Director of Central Intelligence

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The Soviet Space Program

National Intelligence Estimate
Volume I—Key Judgments and Summary

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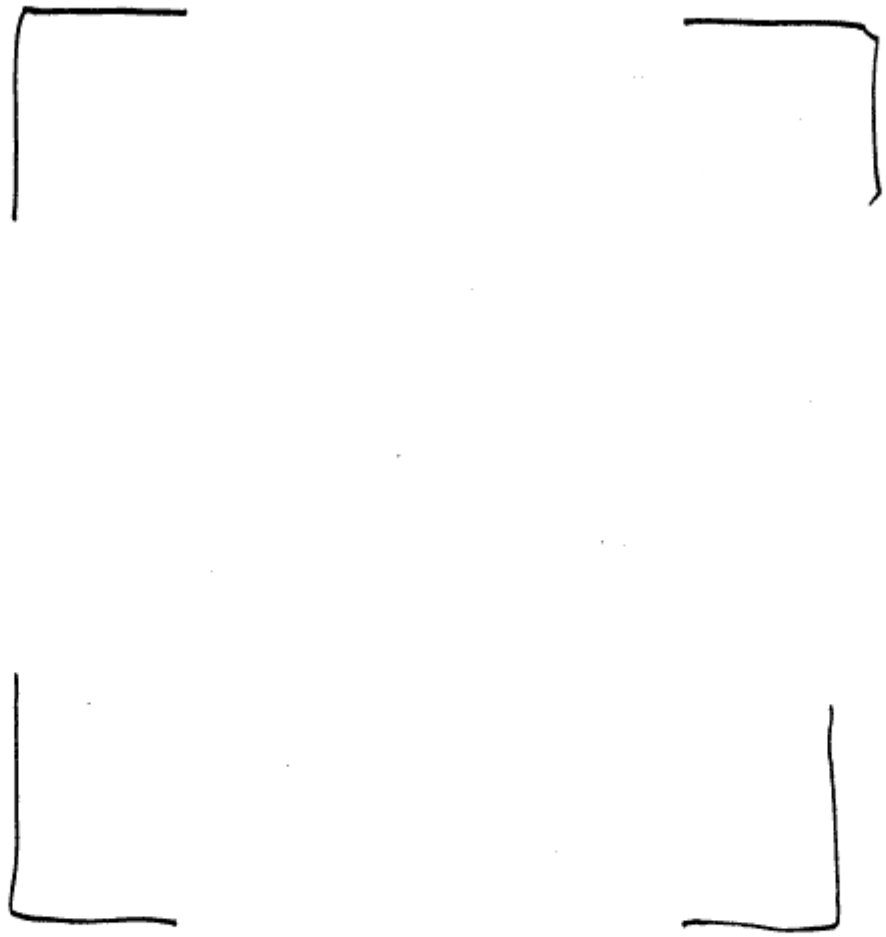

NIE 11-1-83

THE SOVIET SPACE PROGRAM

VOLUME I—KEY JUDGMENTS AND SUMMARY

Information available as of 19 July 1983 was used in the preparation of this Estimate.

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THIS ESTIMATE IS ISSUED BY THE DIRECTOR OF CENTRAL INTELLIGENCE.

THE NATIONAL FOREIGN INTELLIGENCE BOARD CONCURS, EXCEPT AS NOTED IN THE TEXT.

The following intelligence organizations participated in the preparation of the Estimate:

The Central Intelligence Agency, the Defense Intelligence Agency, the National Security Agency, and the intelligence organization of the Department of State.

Also Participating:

The Assistant Chief of Staff for Intelligence, Department of the Army

The Director of Naval Intelligence, Department of the Navy

The Assistant Chief of Staff, Intelligence, Department of the Air Force

The Director of Intelligence, Headquarters, Marine Corps

CONTENTS

SCOPE NOTE

This Estimate describes current Soviet space capabilities, identifies elements of the space program in various stages of development, and estimates how these will affect future Soviet capabilities in space through the 1980s and into the 1990s in the absence of space-related arms control agreements. Volume I presents the Key Judgments and a summary of how expected Soviet space developments will affect political, military, and economic competition as well as Soviet prestige. Volume II provides a more detailed discussion of the missions and capabilities of the Soviet space program.

For purposes of this Estimate, we have judged the likelihood of various Soviet space developments as ranging from very low to very high. These judgments, stated in terms of probability of occurrence, would be:

Very low = less than 10 percent

Low = 10 to 40 percent

Moderate = 40 to 60 percent

High = 60 to 90 percent

Very high = more than 90 percent.

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KEY JUDGMENTS

We believe the principal goals of the Soviet space program are to:

— Provide global support to Soviet military forces.

— Enhance the worldwide influence and prestige of the Soviet Union.

— Deny enemies the use of space in wartime.

— Contribute to the Soviet economy.

Military activities account for more than 70 percent of the current Soviet space program in terms of annual launches and the estimated total cost of the program. Moreover, from the Soviet military perspective, space is viewed as an extension of theaters of operations rather than as a separate arena of conflict.

The current Soviet space program includes about 110 active satellites that provide communications, intelligence, targeting, warning, navigation, mapping, weather, research, and other functions. In addition, research and reconnaissance are conducted from a manned space complex. Current Soviet antisatellite (ASAT) capabilities are limited and fall short of meeting the apparent requirement to be able to deny enemy use of space in time of war. The USSR has an operational ASAT orbital interceptor, ground-based test lasers with probable ASAT capabilities, and the technological capability to conduct electronic warfare (EW) against space systems.

Although their current space program lacks some of the capabilities found in the technologically sophisticated US space program, the Soviets' space systems adequately satisfy most of their current requirements. The space program, moreover, has several unique features, including ocean reconnaissance satellites for naval targeting, orbital interceptors for the destruction of satellites in low orbit, and long-duration manned space missions that have increasingly emphasized military research and applications.

The Soviet space program is expensive—the dollar cost equivalent is more than $20 billion. Currently this amounts to more than 1.5

percent of the Soviet gross national product (GNP). Part of this high cost is due to the high launch rates—about 100 per year—necessary for the Soviets to maintain their systems in orbit. Average lifetimes of Soviet satellites are quite short, and many have experienced reliability problems. Moreover, Soviet satellites are concentrated primarily in low-altitude orbits that generally require more frequent replenishment.

