program for 1969 indicates that no identifiable program milestones need necessarily occur before about 1966, other than construction at Tyuratam. Since we have no means of identifying such activity prior to the flight test phase, we believe that the absence of a high level of observable activity up to this time should not be interpreted as a negative indicator of Soviet intent or capability to compete.

We have reviewed again the likely effect of economic considerations upon Soviet intentions. There can be no doubt that a competitive manned

lunar landing program would be extremely costly and that economic considerations would have exercised a strong negative influence when the Soviet leaders were considering their response to the US challenge in 1961. However, we do not believe that these considerations would necessarily have been an overriding factor. The Soviet decision would have depended upon the value the Soviet leaders placed upon such a program as a national policy objective relative to competing uses -- military and civilian -- of the same level of resources.

Accordingly, in the absence of firmer evidence than is now available, we believe it is premature to make a confident judgment regarding Soviet intentions to achieve a manned lunar landing in this decade. If future coverage of Tyuratam indicates that a booster capable of accomplishing this mission is being developed, we should be able to judge with a fair degree of confidence by late 1965 or early 1966 that the Soviets are competing. On the other hand, if photography fails to reveal a very large launch complex underway in the next year or so, it could probably be safely concluded that the USSR would not be capable of accomplishing the lunar objective by 1970.

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I. Evidence on Soviet Intentions to Land a Man on the Moon

At present, three main bodies of evidence are available to us -- photography of launch facilities and new construction at the Tyuratam Missile Test Range (TTMTR), photography of static test stands near engine and vehicle producers, and statements by leading Soviet personalities.

TTMTR Launch Facilities. Since NIE 11-1-62 was prepared in late 1962, an unprecedented expansion of the physical facilities at Tyuratam has been undertaken. Although some of the new facilities were in an early stage of construction at the time of that estimate, the bulk of the new construction was begun during 1963. This expansion includes the construction of three new launch areas (H, G-1/G-2, G-3/G-4), the addition of two major new buildings and a number of lesser structures to one of the original Tyuratam launch facilities (Complex B), and the preparation of a large new construction support facility (between Complexes A and E) which may be intended for another new launch complex.

In the past, the appearance of new launch facilities at Tyuratam has regularly foreshadowed the initiation of new programs, concerning which we had no prior knowledge or evidence. These programs have involved either new vehicles or new deployment configurations for existing vehicles. Detection of such facilities at Tyuratam has not only provided our earliest indications of forthcoming programs but has also enabled us to determine at least their general nature by analyzing the facilities under construction and their apparent relationships to existing facilities. In general, however, we have been unable to specify in detail the characteristics of new vehicles until well after flight testing was initiated [redacted]

At present, we are limited in our ability to interpret the significance of the expansion of facilities at Tyuratam, in part because we have had no high-quality photography for almost five months [redacted] However, we believe some general conclusions can be drawn with a fair degree of confidence on the basis of the physical features of the new facilities when last observed, our knowledge of existing Soviet ICBM and space systems, and our judgment of likely Soviet requirements. These conclusions are:

(a) No currently operational launch complexes at Tyuratam are capable of accommodating launch vehicles of the size required for a manned lunar landing mission except Complexes A and B, which would require modification. It is known from KEYHOLE photography that a second assembly and checkout building was constructed near the original checkout building at Complex B between about mid-1962 and mid-1963. Construction of another large new building in the launch area was begun at the end of 1962 or in early 1963 and appeared completed by August 1963. This building, which was not rail-served when last observed in September, is probably as large as or larger than any comparable building at Tyuratam on a square-footage basis. To date, however, there has been no identified activity associated with Complex B which would account for the construction of these buildings and we have no basis for judging what new program or programs they are intended to serve. There has been no comparable expansion of the facilities at Complex A.

(b) Complex H is probably intended for an ICBM system related to the SS-7, inasmuch as it appears to be supported from the Complex C support area. It may be for the new vehicle tested on two occasions in December and January.

(c) The G-1/G-2 launch area of Complex G is probably intended for a new launch vehicle which is more likely to be an ICBM than a space booster. When last observed in photography, construction of the G-3/G-4 launch area was not far enough advanced to permit a firm judgment as to whether the launchers will be soft or hard, and this area may be simply a different mode or configuration of the G-1/G-2 area. However, if the G-3/G-4 launchers are soft, they are probably intended for a considerably larger vehicle than those at G-1/G-2 because the pad separation distance apparently is planned to be almost twice as great. In fact, past Soviet pad separation criteria suggest a vehicle somewhat larger than the US Saturn I. This would be adequate for a 100-megaton delivery system and a variety of new space missions, but would probably not be sufficient for the manned lunar landing mission. The presence of a single support facility at Complex G suggests that even if the two launch areas are intended for different vehicles they will be closely related.

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(e) It is unlikely that all of the foregoing activity is connected with new ICBM programs. If one or more of these facilities is to be devoted primarily or exclusively to space operations, we believe that Complex B and the anticipated launch complex between A and E are the most likely candidates. Photography provides no basis at this time for excluding the possibility that one or both of these areas is being prepared to develop a very large new booster capable of performing the manned lunar landing mission.

Static Test Stands. Analysis of design thrust capabilities of static test stands in the USSR has failed to provide a basis for judging whether the Soviets are developing a new booster of sufficient thrust for a manned lunar landing program. [redacted] Indeed, it is still not possible to distinguish with certainty between those stands intended for engine tests and those for the entire stage.

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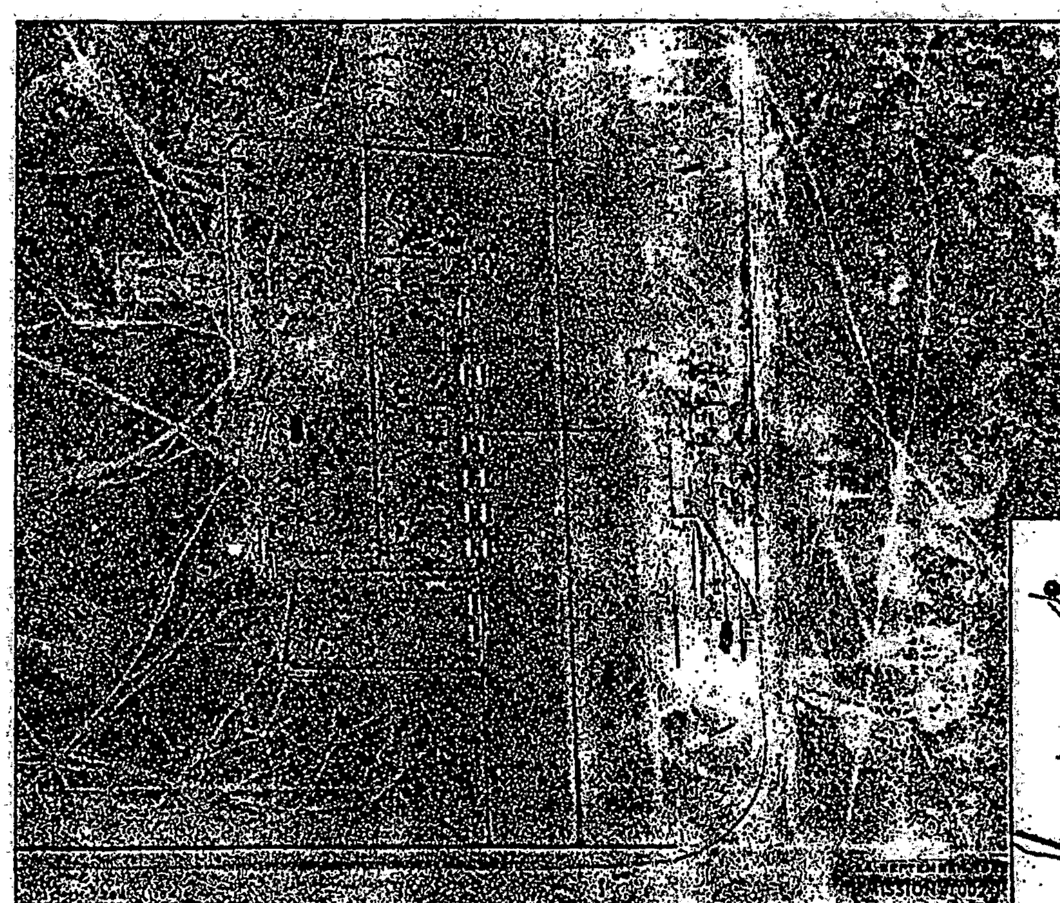
Current estimates of the capabilities of the known static test stands in the USSR range from about 1 to a maximum of about 5 million pounds thrust. In US practice, test stands are normally not used to full design capability, even though there is a safety margin over and above the design rating. Thus, by US standards, the estimated capabilities of even the largest identified Soviet test stands appear somewhat low for testing the entire stage of a booster of about 5 million pounds thrust, although they are more than adequate for testing large single engines in the million pound thrust class. In view of the uncertainties of the data, however, these judgments cannot be regarded as conclusive.