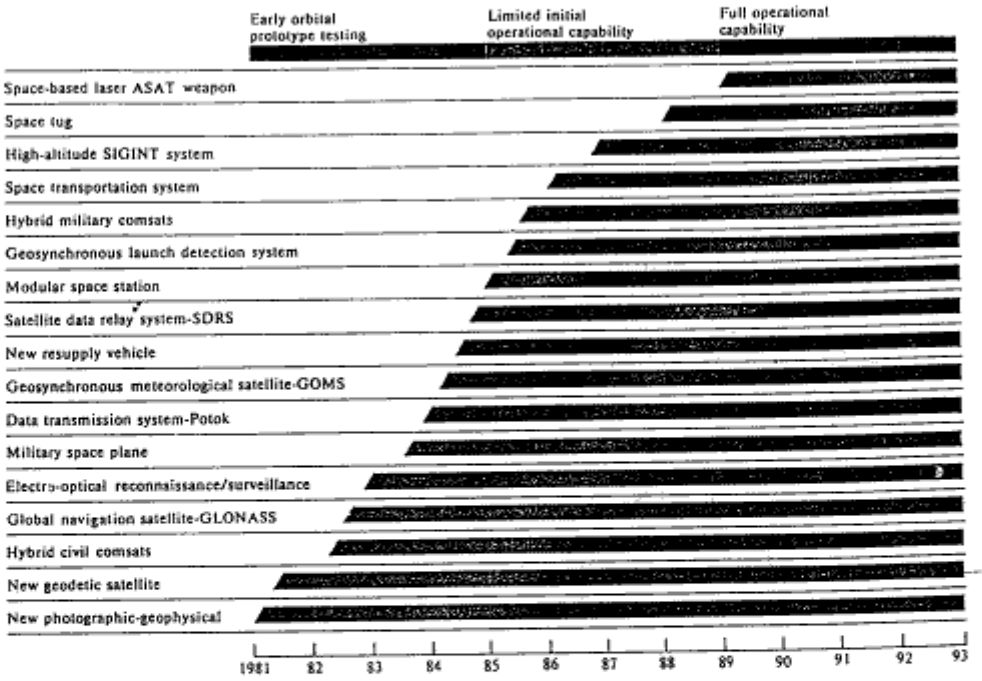
Soviet space expenditures will continue at high levels during the next 10 years, and the rate of growth in military space investment will continue to outpace the rate of growth of the Soviet economy and overall military spending:

- Seventeen new Soviet space systems that have been identified in various stages of development are likely to undergo testing in the next 10 years. (See figure 1.) Most of them are expected to be deployed by the early 1990s. This will result mainly in improvements to current capabilities.
- Major new capabilities in the next 10 years will result from the successful introduction of a reusable space transportation system, a space tug, a military space plane, and a heavy-lift launch vehicle. Any delay in development of the heavy-lift launch vehicle will seriously affect several other Soviet space systems.
- The reliability of Soviet space systems also will improve, but some reliability problems will remain because of poor product engineering, limitations in technology, and inadequate quality control. Newer satellites should achieve an average lifetime of three years, nearly doubling the average lifetime of older systems.

The most significant result of the increased effort in space will be the extension of the Soviet military reach by providing global support to military operations:

- Command and control communications will be available on a global basis, providing an expanding number of military users with continuous, secure, and reliable communications.
- Intelligence collection, targeting, global navigation, and weather data will be more accurate and timely.
- As satellite data relay systems become available, intelligence and target information will be increasingly available to tactical commanders.

Figure 1
Major New Soviet Space Systems in Development



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For the rest of this century, Soviet space-related weapon systems will probably be limited to ASAT roles:

— We do not expect significant improvements in the capabilities of the nonnuclear orbital ASAT interceptors. We do not anticipate the development of a high-altitude conventional orbital ASAT capability.

— Potentially, the most serious threat to US space systems is active EW, especially against high-altitude satellites. An additional view holds that, if a Soviet active EW capability against satellites does exist, brute force jamming would be the most likely EW technique. On the basis of available evidence, it is

difficult to judge with any confidence that a Soviet technological capability would include more complex forms of jamming.[1]

— Although potentially capable, we believe that Soviet intercontinental ballistic missiles and direct-ascent antiballistic missiles (ABMs) are unlikely to be used in ASAT roles. Nevertheless, unprotected satellites will remain vulnerable to the long-range and persistent effects of nuclear detonations in space.

— We believe there is a high probability that a prototype high-energy laser ASAT weapon will be tested in low orbit by the early 1990s. A high-altitude version may be tested by the end of the century. A space-based laser of the 1-megawatt class could be tested in the late 1980s at the earliest, but prototype testing is more likely to occur in the early 1990s. If testing proves successful, an initial operational low-altitude system consisting of a few satellite weapons, having an ASAT range of hundreds of kilometers, could be available by the mid-1990s. The psychological impact of the first test of a space-based laser in a weapon-related mode would be greater than the actual military significance of such a weapon in its initial applications.

Space-based weapons for ballistic missile defense (BMD) will require greater technological advances than those needed for an ASAT mission. Thus, the Soviets are unlikely to have a prototype space-based laser BMD system until at least the mid-1990s or an operational system until after the year 2000.

In a transition to war, we believe the Soviets would expand the deployment of naval targeting and photoreconnaissance systems to reach full operational potential. Short of direct US-Soviet conflict, it seems unlikely that the Soviet leadership would risk physical destruction of US satellites, whereas it could perceive nondestructive interference as a somewhat less risky option. Should war occur, the use of active electronic warfare against space systems would probably be the initial ASAT activity. We do not believe that any ASAT activity would be undertaken merely for warning or demonstration purposes. The likelihood of their launching orbital ASAT interceptors against selected US satellites probably would be high during a NATO–Warsaw Pact conflict. In such a conflict, the Soviets may perceive an operational advantage if both sides experience significant satellite losses. In addition, the USSR's quick-launch capabilities provide an advantage over the United States in restoring satellite capabilities, assuming its launchpads remain intact.

[1] *The holder of this view is the Director, National Security Agency.*

In a nuclear war, Soviet space systems would have key vulnerabilities. Their launch and control sites are not hardened, and their satellites probably have limited protection. In the future, key satellite systems could be replaced either by using reserves stored in orbit or by launching satellites from mobile facilities. However, the development of smaller communications and photoreconnaissance satellites would be required for use with a mobile launch capability.

Manned space activities are receiving increased emphasis in the Soviet space program:

— By 1986 manned space activities, which are predominantly military in nature, will account for more than one-fourth of Soviet space expenditures.

— The Soviet leadership has announced the national objective of establishing a continuously manned space station, which we believe will be achieved by about 1986.

— Beyond research and development, the military purposes of manned space stations remain unclear, but reconnaissance, to include ocean surveillance, is likely to be the main military mission. In addition, a military space plane is under development. The space plane mission also is unclear, but is likely to include reconnaissance.

Increased Soviet space activities will offer potential economic benefits:

— The USSR will be able to offer a variety of space services at competitive prices. These services, particularly telecommunications and space launches, could provide sources of hard currency earnings.

— Manufacturing and materials processing in space is another area of potential economic benefit to the USSR. Soviet experiments are sufficiently advanced to begin production in space within the next few years. The Soviet space shuttle will enable regular harvesting of products manufactured in space.

Increased Soviet space activities will also enhance Soviet prestige:

— A visible, highly publicized, continuously manned Soviet space station will receive frequent worldwide attention.

— A manned Mars mission or the establishment of a manned lunar base could be undertaken in the mid-to-late 1990s. If actually undertaken and successful, such activities would demonstrate Soviet scientific and technical prowess.

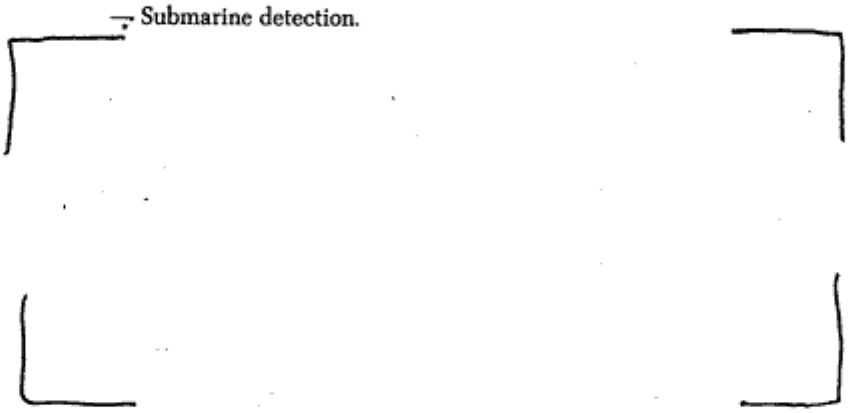
— Unmanned lunar and planetary exploration, such as the coming Venus–Halley's Comet mission, will enhance the USSR's desired image as a peaceful and technologically advanced nation.

Our ability to anticipate developments in the Soviet space program is becoming increasingly difficult[

]Therefore, unanticipated developments will be increasingly possible. Our perception of the Soviet space threat would increase significantly if breakthroughs occur in:

— Space-related weapons.

— Submarine detection.



SUMMARY

Soviet Use of Space

1. The Soviet space program meets a variety of requirements, but the broad objective is to increase worldwide political influence by enhancing military capabilities, prestige, and economic development. The Soviets gauge this objective mainly in the context of East-West competition, and they focus this competition in the military arena. Military activities account for more than 70 percent of the current Soviet space program in terms of annual launches and the estimated total cost of the program. (See figure 2.)

2. From the Soviet military perspective, space is viewed as an extension of theaters of operations rather than as a separate arena of conflict. In time of war, satellites would be subject to military action as would the forces they support. Therefore, according to Soviet military writers, space systems are to be maintained at the same stage of combat readiness as the forces they support. In addition, there are provisions for sustaining military operations by having capabilities to replace key space systems either from reserves stored near ground launch facilities or from inactive satellites stored in orbit. However, should general war occur, ground-support elements of Soviet space systems are vulnerable. Neither launch nor control facilities are hardened against nuclear attack, and there are no indications of mobile launch facilities. Although there is no evidence, a mobile emergency launch capability for small communications satellites could be available, possibly as early as the late 1980s, using solid-propellant intercontinental ballistic missiles (ICBMs) that will be deployed beginning in the mid-1980s. A similar capability with near-real-time photoreconnaissance satellites could be achieved by the early 1990s. We also believe that within the next few years the Soviets will deploy a mobile command capability for unmanned military space systems using ships or ground-based mobile terminals.

3. Current Soviet antisatellite (ASAT) capabilities are limited and fall short of meeting the apparent requirement to be able to deny enemy use of space in time of war. The ASAT orbital interceptor is capable of destroying satellites in low orbit. We believe the USSR currently has the technological capability to attempt to interfere with foreign satellite systems, using active electronic warfare (EW) techniques.[1] In addition, direct-ascent antiballistic missile (ABM) interceptors and ground-based test lasers have potential ASAT capabilities. Also, Soviet space boosters or ICBMs with nuclear warheads could be modified for ASAT purposes; however, we believe the likelihood of such modifications to be low.

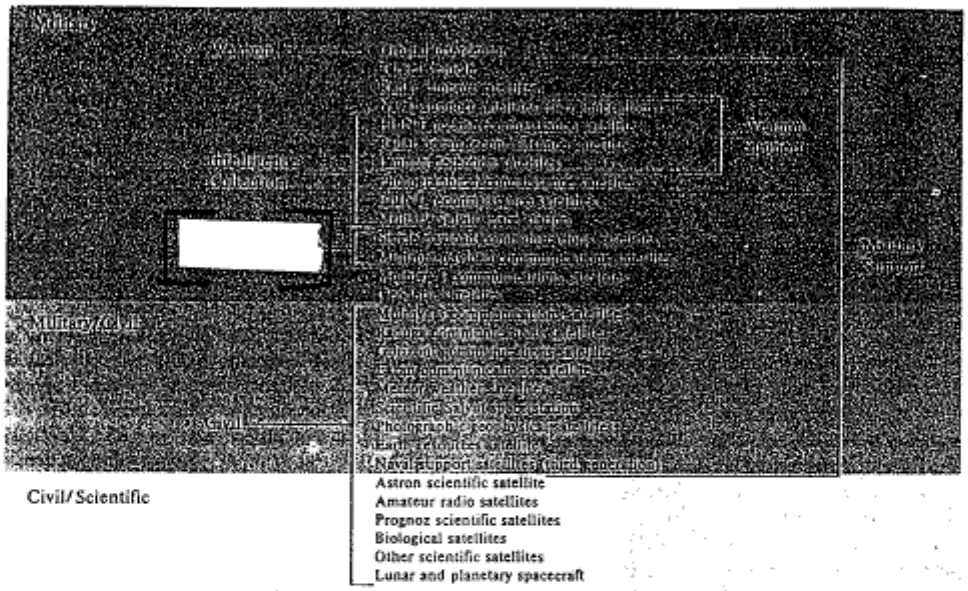
4. Short of direct US-Soviet conflict, it seems unlikely the Soviet leadership would risk physical destruction of US satellites, whereas they could perceive nondestructive interference as a somewhat less risky option. We do not believe that any ASAT activities would be undertaken merely for warning or demonstration purposes. We believe there is a high likelihood that, during a NATO–Warsaw Pact conventional conflict, the Soviets would attempt to interfere with selected US space systems that provide important support, using both nondestructive and destructive means. In such a conflict Soviet leaders may perceive an operational advantage if both sides experience significant satellite losses because of greater US dependence on space systems. In addition, Soviet satellites can be more quickly replaced if space launch facilities remain intact. The decision to launch ASAT interceptors against satellites during the early part of a conventional NATO–Warsaw Pact conflict would be affected by Soviet uncertainties with regard to US responses, including the likelihood of attacks against existing Soviet space launch sites. If a general war were under way in which the massive use of nuclear weapons appeared imminent, the likelihood of attempted interference with all US space systems is very high, using all available means.

Priority and Growth of Space Program

5. Soviet space expenditures will continue at high levels during the next 10 years, and the rate of growth

[1] *See paragraph 21 for an alternative view expressed by the Director, National Security Agency.*

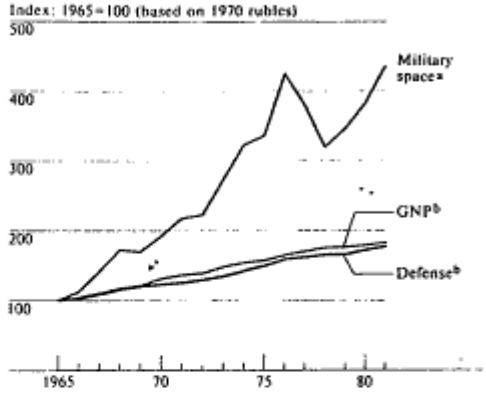
Figure 2
Soviet Spacecraft Categories



in military space investment will continue to outpace the rate of growth of the Soviet economy and Soviet military spending. (See figure 3.) The dollar cost equivalent of the Soviet space program in 1983 is about $20 billion, as compared with about $13 billion for US Government space expenditures plus several billion dollars in additional US commercial investments in space. (See figure 4 on page 12.) The European Space Agency (ESA), France, and Japan have developed modest space programs, but they are not competitive on a scale with the USSR; each program amounts to less than $1 billion annually. Estimated total Soviet space costs have doubled from $10 billion in 1978 to the projected $20 billion in 1983 for an average annual increase of 15 percent, a result of the large number of programs in development. (See table 1.) Much of the large jump in Soviet space expenditures noted between 1980 and 1983 reflects costly manned space activities, including the shuttle orbiter, heavy-lift launch vehicle, and space stations. By 1986 manned space activities, which are predominantly military, will account for one-fourth of Soviet investments in space. After 1983, growth in space expenditures is expected to be less rapid, perhaps averaging about 6 percent a year through 1986.