The largest test stand identified to date is at Zagorsk, a location long associated with NII/Plant 88, which is situated on the outskirts

Figure 1



Construction Support Area Between Launch Complexes A and E. Tyuratam Missile Test Range. September 1963

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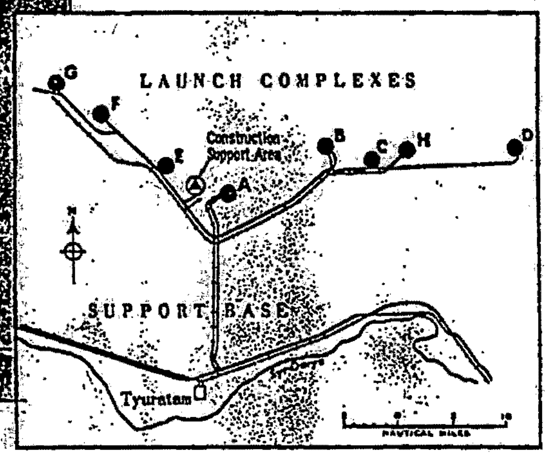

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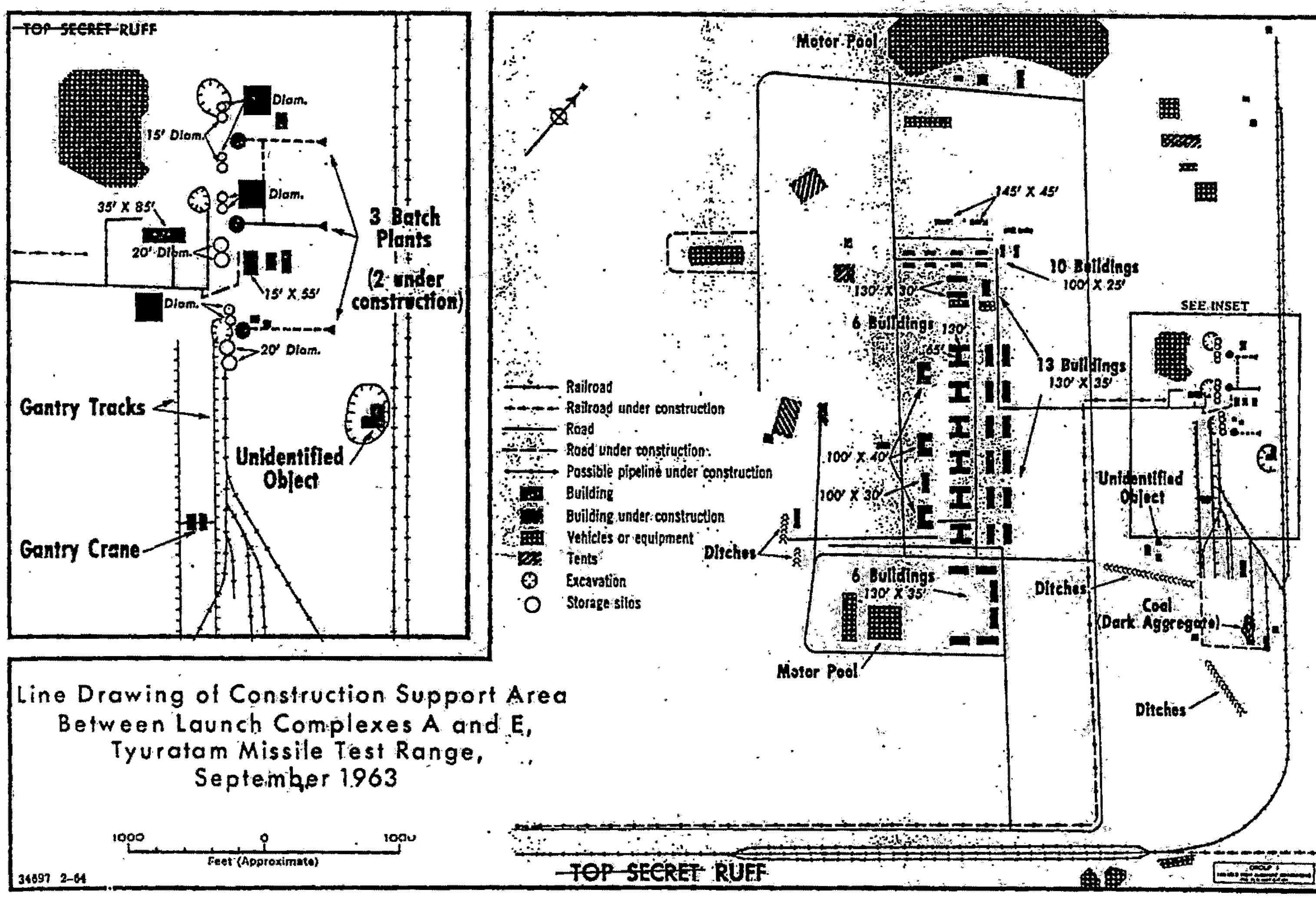
Figure 2



Line Drawing of Construction Support Area Between Launch Complexes A and E, Tyuratam Missile Test Range, September 1963

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[redacted] This stand, which was completed in 1956, probably was used initially to test the Category A ICBM booster [redacted] and later may have been used to test the Category C booster [redacted] we regard these two installations as the most likely to be used in the design, manufacture and testing of the large booster required for a manned lunar landing mission.

Photography of these facilities indicates that no new test stands or other installations have been constructed which, by virtue of their size and the timing of their appearance, might be indicators of the development of a very large new vehicle. However, there has also been no evidence of any major new program at these facilities since [redacted] and it is likely that a considerable portion of both facilities has been available for new programs for some time. Since even major modifications might not be discernible in the poor-quality and infrequent coverage of these facilities to date, we cannot be certain that development of a booster of the size required for the lunar mission is not already underway. Moreover, if the Soviets have chosen to design a booster similar in concept to the Category A space booster, based on a cluster of high-thrust engines with individual tankage rather than very large common tankage as in the Saturn IC, there might be no need for uniquely large production, handling and testing facilities. Such boosters may well be under development at the Plant 88/Zagorsk facilities or at other locations in the USSR, including the Kuybyshev area, where 5 static test stands have become operational at Kuromoch since 1961.

Statements. Soviet statements provide the only direct indication that the USSR has a manned lunar landing program underway. However, they are ambiguous, conflicting, and of little value in determining the present status of the program and whether it is aimed at achieving a manned lunar landing in this decade.

Khrushchev's statements in the latter part of 1963 concerning a manned lunar landing clearly were intended to create the impression that the USSR is not competing with the US in such a venture. However, it is difficult to judge the extent to which his remarks actually reflect current Soviet policy. On the one hand, these statements are consistent with Khrushchev's few private remarks on this subject over the past several years, which have stressed the high cost and technical difficulty of putting a man on the moon.* It is possible that Khrushchev's statements indicate that the Soviets have some undefined or relatively distant target date for whatever lunar landing program is now underway. On the other hand, it seems clear that the Soviets would have little to gain from a public commitment at this juncture to a race with the US, but might benefit substantially from a slowdown in the US Apollo project. It may be, therefore, that Khrushchev's remarks were motivated primarily by a desire to exploit criticism within the US of the scope and pace of the Apollo program. Moreover, the statements are sufficiently ambiguous to admit the possibility that the Soviets might accomplish a manned lunar landing by the end of the decade.

Khrushchev's statements differ markedly in tone from statements made with increasing frequency earlier in 1963 by individuals associated with the Soviet space program. In general, the latter statements implied a Soviet intention to attempt a manned lunar landing within a relatively few years and in several instances had a competitive tone, expressing a desire to accomplish this feat first. Since the Khrushchev statements, however, there has been a notable decline in commentary from other Soviet sources. In the absence of more tangible evidence, we do not believe that Soviet statements assist materially in evaluating Soviet policy regarding a competitive manned lunar landing.

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II. An Illustrative Soviet Manned Lunar Landing Program

Because of Soviet success in concealing sensitive activities, we have been able to identify Soviet space programs only after [redacted] In the past, absence of technical evidence has not provided a reliable basis for denying the existence of specific space programs. The situation with regard to a manned lunar landing program is somewhat different, in that the magnitude of this undertaking would require unique hardware and facilities at the test range and possibly at some other space-related locations in the USSR. Nevertheless, analysis of a reasonably-paced manned lunar landing program indicates that a Soviet program to land a man on the moon by 1970 could be underway at the present time without any major milestones being observable other than the initial phases of construction at Tyuratam.

If KEYHOLE coverage of Tyuratam during the next 18-24 months reveals a launch complex clearly associated with a very large booster, we could probably judge with considerable confidence by late 1965 or early 1966 that the Soviets were engaged in a competitive program. Presumably the Soviets will have accomplished during this period a number of detectable missions which would be applicable to a manned lunar landing, such as additional lunar reconnaissance and rendezvous and docking. These activities would not be conclusive indicators of a competitive program, because they could apply equally to some other objective or combination of objectives. It is our present judgment, however, that the appearance of such a booster during this time period, and the major resource commitment which it would imply, would be more likely to reflect a direct Soviet response to the US lunar challenge of 1961 than pursuit of any alternative space flight objective. On the other hand, if it becomes clear that none of the construction now underway at Tyuratam is intended for a very large booster, and no additional construction is begun in the next year or so which appears to be for this purpose, there would then seem to be little likelihood that the Soviets could accomplish a manned lunar landing by 1970.

By way of illustration, a hypothetical manned lunar landing program is shown in Figure 3.* This program <u>assumes</u> that a decision to proceed with the program was reached by mid-1962 and that the new support area between Complexes A and E is intended to support construction of launch facilities for the manned lunar landing mission. Based on statements by Soviet personalities known to be associated with the

* In general, the timing of specific activities and the relationships between them are in agreement with an early proposal for the Apollo program which was then based on the EOR technique.

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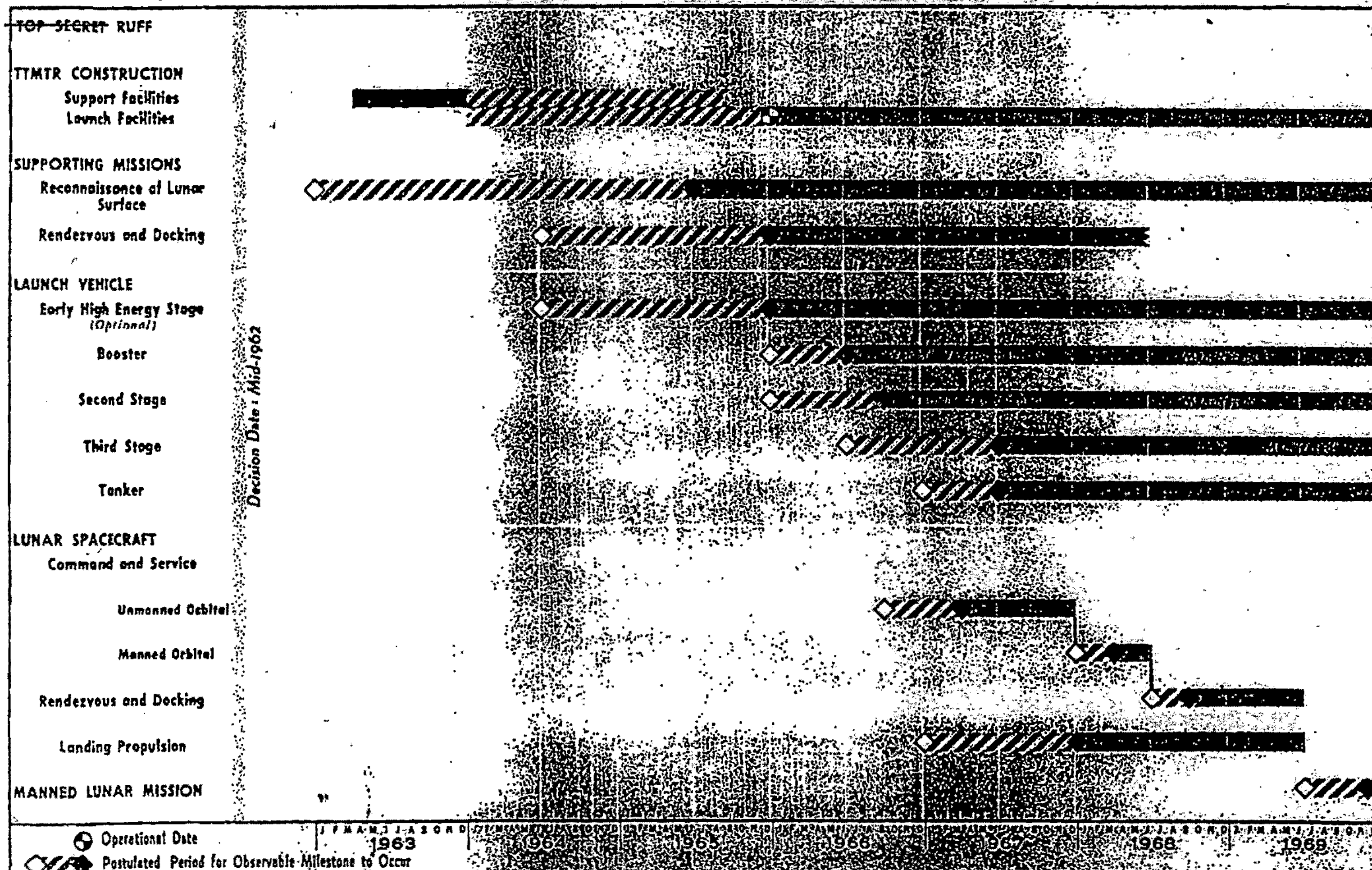
Figure 3