6. The expanding Soviet space program has been supported by steady growth in design bureaus, production facilities, launch complexes, control sites, cosmo-

Figure 3
Relative Rates of Growth: Soviet GNP, Military Spending, and Military Space



[a] This category only includes ruble costs for space that we identify exclusively as military hardware. If civilian space procurement was included, the relative growth rate for space hardware would be lower than shown here.

[b] Soviet GNP was approximately 300 million rubles (1970 prices) in 1965. About 13 to 14 percent of that was devoted to defense; in turn, 1 to 2 percent of defense was allocated to military space hardware in 1965. By 1981 the share going to military space hardware had risen to 3 to 4 percent of defense spending.

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naut training facilities, and the fleet of space support ships. This impressive infrastructure supports about 100 launches per year and controls about 110 active satellites in orbit at any time. By contrast, the United States maintains about the same number of active satellites while conducting only about 20 launches per year. The difference lies in the much shorter average operational life of Soviet satellites and in Soviet dependence primarily on networks of low-altitude satellites, resulting in the need to maintain these networks with a high launch rate. Product engineering appears to be a basic problem with Soviet spacecraft. Better quality control in production and improved reliability in electronic components should extend the operational life of most Soviet satellites. By the late 1980s, newer satellites should have lifetimes averaging 36 months, about double the current average. Even with missions of longer duration, we expect the launch rate

Table 1
Major New Soviet Space Systems Likely To Be Tested in the 1980s

Systems	Estimated Date of Prototype Testing	Degree of Confidence [a]
Military and Civil		
Antisatellite		
Space-based laser ASAT (megawatt class, low orbit)	1988-93	Moderate
Intelligence collection		
Electro-optical reconnaissance/surveillance	1983-85	High
High-altitude SIGINT	1986-89	Low
Photographic-geophysical, second generation	1981-83	High
Communications		
Potok data transmission	1983-85	High
Satellite data relay system	1984-86	High
Hybrid military comsats (Statsionar, Gals, Luch-P, Volna)	1985-87	High
Hybrid civil comsats (Luch, Volna, Statsionar)	1982-84	High
Military support		
Geosynchronous meteorological satellite (GOMS)	1983-85	High
Global navigation system (GLONASS)	1983-85	High
Geosynchronous launch detection system	1984-86	Moderate
Geodetic, second generation	1981-83	High
Manned systems		
Modular space station	1984-86	High
Military space plane	1983-85	Moderate
Space transportation system	1986-88	High
Space tug	1988-91	Moderate
New resupply vehicle	1983-86	High
Lunar and Planetary [b]		
Lunar polar orbiter	1990-92	High
Lunar far side soil sample	1991-93	High
Mars soil sample return	1986-90	High
Jupiter probe	1989-92	Moderate
Venus radar mapping	1983	High
Venus–Halley's Comet flyby (VEGA)	1984	High

[a] Our information on specific systems varies considerably. This estimate of confidence indicates the relative levels of our understanding of the various developments, not the likelihood of testing, as in table 3.

[b] For these developments, date is that of mission, not a prototype test.

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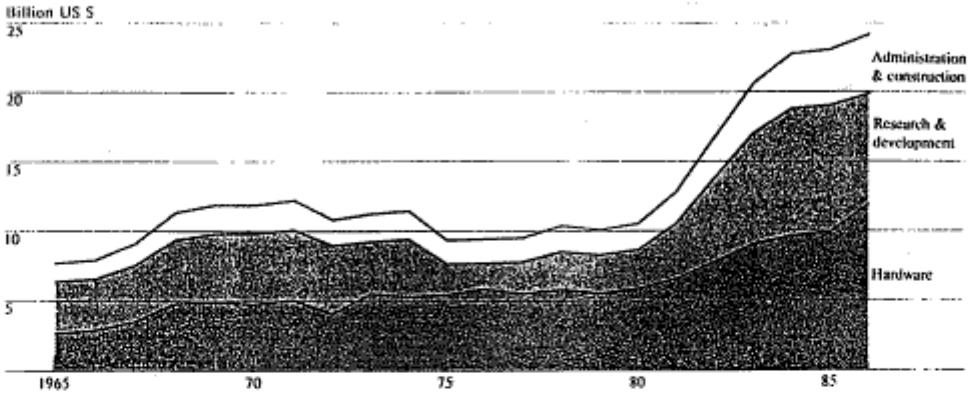
Figure 4
Dollar Costs of the Soviet Space Program*



* These dollar estimates represent what it would cost to replicate Soviet development and procurement of space systems in the United States and then launch and operate the systems as the Soviets would. We have more confidence in our estimates of hardware cost than our estimates for research, development, administration, and other support costs. Data are in constant 1981 US dollars. Because our cost estimates cover only those existing or planned programs for which we have evidence, they may underestimate overall program costs.

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to be sustained at nearly the same level for the next several years as new space systems are introduced. A series of new space launch vehicles will account for an increasing number of these launches.

7. If Soviet investment in space continues as expected, 17 new military and civil space systems which have been identified in various stages of development are likely to undergo testing in the next 10 years. Most of these are expected to be deployed by the early 1990s. (See table 1.) This nearly doubles the rate at which new systems were introduced in the 1970s. In addition to these new space systems, six lunar and planetary projects have been identified and probably will be pursued. The 1980s will be more like the 1960s, when several new systems were introduced. In contrast, the 1970s were characterized by the introduction of improvements and the establishment of fully operational networks of satellites.

8. By US standards, the Soviet space program is relatively unsophisticated and expensive—costing the equivalent of 1 percent of the Soviet gross national product (GNP) during the past 10 years and more than 1.5 percent today. However, we believe that the space program adequately satisfies most current Soviet requirements. The introduction of new Soviet space systems in the next 10 years will make more timely and more accurate information available to Soviet political leaders and military commanders. Also, im-

proved communications will be available to Soviet leaders, and a space-based laser will probably be tested. Ambitious manned space activities will enhance Soviet prestige. Table 2 describes what capabilities currently are derived from the Soviet space program and how they will change if all of the anticipated systems in development (table 1) progress according to our estimates. Major new capabilities in the next 10 years will result from the successful introduction of a reusable space transportation system, a space tug, and especially the heavy-lift launch vehicle which is a critical component of other space systems, including the shuttle and the large space station. Moreover, any delay in developing the heavy-lift launch vehicle also will seriously affect Soviet plans for placing large payloads in geosynchronous orbit.

Military Use of Space

9. Since the early 1960s, space systems have become an integral part of Soviet military capabilities, providing intelligence collection, command and control, targeting of strategic and conventional weapons, navigation, and warning of ICBM launch. Subsequently, an orbital ASAT interceptor was introduced. Also, we believe methods were developed to afford some protection for Soviet satellites. The main consequence of the introduction of new space systems during the next 10 years will be the extension of the USSR's military reach by providing global support to its military forces:

- Command and control communications will be available on a global basis, providing an expanding number of military users with continuous, secure, and reliable communications.
- Intelligence collection, targeting, global navigation, and weather data will be more accurate and timely.
- As satellite data relay systems become available, intelligence and target information will be increasingly available to tactical commanders.

10. We believe that, despite their large and comprehensive space program, Soviet leaders perceive that overall US leadership in space could continue. Therefore, Soviet diplomatic initiatives and propaganda related to space have the objective of slowing down the US space program. They also are intended to isolate the United States in international political forums. Soviet leaders have consistently shown a preoccupation with potential US space threats. They argue that the United States is preparing for space war. They point to substantial increases in US spending for military space programs, a Presidential Directive on national space policy that they claim directs the Pentagon to be prepared to conduct military operations in space, the establishment of a new US Air Force Space Command, the military potential of the US shuttle, and the development of the air-launched miniature vehicle (ALMV) ASAT weapon. They have mounted a major arms control campaign to ban all weapons from space and to attempt to resume talks with the United States on limiting ASAT weapons. Recently, General Secretary Andropov reiterated the 1981 Soviet proposal for a United Nations treaty banning all weapons in space. The treaty would prohibit acts that destroy, damage, disturb, or change the trajectory of any satellite belonging to a treaty member who was in compliance with the treaty's ban on weapons. Monitoring such a ban would be difficult, especially if the USSR uses space stations for weapons development. Soviet initiatives have been somewhat successful in stimulating worldwide concern about an arms race in space.

11. Intelligence collection was the first military application of the Soviet space program and currently accounts for the largest share of space launches. About 30 military photoreconnaissance satellites are launched annually. First-generation photoreconnaissance satellites averaged about 13 days in orbit, and second-generation photosatellites with solar panels have conducted missions of up to 49 days. A major improvement will be a new electro-optical reconnaissance and surveillance system. The system probably will be deployed in a network of imaging satellites supported by a series of data relay satellites to provide photography to the Soviet General Staff in near-real time.

We expect the Soviets to test a high-altitude signals intelligence (SIGINT) system by the late 1980s, but we are uncertain whether it would be for communications intelligence (COMINT) or for electronic intelligence (ELINT). To date, the USSR has not deployed a space-based COMINT collection sys-

Table 2

Main Capabilities of Soviet Space Systems

Existing Capabilities and Expected Improvements

Navigation. Location data (within 180 meters) are provided to Soviet naval and commercial shipping. A new system, GLONASS, will aid ships and other mobile users in determining their positions, possibly within 30 meters.

Mapping, Charting, and Geodesy. Data are generated for accurately locating points on the Earth's surface and for producing accurate models of the Earth's gravitational field for intercontinental ballistic missile (ICBM) targeting and other uses. New generations of geodetic and geophysical satellites will provide more accurate data for targeting by ballistic and cruise missiles.

Calibration. Testing and development [redacted] are facilitated by calibration satellites.

Weather. Data are provided for global weather forecasting and may be used to improve effectiveness of space-based imagery collection. The new geosynchronous system (GOMS) will provide better coverage and more timely data.

Command and Control. Secure and redundant communications and data relay are made available to major Soviet military units as well as military advisory groups. New systems will provide higher capacity, more secure, global communications.

Civil Communications. Newer geosynchronous satellites will make domestic telephone and television services available to about 90 percent of the Soviet population.

Military Intelligence. The deployment and exercises of most major NATO and Chinese ground, naval, and air units are monitored by space systems providing current order-of-battle information, warning of possible attack, and monitoring of treaty compliance and crisis situations. Improved SIGINT and new electro-optical satellites will provide improved coverage and more timely indications and warning information as well as tactical data. A new satellite data relay system will pass reconnaissance data from low-altitude satellites directly to Moscow in near-real time.

Naval Targeting. Satellites locate US naval battle groups and other naval formations and transmit the derived target information on a real-time basis to selected Soviet naval combatants. These satellites have gaps in coverage [redacted]

Warning. A nine-satellite system provides on a continuous basis 30 minutes' early warning of US ICBM launch [redacted] it supplements ground-based ballistic missile early warning radar systems. A new network of geosynchronous satellites [redacted] is expected to begin initial testing in 1984 and reach full operational capability by 1990.

Resupply Vehicle. Existing "Progress" vehicles deliver about 2,300 kilograms of cargo. Newer resupply vehicles have greater capacity and will be able to recover materials produced in space, return cosmonauts in emergencies, and return equipment.

Earth Resources. Data on domestic and foreign natural resources and crop surveys are collected using a recoverable film system. A developmental electro-optical system with capabilities similar to US Landsat will provide more timely information and attain longer mission duration.

[redacted]

ASAT. Orbital interceptors can attack satellites in low Earth orbit one at a time, and up to eight within a 24-hour period. The operational system has destroyed a target in nine of the 15 tests to date. Future ASAT improvements are expected to include a space-based laser, which we believe will be tested by the early 1990s. We do not expect a high-altitude conventional orbital interceptor to be developed.

Lunar and Planetary Exploration. Unmanned exploration of the lunar far side and a Mars soil sample return mission are likely within the next decade. Venus probes will continue to be frequent in the near term.

Space Station. Soviet space stations have been manned about 40 percent of the time. Cosmonauts have conducted military experiments, reconnaissance, materials processing, and other research. By about 1986, modular space stations, with crews of six to 12 persons, will provide permanently manned platforms for similar activities and weapons component testing.

New Capabilities

Space Transportation System. This system, similar to the US space shuttle, will be able to transport bulk cargo to and from space stations. It also will enable delivery, recovery, refueling, and repair of satellites. It also may be a test bed for laser weapons. A space tug, if perfected, would assist the space station and shuttle and transfer satellites between high and low orbits for servicing.

A Military Space Plane. A spacecraft is being developed for a mission we cannot yet determine, but is likely to include reconnaissance and satellite inspection roles.

Heavy-Lift Launch Vehicle (HLLV). Current Soviet space launch vehicles are limited to placing about 20,000 kg in low orbit. The new Saturn V–class HLLV booster will be capable of lifting at least 100,000 kg into low orbit.

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tem, but we believe such a system is within Soviet technical capabilities. According to one view, there is a low probability that a space-based COMINT system will be deployed because the information can be collected by other means; therefore, the SIGINT system expected to be tested in the late 1980s would probably be for ELINT.[2] Another view holds that there is a moderate likelihood the Soviets will test a prototype spaceborne COMINT collection system by the late 1980s.[3]

12. Certain space systems directly support Soviet weapon systems by providing more accurate target information. The EORSAT (ELINT ocean reconnaissance satellite) and RORSAT (radar ocean reconnaissance satellite) systems provide naval targeting data directly to selected Soviet surface combatants and submarines. However, these systems have serious limitations. [ ] RORSATs are adversely affected by poor weather. In peacetime neither of these systems is deployed with what we believe would be a full wartime complement of satellites, but the SL-11 launch vehicle could place additional satellites in orbit quickly.

13. Some other space systems, such as ELINT 3, have been developed to identify and locate land- and sea-based radars, but do not report such detections in real time. New-generation ELINT systems are expected to improve frequency coverage. Also, a new ELINT system, if developed, could use a higher orbit to provide greater geographic coverage. Other space systems have been used to provide accurate geodetic and gravitational models for targeting Soviet ICBMs and SLBMs. The accuracy of this information will be improved by the introduction of new geodetic (GEOSAT 2) and photographic-geophysical (PHOTOGEO 2) satellites.