Illustrative Soviet Manned Lunar Landing Program For 1969



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space program, we believe that the Soviets would have adopted an Earth Orbital Rendezvous (EOR) mode.

<u>TTMTR Construction</u>. The estimated two-year construction period for the launch facilities generally is in line with Soviet construction experience observed in the past for large-scale installations at the test range. Launch Complex A required somewhat more than two years to build but did not have the extensive construction support facilities present between Complexes A and E. Launch Complex G, which has a support facility approaching in size that of the new area, has been under construction since shortly before mid-1962. Pads G-1 and G-2 in this Complex have required an estimated 18 months to complete; Pads G-3 and G-4, which began about a year later, were in such an early stage of construction when last seen that we are unable to make a firm estimate of a completion date. Judging by the status of the construction support facilities between A and E when last observed in September 1963, we would expect construction of the operations support area and probably the launch area to have started by now. Presumably, the magnitude and general nature of these facilities would be clearly identifiable some time in 1965, if not before.

In the US Apollo program, by contrast, construction of Pad 39A for the Saturn V began in late 1962 and is not scheduled for completion until about mid-1966 -- a period of about 3.5 years; however, almost an entire year has been spent in earth moving operations peculiar to the launch site at Cape Kennedy. Construction of the vertical assembly building was started in mid-1963 and will require about two years. An industrial area was begun in early 1963 to support the Gemini program and will take about 18 months to complete; this area will be later expanded and used to support the Apollo program.

<u>Supporting Missions</u>. The Soviets have already begun to carry out missions which could support a manned lunar landing program. ~~Reconnaissance of the lunar surface began with three probable attempts at a lunar landing in early 1963. Like the US counterpart, the Ranger program, all Soviet attempts thus far have ended in failure.~~ We have no way of knowing why the Soviets have not repeated their attempts at lunar reconnaissance or when such operations might be resumed. Our knowledge of Soviet space programming is so imperfect that we have no basis for choosing among a number of possible explanations, ranging from a lack of urgency in acquiring the data to a desire on the part of the Soviets for more advanced hardware -- boosters, stages, spacecraft -- than that now available.

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In the illustrative program, the Soviet maneuverable spacecraft would not have to be man-rated before 1966 [redacted] In the Gemini program, which is intended to support the US manned lunar mission, the first launch is scheduled for the second quarter of 1964 with the first manned flight in late 1964 and the first rendezvous operation in the second quarter of 1965.

Development of re-entry technology for the return phase of the lunar mission has not been included in the illustrative program, but several alternative approaches to this problem are open to the Soviets. They may choose to use high angle re-entry utilizing atmospheric braking only (as in the US program), in which case the first observable flight test might occur in 1964. Alternatively, they may adopt a technique involving partial retro-braking prior to re-entry, which would reduce the heat shield performance requirement. Finally, if weight is not a constraint, they may elect to use retro-braking to get into earth orbit and then use proven re-entry techniques.

<u>Launch Vehicle</u>. Development of an early high energy stage [redacted] scheduled, but is not essential to the accomplishment of subsequent milestones in the development of launch vehicle hardware for the lunar mission. If the Soviets choose to use hydrogen fuel in the upper stages of the launch vehicle, they would probably develop a smaller engine as a test bed, although this early engine would not have to be flight tested before the end of 1965. However, the Soviets may not be compelled to use hydrogen fuel to achieve a higher specific impulse; they may elect to use other propellent combinations or fuel additives for this purpose.

About 18 months have been allowed in the illustrative program for test firings of the launch vehicle, from the first firing of the booster to the first manned flight. This compares with about 15 months now scheduled for unmanned launches in the US program. The first and second

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stages of the Soviet vehicles are estimated to be man-rated by 1968, while the third stage is man-rated by 1969, following which the manned lunar landing mission could be attempted.

Lunar Spacecraft. Flight tests of the lunar spacecraft stretch over a period of about 2.5 years prior to mission accomplishment. This compares favorably with the launch schedule for fully instrumented Apollo spacecraft, although five launches of Apollo boilerplate models are programmed during a period from about mid-1964 through mid-1965. [redacted] Nevertheless, in the Category A ICBM, the Soviets probably already have a booster capable of launching boilerplate prototypes.

About a year has been allowed for rendezvous and docking operations using mission hardware before the earliest manned lunar landing attempt is scheduled. In the early Apollo program which utilized the EOR mode, a nine-month period was scheduled for this purpose.

III. Economic Considerations

A manned lunar landing program is very expensive; Khrushchev and others have expressed concern in the past over the high cost of such an undertaking. In considering whether to accept the US challenge in 1961, the Soviet leaders would have had to weigh carefully the benefits from such a program against those to be derived from alternative, competing uses -- both military and civilian -- of the same level of resources. Whatever the Soviet decision, however, it is unlikely to have been based solely on economic considerations. At least equally important would be the Soviet leaders' view of their ability to compete successfully and their assessment of the consequences for Soviet prestige and claims to great power status of default from the race.

Although we have no direct information on the costs of Soviet space programs, the estimated cost (produced-in-the-US) of the illustrative Soviet manned lunar landing program would be on the order of $15 billion to $20 billion through 1969. Peak expenditures on the order of $3 billion to $4 billion a year would probably be required in 1965-66.* Costs of this magnitude probably would have tended to dissuade the Soviet leaders from accepting the US challenge in 1961.

Nevertheless, in the past, the Soviets have been willing to allocate substantial resources to their space program, to which they have attached great importance as a means of projecting an image of military strength and technological superiority. Although they have done much to make their space program as economical as possible through the use of available military hardware and facilities, keeping unique vehicle development to a minimum, and through concentration on a limited number of major space objectives, Soviet accomplishments in space have come high. It is estimated that by the end of 1963, the Soviets had spent the equivalent of at least $3.0 billion and perhaps as much as $4.5 billion for those programs already in the flight test phase.

Additional expenditures for programs now underway, but not yet identified ~~through the detection of flight tests~~, may be on the order of $1.5 billion to $4.0 billion. Primarily, this range reflects our uncertainty concerning the Soviet timetable for a manner lunar landing. Because of leadtime constraints, a Soviet decision to compete would

* These figures exclude all other space programs except those required to support a manned lunar landing, such as lunar reconnaissance and early rendezvous and docking. They also exclude the costs which would be incurred during the latter part of the decade for subsequent lunar programs, such as the establishment of a lunar base.

have had to be made by mid-1962 and already would have entailed a substantial expenditure -- about $3.0 billion. Even if the Soviets decided not to compete, however, they must have made some initial investment in a future effort to land a man on the moon -- probably on the order of $1.0 billion.

Thus, estimated total Soviet space expenditures through the end of 1963 range from $4.5 billion to $8.5 billion. This compares with NASA expenditures for this period of about $7 billion and DOD space expenditures of about $5 billion, a total US space expenditure of $12 billion through the end of 1963.

There are numerous indications that the Soviets are committed to a vigorous space program in the next few years, involving new missions and new space systems, and there seems little doubt that Soviet expenditures for space are destined to grow. The KYMTR and TTMTR Cosmos programs are continuing, [redacted] Moreover, the expansion in the number and size of launch complexes at TTMTR in the past few years has been so great that it cannot be accounted for entirely by new weapon systems programs. Some of the facilities now being built almost certainly are intended to support future space programs.

Even if the Soviets are not committed to a competitive manned lunar landing program, we would expect them to undertake several less costly, less spectacular missions in this decade in order to maintain their position as a great space power and their world image as a technologically advanced nation. There is a wide range of missions which could be accomplished with a more advanced booster, such as that currently estimated to be developed in the next few years as a delivery vehicle for the 100-megaton warhead. These missions probably would include early rendezvous and docking, a small earth-orbiting station, and a manned circumlunar flight. Because the cost of developing the booster would be borne by the military, such a package of programs could be purchased for an estimated expenditure of only $6 billion to $8 billion.

The next class of space missions would require a booster of much greater thrust which would have no immediate military application. The cost of developing this unique booster, therefore, would be attributable solely to the Soviet space program. Other than a manned lunar landing mission, the most likely mission in this decade that might employ such a booster is a large manned scientific satellite, the estimated cost of which ranges from $12 billion to $16 billion. Expenditures of this magnitude, however, verge on those estimated for the illustrative manned lunar landing program ($15 billion to $20 billion). Moreover, a smaller manned space station could be established without the use of a very large and costly booster. Because the Soviets would probably consider that the lunar mission would be of greater value in maintaining their national image of preeminence in space, we believe that Soviet development of a very large booster in the near term, as seems to be implied by the size of the facilities now under construction between Complexes A and E at Tyuratam, would provide a strong indication that the Soviets intend to compete in a manned lunar landing mission.

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Soviet Satellite Defense Against the US Miniature Vehicle Antisatellite Weapon (U)

An Intelligence Assessment

~~Secret~~

SW 83-10062
September 1983

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Soviet Satellite Defense Against the US Miniature Vehicle Antisatellite Weapon (U)

An Intelligence Assessment

Withheld under statutory authority of the Central Intelligence Agency Act of 1949 (50 U.S.C., section 3507)

This assessment was prepared by [redacted] of the Office of Scientific and Weapons Research. Contributions were made by [redacted] of OSWR. Comments and queries are welcome and may be directed to the [redacted]

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SW 83-10062
September 1983

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Soviet Satellite Defense Against the US Miniature Vehicle Antisatellite Weapon (U)

Summary

Information available as of 1 August 1983 was used in this report.

The Soviets will have only a limited capability to defend their satellites against an attack by the air-launched miniature vehicle (ALMV), the US antisatellite (ASAT) weapon system that is scheduled to be deployed in 1987. The ASAT weapon will be capable of attacking low-altitude satellites, including most of the Soviet reconnaissance satellites. Once the Soviets detect an attack, the most likely tactic they would employ to defend their satellites is maneuvering to avoid interception, although onboard propellant supplies and other factors will limit this option. Alternatives to defend the network rather than the individual satellites include replacement of damaged or destroyed satellites and storing spacecraft in orbit (perhaps in orbits beyond the ALMV's range). [redacted]

Our estimates of Soviet technological advances and of Soviet perceptions of the ASAT threat indicate a moderate likelihood that the Soviets will develop additional defensives—decoys, electronic countermeasures, and signature reduction—by the late 1990s. Although these countermeasures would increase the probability of satellite survival, they can only be implemented after major technical problems have been solved. The weight of countermeasure packages added to present satellites probably would require the use of a new launch vehicle, and the Soviets have a suitable launch vehicle under development. Alternatively, the Soviets may choose to incorporate countermeasures in newly designed satellites. Far-term options like shootback or escort satellites will pose even greater problems and may be as expensive as the satellites they are defending. [redacted]

[redacted]

Although we believe that the Soviets may attempt to increase satellite maneuver capabilities by increasing propellant capacities, we see no new spacecraft designs that include this or other modifications for defensive countermeasures. [redacted]

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We believe the Soviets know enough about the ASAT system to develop countermeasures designed to increase the survivability of their satellites. Open-source reports about the ALMV contain data on the probable Soviet target satellites, physical dimensions of the ALMV, main components of the system, initial basing of the F-15s modified for ALMV launch, prime contractors and budget, and even a detailed design drawing of the ALMV. We believe this information would allow the Soviets to model the ASAT system accurately enough to predict attack geometries and to identify threatened satellite targets during an attack. [redacted]

Time will limit any Soviet satellite defense effort. The Soviets must detect US actions and intent, inform the proper authorities, and command the satellite to perform a countermeasure—all within as little as 30 minutes. The United States could therefore design an attack to minimize the amount of time available to command the target spacecraft. The Soviets are developing a satellite data relay system, however, and we believe they will be able to command a few of their spacecraft in real time by the late 1980s.[redacted]

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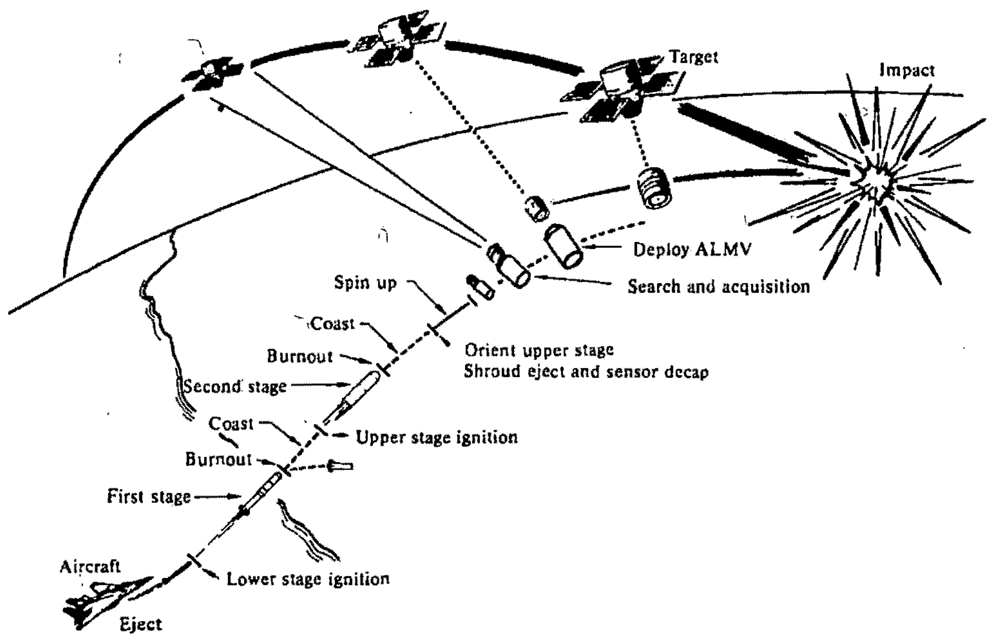
Figure 1
ASAT System Mission Profile



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Soviet Satellite Defense Against the US Miniature Vehicle Antisatellite Weapon (U)

The Air-Launched Miniature Vehicle Program

The US air-launched miniature vehicle (ALMV) is part of a direct-ascent, hit-to-kill antisatellite (ASAT) weapon that is scheduled to be deployed in 1987. The weapon consists of the ALMV payload and a two-stage booster. It is carried to launch point by an F-15 aircraft that has been modified to carry cooling and computer interface support equipment on a pallet in the ammunition bay and the ASAT weapon beneath the fuselage. [redacted]

In a typical intercept plan, the F-15 carries the ASAT weapon to an altitude of about 13 kilometers (km); then it performs a supersonic dash and ejects the ASAT weapon. The first stage is ignited and burns for approximately 37 seconds. The second stage ignites and burns for about 33 seconds. After its burnout, the second stage is oriented toward the area where the target satellite is expected, and the ALMV payload is spun up for stabilization, attitude control, and sensor operation. The ALMV's long-wavelength infrared sensor then searches, detects, and acquires the target satellite. Finally, the ALMV is separated from the second stage, and small, radially oriented, solid-fuel rockets maneuver it toward interception at altitudes as high as 670 km. Relative closing velocities between the ALMV and the target are about 4,000 to 12,000 meters per second (m/s), depending on the attack geometry. Figure 1 is a diagram of a typical ASAT mission. [redacted]

The Mission Operations Center (MOC) at Space Command Headquarters in Colorado Springs will direct all ASAT operations and act as an interface between the National Command Authority and the air-launch control centers (ALCCs) at Langley Air Force Base (AFB) and McChord AFB, where the modified F-15s initially will be based.[1] The MOC will prepare lists of potential targets and intercept data, plan attack engagements, and perform battle management and strike assessment functions. It will receive data from the US Space Detection and Tracking System (SPADATS), a worldwide network of ground-based radars, and the ground-based electro-optical deep space surveillance (GEODSS) system of optical tracking stations. The ALCCs will control the F-15/ASAT operations at the airbases and prepare the intercept data for the F-15/ASAT computers. [redacted]

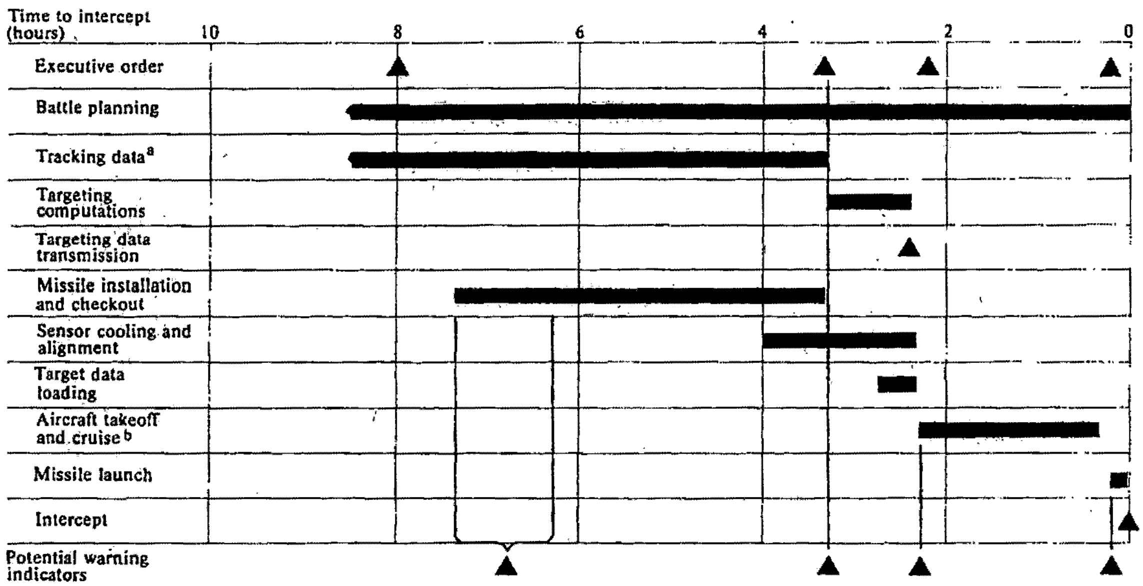
The ASAT mission will begin when the National Command Authority issues the order to attack a Soviet satellite. The system is required to negate any [redacted] and the ASAT force level is designed to satisfy this requirement. In the event of an alert, a number of F-15s will be fitted with an ALMV support pallet. Four hours will be needed to load the missile and to cool the ALMV. During that time the MOC will perform final target selection and intercept data updates, which will be sent to the ALCC for the F-15/ASAT computers. Although not a system requirement, ground sensors in the SPADATS network will probably provide additional tracking data. [redacted]

After takeoff, the pilot will fly to a preset location to launch the ASAT weapon. Flyout times may range from four to 160 minutes, depending on the attack geometry. After release from the F-15, the ALMV will intercept the target satellite in three to 10 minutes. Plans for upgrading the system include adding the capability of the F-15 to receive in-flight

[redacted]

[1] The ASAT system is flexible, and minor modifications (a special weapons handling facility and ground support equipment) could allow basing at remote facilities. [redacted]

Figure 2
ASAT System Operational Timeline



[a] Additional tracking data would not be required if NORAD data are adequate.