14. Several Soviet military command and control networks use satellites to provide high-speed, secure communications between widely separated elements. All of the new communications and data relay systems being developed probably will involve military users. These new systems probably will use wide bandwidths and spread-spectrum signals. Many mobile ground terminals also have been introduced to support deployed forces. (See figure 5.) Such developments and other improvements will result in greater capacity, higher speed, and more secure communications for Soviet military commands to operate virtually anywhere in the world. As satellite data relay systems become available, intelligence and target information should become increasingly available to tactical commanders.

15. Navigation information is provided by two independent satellite systems to Soviet naval and merchant ships and fishing vessels. The new navigational system GLONASS probably will be operational by 1986 with about nine satellites providing location data to both ships and aircraft, accurate to possibly 30 meters, worldwide. However, unlike the US Global Positioning System (GPS), GLONASS is not believed to have the capability to provide altitude data to aircraft. Expansion to an 18-satellite system would enable GLONASS to provide this information. Even when GLONASS becomes fully operational, Soviet ships and aircraft are likely to continue to carry receivers that will enable them to use US space-based navigation systems.

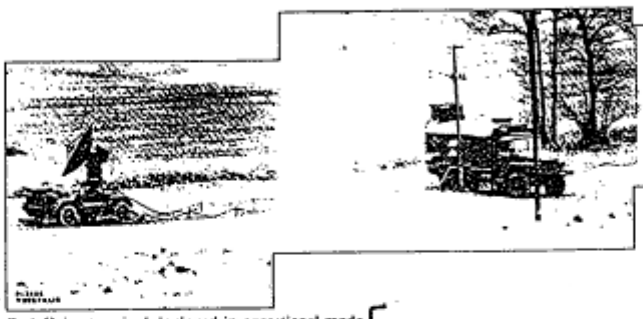
16. About 30 minutes' warning of US ICBM attack is provided by the Soviet launch detection satellite (LDS) network. Eight satellites of the projected nine-satellite network have been placed in orbit and provide coverage of US ICBM fields and the space launch facilities at Cape Canaveral. SLBM patrol areas are not covered, but a new geosynchronous system is expected to overcome this limitation by 1990.

17. Research in space-based submarine detection has been conducted from Soviet space stations [ ] We cannot judge whether the Soviets will achieve a technological breakthrough in remote sensing of submarine-generated effects during the next 10 years. Even if such a breakthrough occurs, we do not believe, in view of the operational considerations and the length of time needed for full-system deployment, that there is a realistic possibility that the Soviets, during the next 10 years, will have a system that could

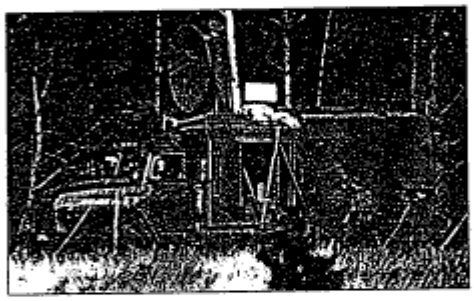
[2] *The holder of this view is the Deputy Director for Intelligence, Central Intelligence Agency.*

[3] *The holders of this view are the Director, Defense Intelligence Agency, and the senior intelligence officers of the military services.*

Figure 5
Soviet Mobile Communications Satellite Terminals



Park Drive terminal deployed in operational mode.



New Woodbine terminal photographed in East Germany

simultaneously track a substantial fraction of the US force of nuclear-powered ballistic missile submarines (SSBNs). We are more uncertain, and hence more concerned, about the capabilities that could potentially be realized and deployed in the mid-to-late 1990s. An alternative view is that

the Soviets have not had significant success in these techniques.

18. Protection of Soviet space systems could involve a wide range of measures, but we are uncertain which methods are being adopted. The launch facilities and the ground control sites are the most vulnerable links in Soviet space systems, and there is no evidence of hardening for any of these. A mobile command capability for unmanned military systems could be achieved within the next few years. Satellites in orbit could be afforded some protection by maneuvering,

* *The holder of this view is the Director of Naval Intelligence, Department of the Navy.*

hardening against laser or electronic radiation, and the use of decoys. In the 1990s the USSR probably will be able to reconstitute essential space systems by reactivating and repositioning satellites stored in orbit and by quickly launching satellites from mobile launchers.

19. Current Soviet capabilities for destroying or otherwise interfering with US satellites include an operational nonnuclear orbital ASAT interceptor, which has demonstrated satellite intercepts at altitudes up to 1,600 kilometers. Many US satellites operate below this altitude. Nine out of 15 tests since 1968 have been successful, the last success having occurred in March 1981. The most recent test, in June 1982, was the first failure of the operational interceptor since 1977. During the period 1976-81, the Soviets conducted five tests of a developmental version incorporating a probable passive electro-optical sensor; all five were failures. We do not expect significant improvements in the reliability of either the operational or developmental ASAT orbital interceptors. Furthermore, we do not anticipate the development of a high-altitude conventional ASAT orbital interceptor because:

— Evidence of such a program is lacking.

— Appropriate quick-reaction launch vehicles are lacking and have not been identified in development.

— The long flight time to intercept reduces potential effectiveness.

— Other emerging technologies, especially directed energy, offer more promising prospects.

20. [redacted] we believe that the Soviets intend to use active EW against both satellites and ground-based users of space systems. Furthermore, we consider EW to be the most likely type of initial Soviet ASAT activity. Such a capability potentially poses the most serious threat to US space systems. Against high-altitude satellites, this currently may be the only ASAT capability. We believe the USSR currently has the technological capability using active EW to attempt to interfere with foreign space systems. Compared with other ASAT techniques, an active ASAT EW program would have relatively low cost and low risk of escalation. Further, such a role is consistent with ambitious EW programs existing throughout the Soviet military forces. Potential Soviet active EW platforms include many fixed, transportable, and mobile transmitters. However, we have no evidence of Soviet equipment or organizations with an ASAT EW mission.

21. An alternative view contends that there is insufficient evidence at this time to support the judgment of Soviet intent to use active EW against satellites. [redacted] Moreover, the holder of this view concludes that, if a Soviet active EW capability against satellites does exist, brute force jamming would be the most likely EW technique. On the basis of available evidence, it is difficult to judge with any confidence that a Soviet technological capability would include more complex forms of jamming.[5]

22. Direct-ascent ABM interceptors, armed with nuclear or nonnuclear warheads, also have the potential to attack low-orbit satellites; however, we do not believe that ABM interceptors would be used in an ASAT role. Space launch vehicles, such as the SL-6 and SL-12, could be modified with nuclear warheads for ASAT purposes, but relatively low launch rates make them unlikely candidates.

23. We believe ICBMs are unlikely to be used in an ASAT role, although ICBMs are available in larger numbers and can reach higher altitudes than ABMs. Also, ICBMs are protected by hardened silos and control facilities. We believe the Soviets are unlikely to risk collateral damage to their own satellites by using ICBMs with nuclear warheads, and they would be wary of the risks and uncertainties about US responses if a conflict were otherwise still at the conventional force level. We do note, however, the Soviets' potential advantage in reconstituting their space systems if their launchpads remain intact. Current ICBMs probably would require some modifications and a short period

[5] *The holder of this view is the Director, National Security Agency.*

of testing to be ASAT capable. If high-altitude targets are to be attacked, modifications to existing guidance systems would be required, and new upper stages would be needed. We would expect to observe testing of the new upper stages. In any event, unprotected satellites will remain vulnerable to the long-range and persistent effects of nuclear detonations in space.