[b] Flyout time can range from 4 to 160 minutes. Bar represents maximum time.

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updates from the ALCC and modify the time of release by as much as ±90 seconds, enabling the ALMV to respond to possible defensive maneuvers of the target satellite. A timeline of the ASAT operation is shown in figure 2.[redacted]

Soviet Knowledge of the ASAT System

A large amount of open-source information on the ALMV and its subsystems is available to the Soviets, and they have recently published a detailed description of the ASAT system in one of their military journals. The major source of information is *Aviation Week and Space Technology*, along with technical journals, Congressional and Defense Department reports, and *Jane's Weapons Almanac*. Information about the contractors, ASAT mission, physical dimensions (including detailed design drawings), sensors, basing, and probable Soviet targets is available in these publications. The estimated budget, the intended date for initial operational capability, and the C^3 (command, control, and communications) and tracking support provided by NORAD also have been reported. Proposed plans to update tracking and targeting capabilities of supporting radars have also been published. An example of classified information that has been published in the open press is shown in figure 3. (U)

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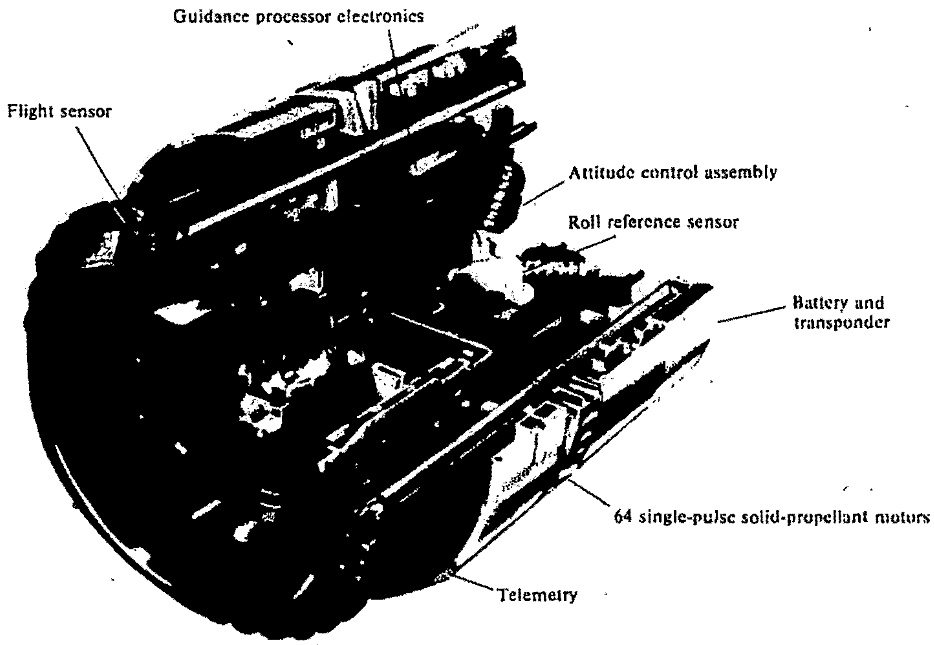
Figure 3
The ALMV: An Example of Classified Material Available in the Open Press



Weight: 17 kg
Length: 34 cm
Diameter: 31 cm

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A US Air Force contractor performed an analysis of the ALMV using only open-source material and was able to estimate the ALMV's maneuver and altitude capabilities, possible attack geometries, the sensor's field of view, and the correctable miss distance of the vehicle. Similar work performed by a Soviet analyst would indicate the effectiveness of potential defensive countermeasures. The Soviets may lack some of the critical design parameters of the ALMV, however, including sensor capabilities. They would therefore have to allow for uncertainties in assessing its capabilities. The Soviets would be able to target their intelligence collection to fill these gaps, however, because they know which contractors are involved in the ALMV program.[3] [redacted]

In addition to this readily available information, the Soviets probably are collecting against the ALMV program. They could receive tipoffs of upcoming tests and relevant flight information. The dates and times

[redacted]

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of early flight tests at Edwards AFB are unclassified. Flight test telemetry is encrypted, but voice communications are not. Information acquired through technical collection indicates that [redacted] We expect that future flight tests, which will be flown over water in the Western Test Range, will be monitored by Soviet intelligence collection ships (AGIs) or merchant ships. These ships have been observed in this area during previous US weapons tests, and they probably have been monitoring these tests. [redacted]

The information collected from these various sources will enable the Soviets to tailor countermeasures to specific system limitations. For example, knowledge of the range of the F-15 and of the booster capabilities, combined with knowledge derived from monitoring flight tests, would help the Soviets deduce altitude and attack geometry limitations of the system. With information on the sensor system, they would know which attack geometries would be precluded by sun- and Earth-angle constraints. Knowledge of attack geometry limitations would help the Soviets identify a set of possible target satellites. However, because they would not know the exact target until the ASAT weapon is released from the F-15, they would have to initiate countermeasures on several possible target satellites—a costly method of defense. [redacted]

Soviet Warning and Countermeasure Command

Defensive countermeasures against an attack on an individual satellite will depend on the Soviets' capability to obtain a warning of the attack and direct the satellite's response. A control center may receive the warning and relay commands to the satellite; or the satellite could be equipped with onboard sensors to detect the attack and could be programed to initiate defensive options. [redacted]

[redacted]

[redacted] This would occur between six and 10 hours before the planned intercept to allow enough time for cooling the ALMV.

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- Additional target tracking might be detected by Soviet ELINT satellites, but this would be unlikely. ELINT 3 satellites do not transmit data to a ground station in real time, and [redacted]
- Takeoff of an F-15 with the ASAT weapon attached to its fuselage could be detected by a covert observer near the airbase. This could be for a simulated attack or a training mission, however, so aircraft takeoff is not a reliable indicator of an intended ALMV attack. (The only reliable method of attack detection would be a warning system on board the target, as discussed below.) The F-15 and missile operations also could be observed from a platform (aircraft or ship), but this alternative is unlikely because of platform complexity and distance from home waters, as well as US security measures. [redacted]

Estimates from a contractor's analysis indicate that, once the data about an imminent ALMV attack are received in Moscow, it would take approximately 30 minutes to process the information and generate a command to initiate a countermeasure. Despite their extensive knowledge of the ALMV system and its target list, the Soviets probably would not be able to narrow the target set to less than five satellites before the ALMV is released. Only when the ASAT weapon had been released from the F-15 would they know precisely which satellite was targeted. [redacted]

Once a warning has been received and the decision to implement a countermeasure has been made, the new programing data must be sent to the satellites. Although the Soviets cannot command their low-altitude

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Definition of Probability Terms

Term	*Percent*
Very low	*1-10*
Low	*10-40*
Moderate	*40-60*
High	*60-90*
Very high	*90-100*

(U)

satellites in real time, they are developing a geosynchronous satellite data relay network. Soviet filings with the International Telecommunications Union indicate that this network will be operational in 1985. Most current Soviet satellites were designed in the 1960s and probably are not equipped to use the data relay system, however.[4] Soviet reconnaissance systems probably will have to be modified or replaced with new designs. Past Soviet development trends indicate that modifications and follow-ons will be operational in the late 1980s. [redacted]

[redacted]

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[4] Without this data relay network, a Soviet command center could relay new programing data to a satellite only when it was within line of sight [redacted] The Soviets could offset this disadvantage by preprograming countermeasures to occur when the satellite was within the attack radius of the ALMV. Although this would be wasteful of resources, the Soviets could guarantee at least a marginal improvement in survivability. [redacted]

Possible Countermeasures

The Soviets have at least nine possible future options for defense against the ALMV. Tables 1 and 2 summarize our assessment of the probability of development for each countermeasure and for each satellite system. (s)

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Maneuvering

The only Soviet method of direct defense against an ALMV attack is maneuvering. [redacted] the Soviet low-altitude satellites likely to be targeted are maneuverable, except for the ELINT 3. [redacted] This countermeasure will have greater chances of success when the satellite data relay system is operational. [redacted]

Present Soviet EORSAT, RORSAT, and HiRES 2 photoreconnaissance satellites were designed in the 1960s and carry enough propellant to perform only operational or mission-related maneuvers. Defensive maneuvers would shorten their lifetimes [redacted] because they would have to maneuver each time they passed an ASAT base— [redacted] A satellite's maneuver capability (ΔV) is the change in velocity that can be added to its initial orbital velocity and is approximately proportional to the onboard propellant supply. The following tabulation shows ΔV requirements, measured in meters per second (m/s), for operational and defensive maneuvering:

[redacted]

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Table 1
Defense Options for Soviet Satellites Against the ASAT System [a]

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Option	Likelihood of Availability at Time of ALMV Deployment	Likelihood of Availability by Late 1990s
Current Capabilities		
Maneuver	Demonstrated capability [b]	Increased capability
Replacement		
Additional launches	Demonstrated capability—some satellites can be launched in four to five hours	Increased capability
Orbiting spares	[redacted]	
Attack on F-15/Airbase	Possible but improbable at stages of conflict below strategic war	Possible but improbable at stages of conflict below strategic war
Future Capabilities		
Decoys	Low—would require major redesign of present spacecraft	Moderate on satellites that cannot maneuver; low on satellites that can maneuver [b]
Electronic countermeasures	Low—difficult to implement [redacted]	Moderate
Signature reduction	Very low—would require major redesign of present spacecraft	Moderate
Higher altitudes	Low—would degrade mission quality	Low
Shootback		
Low-powered lasers	Very low—technologically constrained	Low
Missiles	Very low—technologically constrained	Low
Escort satellites	Very low—technologically constrained	Very low

[a] These options reflect possible responses to a crisis, theater conflict, or a strategic war. We do not believe that the Soviets would have any reason, other than systems testing, to implement these measures during peacetime.
[b] Soviet EORSAT, RORSAT, Salyut, and photoreconnaissance satellites can maneuver, but ELINT 3 satellites cannot.
[redacted]

This table is ~~Secret~~ [redacted]

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The maneuver capabilities of Soviet satellites could be increased by using larger space launch boosters, higher energy propellants, lighter subsystems, or increased satellite propellant capacities. [redacted] The SL-Y space launch vehicle, which will probably be deployed within a year, will carry approximately 15,000 kilograms to low altitude; [redacted]

The Soviets may also design new satellites to carry more propellant. We expect the next generation of RORSATs and EORSATs to be deployed by 1990, and they might have increased maneuver capabilities. [redacted]

The Soviets most likely would design satellite maneuvers to degrade the US capability to track and target the satellite. This can be done largely by effective timing. After a Soviet maneuver, it would take 20 to 60 minutes for the ALMV computer to receive and process maneuver information. Depending on the

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Table 2
Defense Options for Individual Satellite Systems [a]

Satellite	Maneuvering	Decoys	Rapid Launch of Replacements	Orbiting Spares	Signature Reduction	Shootback	Lasers
EORSAT	Limited present capability	Low probability	Present capability	Present capability	Moderate probability	Very low probability	Very low probability
RORSAT	Limited present capability	Low probability	Present capability	High probability. Technically possible but not yet demonstrated	Very low probability. Active sensor is difficult to mask	Very low probability	Very low probability
ELINT	Very low probability	Moderate probability	Present capability	Present capability	Moderate probability	Very low probability	Very low probability
Photoreconnaissance	Limited present capability	Low probability	Low probability	High probability. Technically possible but not yet demonstrated	Moderate probability	Very low probability	Very low probability
Salyut	Present capability	Moderate probability	Very low probability	Very low probability	Very low probability. Difficult to mask such a large spacecraft	Very low probability	Very low probability

[a] All entries indicating probability refer to possible development in the next 10 to 15 years.

This table is [redacted].

mission profile, time limitations might force US mission planners to abort the attack. The Soviets could minimize the amount of time the United States would have to react to the change by maneuvering the satellite just after it passes the detection window of the last radar or GEODSS optical tracking station before the intercept point, thus precluding update of the targeting data. This maneuver would be initiated 45 to 90 minutes before entering the ALMV intercept window. [redacted]

Although an endgame maneuver (one attempted after the ALMV has acquired its target) is theoretically possible, it would not be successful. Because of the ALMV's large ΔV (335 m/s) and capability to divert along its intercept path, it can easily intercept the satellite once it acquires the target despite any endgame maneuver. [redacted]

Although Soviet knowledge of the ALMV system probably is not complete enough to calculate the exact magnitude of maneuver necessary to avoid an ASAT attack, we believe the Soviets will most likely use this countermeasure to defend their maneuverable satellites because it would be easier to deploy than other options. [redacted]

Replacement Satellites

[redacted] that the Soviets intend to increase their space assets before and during a conflict. This option could involve launching replacement satellites and maintaining spares in orbit. [redacted] Although replacement

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would be very expensive, the ability to replace damaged or destroyed satellites provides an alternative to redesigning their spacecraft for other countermeasures. [redacted]

Additional Launches. Additional satellites can be launched to augment all Soviet networks, but [redacted] only EORSAT, RORSAT, and ELINT 3 could be launched quickly (within four to five hours) in a crisis. [redacted]

RORSATs and EORSATs are launched by the SL-11 booster from Tyuratam. [redacted]

If the Soviets launched only EORSATs and RORSATs and used both launch pads at Tyuratam, they theoretically could launch four satellites in six to eight hours and seven satellites in 20 to 28 hours. However, this optimum schedule would be delayed by the following constraints:

- Spacing satellites in the proper plane.
- Offsetting launches by two hours to avoid having boosters on both pads at once.
- Delays in pad refurbishment with an increase in launches. [redacted]

The ELINT 3 also could be launched rapidly. [redacted]

Orbiting Spares. [redacted]

The Soviets may decide to store some satellites in high orbits beyond the range of the ALMV. The Soviets probably know the maximum altitude of the ALMV based on open-source information about booster and F-15 capabilities. Spares could be positioned beyond this range and brought down to operational altitudes to augment or replace space assets as needed. We believe there is a moderate likelihood that the Soviets would use orbiting spares to enhance the survivability of their reconnaissance network [redacted]

Attack on F-15 or Airbase

Although attacking the F-15 with interceptor aircraft is a theoretical option, the aircraft operates so close to the United States when launching the ASAT weapon that such an attack would only be likely in war. Furthermore, the high performance characteristics of the F-15 make it extremely difficult to intercept. The Soviets would have to know precisely when the F-15 was to take off on an ASAT mission and where it would launch the ASAT weapon. Interceptors could be deployed from Cuban or Central American staging bases or from ships, but this approach is very unlikely because of logistic problems. Attacking the F-15 bases with SLBMs is somewhat more likely because of the ease of targeting the SLBMs and the softness of the bases. Special operational forces also could be used, but this is a much less likely alternative because of logistic problems. [redacted]

Decoys

The Soviets could develop decoys to confuse the ALMV's infrared sensor and processing systems. To imitate the target satellite, decoys would need to radiate infrared on the order of 100 to 500 watts per steradian. A satellite might also eject flares to confuse the ALMV. We believe there is a low likelihood that the Soviets would use decoys with existing nonmaneuverable high-value satellites (ELINT 2 and 3) because of the weight penalty associated with their use. There is a moderate chance that a follow-on ELINT satellite will be designed to eject decoys. We do not expect the follow-on ELINT system to be maneuverable, so a decoy countermeasure option is the next most likely alternative if the Soviets perceive the need to protect it from ALMV. [redacted]

We believe that the Soviets are more likely to use expendable than nonexpendable decoys [redacted] it is logical to assume that the Soviets would test infrared decoys before they were deployed on an operational satellite. [redacted]

A decoy countermeasure would have to account for uncertainties in Soviet knowledge of the ALMV and its processing capabilities. The Soviets would have to speculate on how much distance would be required between the decoys and the parent vehicle to deceive the ALMV and also on the separation velocity. If the decoys were too close to the target vehicle, the ALMV would aim for the infrared centroid, which might include the spacecraft. If the decoys were too far from the satellite, they might fall outside the ALMV's field of view. [redacted]

The Soviets might choose to eject decoys whenever the satellite entered the attack windows of the ASAT weapon. This would be the most costly decoy ejection scheme, and the supply of decoys would be quickly depleted. Objects also could be ejected upon tactical warning of an attack. If the Soviets could observe the activities at the ASAT bases and relay the information quickly, they might be able to command their satellites to eject decoys. This method is more risky than the automatic ejection method, but it is less demanding of decoy resources. [redacted]

The Soviets might also decide to deploy nonexpendable decoys on permanent booms suspended from the main body of the satellite. When warned of an attack or when passing over the ASAT weapon attack window, the satellite could activate bright infrared sources. This countermeasure would expand the infrared signature seen by the ALMV and thereby reduce the probability of a direct hit. [redacted]

If the satellites had sensors on board, decoys could be ejected upon tactical warning. [redacted] To ensure a certain level of survivability, the Soviets would have to eject a number of decoys at various speeds and intensity levels, and the supply of expendable decoys would quickly be exhausted [redacted]

Electronic Countermeasures

[redacted]

Signature Reduction

[redacted] The Soviets have investigated properties of various radar-absorbing materials since 1950, and our analysis of their open-source reports indicates that they can reduce a

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signal [redacted] The Soviets have reported in open sources their experiments with several methods of reducing radar cross sections, including ferrite paints, composite materials, and aerosols. At present, all these techniques are difficult to implement and their general effectiveness as methods of radar signature reduction is suspect. The Soviets might try to reduce radar cross sections when designing future satellites. [redacted]

Another possible countermeasure is to reduce the infrared signature, [redacted] If the Soviets could significantly reduce the infrared intensity of their satellites by using different materials in constructing their satellites, the acquisition capabilities of the ALMV would be impaired because the sensor on the ALMV is preset to the estimated signature of the target satellite. However, masking the infrared signature of the RORSAT's nuclear reactor would be difficult. [redacted]

Shootback
The most effective way to counter the ASAT weapon would be to destroy it in flight with either a laser or a missile. This shootback capability would significantly increase the probability of satellite survival, but neither of these shootback weapons is a near-term option because of major technological limitations. [redacted]

Lasers. The various technical problems associated with a laser system (including acquisition, pointing, and tracking; laser flux levels; and beam quality) would be difficult to overcome. System weight and power consumption could also preclude the use of this countermeasure. We believe the total technological and financial constraints of this countermeasure would prohibit deployment earlier than the late 1990s. [redacted]

Two types of lasers might be used—low-powered lasers designed to damage the ALMV's long-wavelength infrared sensor and high-powered lasers to destroy the ASAT weapon. The most effective use of a laser in satellite defense would be a low-powered laser used to cause in-band sensor damage. Such a system could be designed to scan space at low power until the attacker's sensor was detected. Then an intense beam could be directed back at the sensor to damage the sensor optics of the attacker. Because the Soviets know that the ALMV utilizes a long-wavelength infrared detector, the most likely candidate for a defensive laser would be a CO_2-type, which operates in that region. High-powered lasers could be deployed either on board other satellites or as self-contained satellites. Because of the additional problem of power consumption, we believe that a high-powered laser system would probably not be deployed before the deployment of a low-powered laser. [redacted]

Missiles. The Soviets might develop a satellite that could shoot back at the ALMV using missiles. If the Soviets were to attempt a shootback defense, they would be constrained by the strength of the signal received by acquisition and targeting radars or by the capabilities of an infrared detector. Because designing a missile with a fast-reaction capability also would require a major technological breakthrough, we do not believe that they could employ this defense before 1995. [redacted]

Escort Satellites
The Soviets might design escort satellites to defend one or more high-value satellites with lasers or with nuclear or nonnuclear missiles. Defense of low-altitude satellites would be difficult because of insufficient time for warning, acquisition and tracking, and engagement of the ASAT weapon. Because the Soviets do not possess the necessary technology, we believe they could not employ defensive escort satellites until the late 1990s. [redacted]

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ISCAP APPEAL NO. 2012-151, document no. 3
DECLASSIFICATION DATE: September 6, 2019

Key Conclusions About Present and Future Soviet Space Missions (U)

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	REL...	This information has been authorized for release to...
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Key Conclusions About Present and Future Soviet Space Missions (U)

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This paper was prepared by [redacted] Office of Scientific and Weapons Research, with major contributions from [redacted], OSWR. It was coordinated with the National Intelligence Council. (U)

Comments and queries are welcome and may be directed to the Chief, [redacted] OSWR, on [redacted] (U)

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Key Conclusions About Present and Future Soviet Space Missions (U)

Introduction

Information available as of 25 May 1983 was used in this report.