24. Soviet research related to directed-energy weapons, including lasers, particle beams (both charged and neutral), and radiofrequency (RF) energy, has been under way for many years. These weapons have potential application in antisatellite, air defense, and ballistic missile defense roles. Among the possible directed-energy weapons, our evidence is strongest concerning Soviet laser weapons developments. Two facilities at Saryshagan are assessed to have high-energy lasers and associated optical equipment with the potential to function as ground-based ASAT weapons. [

]

25. Soviet research also has included a project to develop a space-based laser weapon, probably for ASAT applications initially. Such a system would have advantages, such as a multishot capability, over a conventional orbital ASAT interceptor. We believe there is a high probability that a prototype high-energy laser ASAT weapon will be tested in low orbit by the early 1990s. However, development of a space-based laser is technologically difficult and could proceed in several directions. One approach [ ]involves a laser of the 1-megawatt class which could attack satellites at ranges of hundreds of kilometers. A prototype of such a weapon probably could be tested in the late 1980s at the earliest, but more likely in the early 1990s. If testing proves successful, an initial operational system in low orbit consisting of a few satellite weapons could be available by the early 1990s (if tested in the late 1980s), but such an operational system is more likely to appear in the mid-1990s. Another possibility, [ ]is a laser of lower power (hundreds of kilowatts) in an unmanned, low-orbit satellite with an ASAT range in the tens of kilometers. If such a system were pursued, a prototype could be tested earlier than a megawatt-class laser and, if early tests proved successful, possibly reach an operational capability by the early 1990s. But such a system with its short-range capabilities would have severe operational limitations. In any event, the psychological effect of the first test of a space-based laser in a weapon-related mode would be greater than the actual military significance of such a weapon in its initial applications.

26. Research to date has indicated that a space-based particle beam weapon (PBW) will be more difficult to achieve than a laser system. Nevertheless, we continue to see evidence of Soviet research related to space-based PBWs. We believe that prototype testing of an ASAT PBW is unlikely to occur before 1995. An alternative view holds that a space-based PBW system intended to disrupt satellite electronic systems and requiring significantly less power than a destructive PBW could be developed and deployed several years earlier.[4]

27. Another threat involves the use of high-power RF signals to damage satellites. The effectiveness of this threat is dependent on detailed technical knowledge of the target. No facilities designed for RF attack against satellites have been identified in the USSR, but there is evidence of Soviet interest in high-power electronics that could be applied to RF weapons. We believe it is highly unlikely that a Soviet space-based RF-damage ASAT weapon will be tested before the year 2000. By 1990, there is a moderate likelihood the USSR will test a ground-based RF ASAT weapon capable of physically damaging satellites.

28. The USSR is clearly committed to manned space stations, but the military purposes of these stations remain unclear. Experiments by military cosmonauts suggest reconnaissance as the primary mission. We expect to see laser weapon components tested on manned spacecraft. However, unmanned satellites seem better suited as platforms for operational directed-energy weapons.

[4] *The holder of this view is the Director, Defense Intelligence Agency.*

Economic Competition

29. During the 1980s the USSR could become a competitor in providing a wide range of space services. Telecommunications and space launch services offer potential sources of hard currency earnings for the USSR and, maybe more important, world prestige. The Soviet-sponsored INTERSPUTNIK organization, for example, has offered to lease communications satellite voice circuits at prices as much as 40 percent below those charged by INTELSAT. Soviet space launch services also may be offered at prices well below those of the US shuttle and ESA's Ariane. We believe, on the basis of the expected launch rates, that the demand for commercial space launchers may exceed the projected capacity of the shuttle and Ariane launch vehicles. The SL 12/13 Proton would be the vehicle most likely to be launched for Soviet-offered commercial services. The Proton is the world's largest expendable space booster and has proved to be 90-percent reliable during the past 10 years. We believe about five Protons per year could be available for commercial purposes by the late 1980s. The USSR also may provide Earth resources data to other countries in competition with the US Landsat and French SPOT systems. In addition to gaining hard currency, the USSR could provide navigational and meteorological services to other countries as gestures of good will for political purposes.

30. Manufacturing and processing of materials in space is another area of potential economic benefit to the USSR. For example, on Salyut 6 (1976-81) experiments involved the manufacture of semiconductors, superconductors, and special alloys that were sufficiently advanced to permit production of materials to begin in the near future. The most likely next step would be to create a special materials processing module as part of a space station. In addition, the availability of an operational space shuttle within 10 years will enable regular harvesting of products manufactured in space.

Prestige

31. Since opening the space frontier with Sputnik in 1957, the USSR has accumulated a long list of space "firsts." In the 1980s continuously manned Soviet space stations will provide the opportunity to gain international recognition as a leader in space. Recently, for example, Soviet cosmonauts established a new endurance record of 211 days in space. By 1986 the USSR hopes to establish a permanently manned modular space station with a crew of six to 12 persons. These and other manned space activities demonstrate the high value Soviet leaders continue to place on man in space.

32. The USSR has offered other countries the opportunity to participate in its space activities. In 1967 it established the INTERCOSMOS program to provide satellites, launch vehicles, and launch facilities for other member countries to conduct scientific experiments. To date, 10 Soviet Bloc countries have joined the INTERCOSMOS program, and there are cooperative agreements with countries such as France and Sweden. In addition, nine foreign cosmonauts have participated in Soviet space activities. These efforts have strengthened scientific and technical ties and provided opportunities for technology transfer.

33. Interplanetary exploration in the next several years also will enhance the USSR's desired image as a peaceful and technologically advanced nation. In December 1984, Project VEGA spacecraft are scheduled to be launched and fly by Venus and Halley's Comet as part of a Soviet-led international scientific space exploration effort. The resumption of Soviet unmanned lunar exploration is expected in the early 1990s. This would involve a lunar polar orbiter and a lunar lander that could return soil samples from the far side of the moon. The manned lunar exploration project was canceled in 1974, but, if it were reinstituted, which we believe is unlikely, it probably would be for the purpose of establishing a Soviet lunar base and could occur in the late 1990s. More likely is a manned mission to Mars by the late 1990s, discussed in Soviet open literature.

34. The USSR also has gained recognition from the use of Soviet satellites to help locate ships and aircraft in distress. A NAVSAT 3 satellite equipped with two special radio transponders for relaying distress signals from ships and aircraft was orbited in 1982 as part of a US, Soviet, Canadian, and French system (COSPAS-SARSAT) to provide emergency assistance. These and similar activities will continue to keep the Soviet space program before the international public.

Other Possible Developments in the 1990s

35. In addition to the developments thus far anticipated in this Estimate, there are several other possibilities in the Soviet space program that could occur in the

next 10 to 20 years, but the evidence is insufficient to make firm judgments. In some cases, on the basis of limited information on the general nature of Soviet research, we are inferring possible significant future developments. In other cases we are assuming logical Soviet choices based on the expected availability of key technologies. On these limited bases, this section describes possibly significant Soviet space developments during the next 10 to 20 years. (See table 3.) We do not expect these systems to be operational before the 1990s because the typical Soviet space system takes 12 to 15 years to develop. Because of the high cost of these projects, formidable technological challenges, and limitations on research, design, and production facilities, we do not expect all of them to be pursued to the system testing phase. We do, however, consider them important targets for US intelligence collection and analysis.

36. ***Radar Imaging.*** Development of a space-based synthetic aperture radar (SAR) could provide imagery in all types of weather and lighting conditions. Development of specialized signal- and data-processing techniques would be necessary before conducting orbital flight tests. Such tests may be possible by the mid-1990s. If a SAR is tested on the current Soviet Venus radar mapping mission, it could significantly further the development of a radar-imaging reconnaissance satellite.

37. ***Large Aircraft Detection.*** A Soviet space system for detecting large aircraft would employ either a real aperture radar or infrared (IR) sensors. Soviet experience with space-based real aperture radars extends back to the first RORSAT in 1971. Development of a radar system for aircraft detection would require a large deployable antenna as well as high-data-rate signal-processing capabilities. We believe there is a low-to-moderate chance the Soviets will conduct orbital flight tests of a space-based radar system in the early-to-middle 1990s, and a moderate chance by the year 2000. We believe an IR aircraft detection system is less likely to be developed than a radar system and is unlikely to be tested before the mid-1990s. Such a system would require the development of suitable IR sensors and associated data-processing systems.

38. ***Submarine Detection.*** Extensive research in nonacoustic sensing of submarines has been conducted by the USSR during the past two decades, and for the

Table 3
Possible New Soviet Space-Related Developments in the 1990s

System	Likelihood of Testing by the Year 2000 [a]
Radar imaging	Moderate-high
Large aircraft detection	Moderate
Submarine detection	Uncertain
Submarine laser communications	Moderate
Advanced communications satellite	High
Space power station	Very low [b]
Geosynchronous space station	Low-moderate [b]
Large space station	High [b]
Manned lunar base	Low [c]
Manned orbital Mars mission	Moderate [c]
Geosynchronous laser ASAT	Moderate-high [d]
Space-based laser BMD	Low-moderate
Space-based jammer	Low
Ground-based radiofrequency ASAT weapon	Moderate
Space-based radiofrequency ASAT weapon	Very low
High-altitude conventional orbital interceptor	Very low
Offensive space-to-space missiles	Low
Defensive space-to-space missiles on manned platforms	Moderate
Space mines	Very low
Space-based particle beam ASAT weapon	Low
Space-based ground-impact weapon	Low

[a] We have considerable uncertainty in many of these judgments. Among the criteria considered in making these judgments were: (1) the availability of necessary technologies elsewhere that could be acquired by the USSR; (2) demonstration of similar technologies by the USSR; (3) concepts observed in Soviet research publications; (4) a project identified or associated with a design bureau; (5) component testing reported; and (6) perceived requirements. These estimates do not prejudge the effectiveness of the systems should they complete the developmental process and be deployed.

[b] Likelihood of full-scale system.

[c] Likelihood of mission.

[ ]

~~This table is Secret~~

last five years this research has involved space platforms. This research could have utility in protecting Soviet submarines as well as detecting US submarines. Radar, photographic, infrared, and microwave sensors could potentially detect small changes in temperatures or subtle variations in the patterns of waves generated by submarines. One possibility is a space-based radar, probably a SAR. However, we cannot assess with confidence the submarine detection potential of such a radar.[1]

39. ***Submarine Laser Communications.*** One active Soviet program involves development of a satellite with a blue-green laser to communicate with submerged submarines. [redacted] space tests of such components could take place in the mid-to-late 1980s. However, we do not expect to see an operational network for laser satellite-to-submarine communications before the mid-1990s.

40. ***Advanced Communications Satellite.*** We believe an advanced Soviet communications satellite system will be orbited in the early-to-middle 1990s. These satellites will operate at high frequencies, up to 30 GHz, and will have increased capacities over current systems.

41. ***Space Power Station.*** A Soviet concept to provide solar power to Earth involves a large solar power station, about 1 kilometer in diameter. This idea may have been based on a US concept discussed in the 1970s. Such a station would require 10 to 20 payloads using the heavy-lift launch vehicle now under development. A demonstration of the power-station technology could be conducted in space by the mid-1990s, but the chances are very low that a full-scale system could be operating before the next century.

42. ***Geosynchronous Space Station.*** The ambitious Soviet manned space station program could include placing a space station in geosynchronous orbit. Such a station could provide continuous observation of certain geographic areas and could be less vulnerable to attack than low-orbiting space stations. The new heavy-lift launch vehicle could place a Salyut-class space station or module in geosynchronous orbit. Similarly, an upgraded Proton (SL-12) space launch vehicle could place a transport vehicle of the Soyuz T class in geosynchronous orbit. Space stations in these high orbits could serve as research platforms, intelligence collection stations, satellite repair bases, weapons test beds, or staging areas for further exploration of the Moon or for planetary expeditions.

43. ***Large Space Station.*** The modular Soviet space station, designed for crews of six to 12 persons, will probably be followed by a large space station capable of accommodating 12 to 20. Some Soviet scientists have discussed the development of a very large space base in the 1990s with provisions for as many as 100 persons.

44. ***Manned Lunar and Planetary Exploration.*** Soviet statements frequently discuss manned exploration of Mars and occasionally mention lunar expeditions. Also, Soviet studies in the mid-1970s addressed the establishment of a lunar base, but the concept seems to have been dropped in the late 1970s. Recent comments by Soviet scientists and officials suggest that a manned mission to Mars is planned for the mid-to-late 1990s. A manned Mars mission would require fewer resources than a lunar base and would bring greater prestige to the Soviets. Such a mission would be limited to an orbital reconnaissance of Mars and return. It may be technically feasible by that time. First, however, we would expect to see Soviet simulation of such a mission in Earth orbit for about 12 months, verifying that both people and equipment could sustain such long flights.

45. ***Space Weapons.*** There is a moderate-to-high likelihood that the development of low-orbit space-based lasers, coupled with a heavy-lift launch capability, will result in testing of laser ASAT weapons in geosynchronous orbit by the late 1990s, although we ascribe a low probability to operational deployment by the year 2000. An alternative view holds that, while deployment of a geosynchronous space-based laser would probably take place after deployment of a low-altitude system, there is a moderate chance of deployment of a geosynchronous spaced-based laser by the mid-1990s.[2] Although space-based lasers will probably

[1] *See paragraph 17 for the alternative view expressed by the Director of Naval Intelligence, Department of the Navy.*

[2] *The holders of this view are the Director, Defense Intelligence Agency, and the Assistant Chief of Staff, Intelligence, Department of the Air Force.*

be restricted to the ASAT mission for the remainder of this century, technological breakthroughs conceivably could lead to capabilities to destroy ballistic missiles, aircraft, cruise missiles, and ground targets from space in the late 1990s or beyond. Among the wide range of possible weapon systems, we believe the following space-based possibilities deserve continued close attention by the Intelligence Community:

— Laser BMD satellite.

— Space-based jammers.

— Space-based RF ASAT weapon.

— High-altitude conventional orbital interceptor.

— Space-to-space missiles.

— Space mines.

— Particle beam ASAT weapon.

— Satellite for delivering ground-impact weapons.

Gaps and Uncertainties

46. There are several aspects of the Soviet space program that we do not fully understand. [redacted] unanticipated developments will be increasingly possible. Our perception of the Soviet space threat would increase significantly if breakthroughs occurred in:

— Space-related weapons.

— Submarine detection.

[redacted]

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