This report provides current conclusions about existing and projected Soviet missions in space and is largely a compilation of key judgments extracted from CIA publications. More detailed information will be presented in NIE 11-1-83. (U)

Mission	Present	Future
Manned spacecraft program	Salyut Progress Soyuz-T	Military space station Reusable space plane [a] Reusable space transportation system Modular space complex Large space station [a] Space base [a] Future manned expeditions [a] New resupply vehicle [a]
ASAT systems	Interceptors: Operational orbital interceptor Direct-ascent Galosh ABM (nuclear warhead) Directed-energy systems: Ground-based lasers at Complex D, Saryshagan Interference techniques: Electronic warfare 25X1, E.O.13526	Interceptors: Developmental orbital interceptor High-altitude orbital interceptor [b] Direct-ascent Galosh ABM (nonnuclear warhead) Use of Soviet ballistic missile systems and launch vehicles [b] [redacted] Directed-energy systems: Ground-based lasers at Saryshagan R&D Complex Space-based lasers [a] Radiofrequency weapons [a] Particle beams [b] Interference techniques: Spacemines [b]
Communications satellites	Molniya-1 Network Molniya-3 Network Stationar Network Volna Network Luch Network [redacted] Radio satellites	Satellite data relay system (SDRS) Potok [redacted] Gals Luch P
Photoreconnaissance satellite	High-resolution system Medium-resolution system Earth resource system Photo/geophysical system	New photo/geophysical satellite system Electro-optical system
Ocean reconnaissance satellites	Radar ocean reconnaissance satellite (RORSAT) ELINT ocean reconnaissance satellite (EORSAT)	Advanced RORSAT [b]
Electronic intelligence (ELINT) satellites	ELINT 2 ELINT 3	High-altitude ELINT system [b]
Radar support satellites (RADSAT)	RADSAT-2s RADSAT-3s Cosmos 1146–type satellite	No new systems projected
Naval support satellites (NAVSAT)	NAVSAT-2 NAVSAT-3	Glonass Network
Launch-detection satellites (LDS)	LDS for detection of US ICBMs	SLBM launch detection [a] Aircraft detection [b]
Scientific satellites and probes	Meteor Meteor-Priroda Interplanetary Suborbital scientific programs Intercosmos Prognoz Oceanographic Ultraviolet astronomical telescope (UFT)	Many possible future missions

[a] Some evidence of program.
[b] No program identified.

[redacted]

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Key Conclusions About Present and Future Soviet Space Missions (U)

Manned Spacecraft Program

Mission

A major thrust of the Soviet manned space program appears to be the establishment of a continuous manned presence on orbiting space stations.[1] The manned missions are used for scientific and military research and reconnaissance. The program has also included non-Soviet crews, which improves the Soviet international image. [redacted]

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Present

Salyut
- Manned space station for performing a wide variety of military and civil functions.
- About one-third the size of the US Skylab.
- Expected lifetime of greater than four years.
- Can be linked to other segments to form a larger station. [redacted]

Progress
- Unmanned, automated resupply vehicle used to resupply Salyut space stations with expendables and equipment.
- Can deliver 2,300 kilograms of payload into a near-Earth orbit.
- Destroyed in atmosphere at end of mission. [redacted]

Soyuz-T
- New improved ferry vehicle for transporting cosmonauts/materials to space stations.
- Can carry three cosmonauts versus two for older Soyuz.
- Deorbited and recovered after approximately 100 days of use. [redacted]

Future

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Military Space Station
- First manned flight possible in 1983.
- Unmanned test flights in 1977 (Cosmos 929) and 1981 (Cosmos 1267); [redacted]
- Manned flight (Cosmos 1443) in summer 1983 while docked with Salyut-7.
- About 70 percent the size of Salyut. [redacted]

[1] For a more detailed discussion, see DDI Intelligence Assessment SW 82-10082C (Top Secret [redacted] November 1982, *Soviet Capabilities and Intentions for Permanently Manned Space Stations*. See also DDI Intelligence Assessment SW 82-10019 (Secret [redacted] March 1982, *The Soviet Space Program: A Forecast of Major Developments*. (U)

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~~Secret~~

Reusable Space Plane
- Orbital test to the Indian Ocean in June 1982 and March 1983 of what may have been a scale model.
- If under development, first full-scale flight possibly in 1983.
- Small, compared to size of US shuttle.
- Possibly for reconnaissance or will serve as a ferry vehicle.
- Probable capacity for two to four cosmonauts and/or limited amount of cargo. [redacted]

Reusable Space Transportation System
- Similar in size and configuration to the US shuttle.
- Earliest expected flight in 1986.
- Captive flight test appeared to have begun in early 1983.
- Orbital tests of model mentioned above may be part of technology tests for shuttle program. [redacted]

Modular Space Complex (Up to 12 Cosmonauts)
- Two unmanned modules docked in 1981 in a test of forming a modular complex.
- Three or four modules will be docked to a central core (possibly Salyut-8) possibly in 1984.
- Habitable volume comparable with that of US Skylab. [redacted]

Large Space Station (Up to 20 Cosmonauts)
- Habitable volume about the same as that of US Skylab.
- Launch in late 1980s.
- Could perform a variety of civil and military experiments. [redacted]

Space Base (Up to 100 Cosmonauts)
- Possibly in 1990s.
- Formed by docking multiple, large space stations. [redacted]

Manned Expeditions
- Possible manned lunar mission in early 1990s.
- Some possibility of manned fly-by mission to Mars in mid-to-late 1990s. [redacted]

New Resupply Vehicle
- To be used with modular complex about 1985.
- Based on Cosmos 929/1267-type vehicle.
- Will replace Progress and possibly its payload capability. [redacted]

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Antisatellite (ASAT) Systems

Mission

The Soviets are developing several ways to destroy, cripple, or neutralize US satellite systems. The ASAT capabilities discussed are divided into three categories: interceptors, directed-energy systems, and interference techniques.[2] [redacted]

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Present

Interceptors
Operational Orbital Interceptor
— Operational since 1971.
— Uses radar for target acquisition and homing.
— Can attack satellites at altitudes up to 8,700 kilometers (km).
— Uses pellet warhead.
— Direct-Ascent Galosh ABM (Nuclear Warhead)
— Possible ASAT role.
— Capable of attacking satellites at altitudes up to 1,000 km.
— Disadvantage is that it may also damage Soviet satellites. [redacted]

Directed-Energy Systems
Ground-Based Lasers at Complex D at Saryshagan
— Complex externally complete in 1975.
— Lasers at Complex D possibly capable of damaging satellites at altitudes up to 500 km.
[redacted]

Interference Techniques[3]
Electronic Warfare
— Soviets assessed to have limited operational electronic warfare (EW) capability.
— [redacted] Soviets have doctrine for use of EW before nuclear war.
— Many sites assessed to have EW capability.
[redacted]

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Future

Interceptors
Developmental Orbital Interceptor
— Five flight tests conducted; all failed.
[redacted]

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[3] Ground site interference—communications and satellite ground stations could be sabotaged, attacked, and/or covertly interfered with, especially in the theater. (U)

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[redacted]

— Possibly operational as early as 1984. [redacted]

High-Altitude Orbital Interceptor

[redacted]

— We believe the Soviets probably will not develop and test such a system. [redacted]

Direct-Ascent Galosh ABM (Nonnuclear Warhead)

— If developed could attack satellites at altitudes up to 500 km from sites near Moscow or Saryshagan. (S)

Use of Soviet Ballistic Missile Systems and Launch Vehicles

— Could be used as direct-ascent interceptors, but unlikely. [redacted]

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[redacted]

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Directed-Energy Systems

Ground-Based Lasers at Saryshagan R&D Complex

[redacted]

— Lasers may function in an ASAT role.

[redacted]

— Laser probably a pulsed iodine [redacted]

Space-Based Lasers

— We believe the Soviets have a project to develop a space-based laser weapon.

— If the Soviets decide to develop a space-based laser weapon, tests in space of a megawatt-class prototype could not occur until the late 1980s at the earliest, more likely 1990s.

— Earliest application of such a weapon probably would be for ASAT.

— A space-based laser weapon for use against ballistic missiles, if feasible, not likely before the year 2000. [redacted]

Radiofrequency Weapons

— Most of the relevant technologies currently exist.

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[redacted] Soviet interest in ASAT applications.

— Soviet radiofrequency weapons study project was established to investigate feasibility of destroying targets in space by means of microwaves beamed from the ground. [redacted]

Particle Beams

— Soviet project to develop technology for space-based particle-beam weapons probably still in R&D.

— If practical and if the Soviets decide to develop a space-based particle-beam weapon, we would not expect tests in space of a prototype weapon before the 1990s.

— Feasibility of ground-based particle-beam weapons for ASAT very questionable.

— R&D of many relevant technologies may be under way. [redacted]

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Interference Techniques

Spacemines

— Potential ASAT weapon, probably at geosynchronous orbit.

— No evidence of Soviet capability for or development of such a system. [redacted]

Communications Satellites

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Mission

Soviet communications satellites relay military, intelligence, and civil communications.[4] The Soviets will continue to increase the availability of military communications satellites through the use of highly mobile ground terminals. As future communication networks become operational, the Soviets will become increasingly dependent on satellite systems for global military command, control, and communications. [redacted]

Present

Molniya-1 Network
- Full network consists of eight satellites in semisynchronous orbit.
- Two transponders on board each satellite—one primary and one backup.
- Used for military communications. [redacted]

Molniya-3 Network
- Full network consists of four satellites in semisynchronous orbit.
- Uses three transponders.
- Used for military and civil communications. [redacted]

Stationar Network
- Network application filed with International Frequency Registration Board/International Telecommunications Union (IFRB/ITU);[5] network to consist of satellites in 17 geostationary positions.
- Two to three years behind stated deployment schedule.
- Consists of the following satellites:
  - Ekran satellites, which provide daily civil TV service from Moscow to the Soviet Northern and Far East regions.
  - Gorizont satellites, which provide relay of civil communications for the USSR and Intersputnik subscribers; one satellite services Washington/Moscow hotline; also contains Volna and Luch transponders.
  - Raduga satellites, which provide relay of military and civil communications. [redacted]

Volna Network
- Network application filed with IFRB/ITU; network to consist of satellites in eight geostationary positions.
- Two years behind schedule; initial deployment scheduled for 1980.
- First satellite in Volna network launched in March 1982.
- Provides relay of civil aircraft and ship communications. [redacted]

[redacted]

[5] Network applications filed with IFRB/ITU secure satellite position and frequency for 20 years. (U)

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Luch Network
— Network application filed with IFRB/ITU; network to consist of satellites in four geostationary positions.
— Scheduled date for initial deployment was 1981.
— First satellite in Luch network was launched in March 1982, one year behind schedule.
— Provides relay of civil communications. [redacted]

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[redacted]

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Radio Satellites
— 10 satellites launched to date.
— For relay of communications from ham radio operators. (U)

Future

Satellite Data Relay System (SDRS)
— Network application filed with IFRB/ITU in July 1981.
— First launch scheduled for December 1983; delay estimated until 1985.
— Three satellites in geostationary orbit.
— Relay between satellites in near-Earth orbit and ground sites in USSR.
— Possible use for data relay from real-time, electro-optical photoreconnaissance and/or communications with manned space stations when network is deployed. [redacted]

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Potok
— Network application filed with IFRB/ITU in July 1981.
— About one year behind schedule; first launch expected in 1983.
— Relay of ground-to-ground digital data. [redacted]

[redacted]

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Gals

— Network application filed with IFRB/ITU in January 1978.
— Scheduled for operation in 1979; first launch expected about 1985.
— Six-satellite network in geostationary orbit.
— Will serve military communication needs.
— Will be a part of multiple-communication payload spacecraft.[redacted]

Luch P

— Network application filed with IFRB/ITU in January 1978.
— Scheduled date for initial deployment was 1981.
— First launch expected about 1985.
— Four satellites in geostationary orbit.
— For military communication use.
— Probably will be a part of multiple-communication payload spacecraft.[redacted]

Photoreconnaissance Satellites

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Mission

These satellites take high-resolution photography of known high-interest military and civil targets worldwide and conduct small-area search with lower resolution photography of additional high-interest activities.[5] [redacted]

Present

High-Resolution System
- 0.3- to 0.6-meter estimated resolution with small-area coverage (15-km swath).
- Deorbits two buckets during nominal 30- or 45-day mission with remaining payload deorbited at mission's end.
- About 10 satellites launched annually. [redacted]

Medium-Resolution System
- 1.5- to 3.0-meter estimated resolution used for selected area search (70-km swath) when used at high altitude (about 410 km).
- 14-day nominal mission.
- 1.0- to 1.5-meter estimated resolution used to augment high-resolution systems and perform limited search (50-km swath) when used at low altitude (about 230 km).
- About 20 satellites launched annually. [redacted]

Earth Resource System
- Multispectral, low-resolution system; about 8- to 13-meter estimated resolution.
- 13-day nominal mission.
- Broad-area coverage.
- Used extensively to monitor Soviet grain harvest.
- About six satellites launched annually during growing season (April to October). [redacted]

Photo/Geophysical System
- Provides mapping, geodesy, and geophysical studies data.
- Low-resolution system; about 8- to 13-meter estimated resolution.
- Broad-area coverage.
- Two satellites launched annually, each with mission life of about 13 days. [redacted]

[5] For a more detailed discussion, see DDI Intelligence Assessment SW 82-10083JX [redacted], November 1982, *Soviet Unmanned Photoreconnaissance Satellite Systems.* (U)

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Future

New Photo/Geophysical Satellite System
— Experimental system flown in [redacted]
— Probably operational in 1983. [redacted]

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Electro-Optical System
— Near-real-time system.
— Extended lifetime, possibly greater than one year.

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[redacted]
— Cosmos 1426, launched in December 1982, appears to have been test version. [redacted]

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Ocean Reconnaissance Satellites

Mission

Ocean reconnaissance satellites provide real-time targeting data to Soviet combatants carrying antiship weapons and provide selected surveillance of NATO ships.[1] [redacted]

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Present

Radar Ocean Reconnaissance Satellite (RORSAT)
- Active radar system powered by a nuclear reactor.
- High-altitude storage system for spent nuclear reactors; two failures to date.
- High probability of detecting aircraft carrier–sized ships in fair weather.
- Detection of destroyer-sized ships highly probable but only under the best of conditions (illuminated length-on in calm seas).
- Cannot detect any ships in high seas or in rain.

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[redacted]
- Real-time capability for Soviet naval combatants carrying antiship missiles.
- Two- to four-month mission duration. [redacted]

ELINT Ocean Reconnaissance Satellite (EORSAT)
- Collects against US and NATO naval radars [redacted]
- Average probability of detection about 40 percent.

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[redacted]
- Real-time capability for Soviet naval combatants carrying antiship missiles. [redacted]

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Future

Advanced RORSAT
- No program yet defined.
- If developed, earliest flight in late 1980s.
- Could have higher probability of detection with improved signal-to-noise discrimination and have increased field of view.
- May use satellite data relay system to provide data to Moscow in real time for battle management. [redacted]

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[1] For a more detailed discussion, see Joint NISC-NFAC Handbook NIC-1430H-001-80-SAO [redacted] January 1980, *Soviet ELINT Satellite Systems Handbook.* (U)

Electronic Intelligence Satellites

Mission

These Soviet satellites intercept radar signals and sample electronic environment, with some capable of geolocating emitters. [redacted]

Present

ELINT 2
— Worldwide coverage (74°N to 74°S).
— No real-time capability.
— No capability to locate emitters.

[redacted]
— May be phased out in 1983 (only one satellite active). [redacted]

ELINT 3
— Location accuracy of 8 to 220 km.
— Worldwide coverage (81°N to 81°S).
— No real-time capabilities.
— Five to six satellites in network.

[redacted]

Future

High-Altitude ELINT System
— No program yet defined.
— If developed, earliest flight possibly in early 1990s.
— Could have increased frequency coverage:

[redacted]

Radar Support Satellites

Mission

The satellites are used to calibrate ABM radars, perform command system checkout, and perform other R&D activities. [redacted]

Present

RADSAT-2s
— Used to calibrate Soviet ABM radars.
— Can be used to calibrate other Soviet radars with a space tracking capability. [redacted]

RADSAT-3s
— Four types of RADSAT-3s with some common functions but with different subsystems.

[redacted]

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Cosmos 1146–type Satellite

[redacted]

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— Possibly used as radar power calibration targets.

[redacted]

— Probable fourth-generation radar support satellite (RADSAT-4). [redacted]

Future

No new systems projected. [redacted]

[redacted]

Naval Support Satellites

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Mission

Soviet naval support satellites allow users to determine their positions.[9] [redacted]

Present

Second-Generation Naval Support Satellite (NAVSAT 2) Network
— Consists of six satellites in near-Earth orbit.

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[redacted]

Third-Generation Naval Support Satellite (NAVSAT 3) Network
— Consists of four satellites in near-Earth orbit.
— Soviets publicly stated satellites are for civil use, [redacted]

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— Broadcasts only VHF/UHF signals with same accuracy as NAVSAT 2. [redacted]

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Future

Glonass Network
— Network application filed with IFRB/ITU in February 1982; network to consist of nine satellites in 12-hour, 20,000-km orbits.
— Application states satellites will be for civil aircraft and ship use but could also serve a wide variety of military platforms/weapon systems.
— First set of three developmental satellites launched in October 1982 by a single space launch vehicle.
— Accuracy of locating positions unknown.
— System will be similar to US NAVSTAR (GPS) system. [redacted]

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[redacted]

Launch-Detection Satellites

Mission

The Soviet launch-detection satellites provide early warning of US ICBM attack.[10] [redacted]

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Present

Launch-Detection System
- Full network consists of nine satellites in semisynchronous orbit.
- Provides continuous and some redundant real-time coverage of US ICBM fields.
- Provides no coverage of ocean areas for SLBM detection.
- Provides about 30 minutes warning and may be able to provide limited attack assessment information.
- Modified versions of current sensors being flown; changes evolutionary in nature and intended to improve satellite sensitivity. [redacted]

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Future

SLBM Launch Detection
- Probable development of a new system to provide coverage of the greatly expanded patrol areas for US SLBM-carrying submarines.
- Satellite warning of such launches to precede current ground-based warning systems by up to 15 minutes.
- System may also provide coverage of land-based ballistic missiles launched from Europe or the People's Republic of China.
- First test flight possible in mid-to-late 1980s. [redacted]

Aircraft Detection
- System for detection and identification of large, cruise missile–carrying aircraft.
- Could use passive or active sensors.

[redacted]

- Active system would be a radar system.
- Deployment probably not before 1995. [redacted]

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[redacted]

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Scientific Satellites and Probes

Mission

The Soviets currently have only a few satellites dedicated to scientific or research missions. In most of these missions, the resulting data are shared with other countries. The Soviets use these missions to enhance their international image, gain access to Western technology, and gather scientific data. [redacted]

Present

Meteor
- Provides meteorological data for civil weather forecasting, meteorological and atmospheric studies, and military support.
- Supplies real-time day and night cloud cover data only to users whose antennas are in view of the satellite. [redacted]

Meteor-Priroda
- Experimental earth resources remote-sensing system.
- Resolution of some tested sensors comparable to that of the US LANDSAT-4. (U)

Interplanetary
- Soviet interest presently confined to Venus.
- Nine successful Venus landings.
- Recent missions carried experiments for other countries. (U)

Suborbital Scientific Programs
- Used in upper atmospheric, solar, and geophysical studies. (U)

Intercosmos
- Cooperative ventures with other countries.
- Carries remote-sensing, oceanographic, atmospheric, and geophysical payloads. (U)

Prognoz
- Highly elliptical four-day orbit.
- Studies sun-earth interactions. (U)

Oceanographic
- Two successful missions out of three attempts.
- Carried sensors for monitoring sea states. [redacted]

Ultraviolet Astronomical Telescope (UFT)
- Joint Soviet-French venture.
- Launched in March 1983. (U)

Future

— Operational geosynchronous meteorological satellite about 1984.
— Joint Soviet-French venture in launch of two spacecraft in 1984 to study Venus and Halley's Comet—by far the most sophisticated payloads going to Halley.
— Continued Intercosmos activity.
— Continued suborbital geophysical and solar studies.
— New Intershock series will replace Prognoz for solar physics/magnetospheric studies, possibly in 1983.
— Launch of Franco-Soviet Gamma-1 gamma-ray observatory in 1984.
— Launch of cooperative Interball two-satellite system for magnetospheric and ionospheric studies in 1986 to 1987.
— Possible 1980s launch of a lunar polar orbiter to aid in possible missions to far side of the moon.
— Possible sample-return mission to the far side of the moon. [redacted]

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