Space Launch Facilities

11. Soviet space launch facilities are being steadily expanded. The three major launch centers—Tyuratam, Plesetsk, and Kapustin Yar—currently have a total of 19 launch positions and conduct about 100 space launches per year. By 1985, 23 space launch positions will be available. These launch centers are operated by the Soviet Strategic Rocket Forces (SRF). [redacted]

12. Extensive construction has been under way at Tyuratam since the mid-1970s. A new launch complex with two pads for the SL-12/13 was completed by 1980. In 1978 the Soviets broke ground for a second new launch complex with two pads that will be used to launch the new SL-X-16 medium-lift launch vehicle. (See figure II-7.) The Soviets also broke ground in 1978 for a third new complex for launching the heavy-lift launch vehicle. (See figure II-8.) This new single-pad complex will probably be used for space shuttle operations. In addition to this new pad, two more pads which were used in the 1969-72 period in an unsuccessful project to develop a heavy-lift launch vehicle for manned lunar flights, are being modified. In addition, a runway comparable to the shuttle recovery runway at the Kennedy Space Center is nearing completion. It will be used initially for the delivery of the HLLV and orbiter components to Tyuratam and later will serve to recover Soviet shuttle orbiter missions. Another shuttle orbiter recovery runway is under construction in the Far East, near Vladivostok. Large new buildings are also being constructed at Tyuratam for assembly and checkout of Proton boosters, for servicing of the Soviet shuttle orbiter, and for payload handling. [redacted]

13. After space systems are tested at Tyuratam, many are shifted to Plesetsk for routine operations. About 70 percent of Soviet space launches take place at Plesetsk. To date, only the smaller series of boosters (SL-3, SL-4, SL-6, SL-8, and SL-14) have been used at Plesetsk. Larger payloads and geosynchronous comsats must be launched from Tyuratam. One older pad has been modified, bringing the total number of active launchpads at Plesetsk to nine by late 1983. We believe it is unlikely that Plesetsk will be used to launch the new series of SLVs within the next 10 years. [redacted]

14. Kapustin Yar, with two space launchpads, will continue to play a limited role, providing only about 1 to 3 percent of the space launches. Currently, only the SL-8 is launched from Kapustin Yar. Should the USSR become more actively involved in providing space launch services to foreign customers, Kapustin Yar would be a logical location for launching small payloads. However, larger payloads and geosynchronous satellites cannot currently be launched from Kapustin Yar. [redacted]

Space Mission Control Network

15. Sophistication has been the main characteristic of the growth in the Soviet space mission control network, although expansion also has been significant. [redacted]

16. The SRF controls the majority of the satellite operations, but other organizations have constructed ground stations and conduct special satellite operations. [redacted] Intercosmos organization, which operates a series of ground stations for the collection of scientific payload data. [redacted]

17. The SRF space mission control network has been under development for 25 years. It began with only four tracking sites in the late 1950s and currently consists of 18 tracking sites, several control centers, and a fleet of oceangoing ships to augment the land-based sites. The network is administered and controlled by the Space Tracking and Communications

CIA Statute

Figure II-7
New Launchpad for Medium-Lift Launch Vehicle

25X1

Top Secret [redacted]
CIA Statute

Figure II-8
Launchpads Under Construction for Heavy-Lift Launch Vehicles

25X1

[redacted]

Directorate of the SRF, with the main control facility called the Coordination Computer Center (CCC), at Golitsyno, located just outside Moscow. The SRF also operates the Manned Space Flight Centers at Yevpatoriya and Kaliningrad. [redacted]

18. In addition to the SRF land-based control facilities, a fleet of highly instrumented ships is maintained to control and monitor spacecraft outside the control of ground sites in the USSR. The fleet of three larger Soviet Space Operations Control Ships (SSOCS) and eight Soviet Space Event Support Ships (SSESS) is being expanded with the construction of three new ships, one of which may be nuclear powered. This expansion of the fleet may be related to an expected increase in manned spaceflight activity. [redacted]

19. [redacted]

Space Operations

20. During the 1970s and early 1980s, the annual number of Soviet launches steadily increased from 79 in 1970 to a record 107 in 1982. This trend corre-

[redacted]

sponds to a similar trend in the number of operational Soviet spacecraft in orbit. The majority of this increase is related directly to the completion and maintenance of multisatellite networks. During the past year most Soviet networks were maintained at or near full operational capability (see table II-3), and some included satellites in a standby or redundant capacity. [redacted]

21. We expect the Soviets will maintain their high launch rate until the late 1980s or early 1990s when their space shuttle system is expected to go into full service. By that time we expect to see a marked decrease in the number of SL-3, SL-4, and SL-6 missions. Payloads associated with these vehicles will be phased out and replacement missions will be launched on the Soviet shuttle. When the shuttle reaches full operation in the early-to-middle 1990s, the Soviet launch rate should be below 80 launches a year. The number of operational Soviet spacecraft in orbit at any time should continue to grow from the 110 currently to perhaps 140 by 1990. As Soviet satellite lifetimes increase, we expect the Soviets will make considerably more use of on-orbit spares and redundant satellites. [redacted]

Table II-3
Soviet Satellite System Networks

System	IOC	Ideal System Size	Average Size, 1970	Average Size, 1976	Average Size, 1982
Communications					
Molniya 1	1965	4	5-6	8-9	8-10
Molniya 2	1971	4		5	0
Molniya 3	1974	8		4-5	4-5
SPCS	1970	3	1	3-4	3-6
MPCS	1971	16-24	8	6-16	16-24
Statsionar	1975	14		1-2	3-6
Meteorological					
Meteor 1	1969	3-6	3-6	6-8	0
Meteor 2	1975	2-4		1	2-4
Navigation					
Navsat 1	1967	3	2-3	2-4	0
Navsat 2	1974	6		5-7	6-7
Navsat 3	1976	4		0-1	4-5
Reconnaissance					
ELINT 2	1968	6	3-4	4-5	1
ELINT 3	1970	6	0-1	2-3	5-6
EORSAT	1975	4		1-2	1-2
RORSAT	1971	7		0-2	0-2
Surveillance					
LDS	1976	9		0-1	6-7
Total			21-29	48-75	59-85

This table is ~~Secret.~~

Space Systems of the 1980s

22. 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 II-4.) 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. [redacted]

~~23. By US standards, the Soviet space program is~~ relatively unsophisticated and expensive—costing the equivalent of 1 percent of the Soviet gross national product 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, improved 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 II-5 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 II-4) 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 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

Table II-4
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
Photogeophysical, 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 satellite	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 II-6.
[b] For the developments, date is that of mission, not a prototype test.

This table is ~~Secret~~ CIA Statute

heavy-lift launch vehicle also will seriously affect Soviet plans for placing large payloads in geosynchronous orbit. These systems, and the changes in Soviet capabilities resulting from them, are discussed in chapters 3, 4, 5, and 6. CIA

Possible Developments in the 1990s

24. 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. These developments are discussed in chapters 3, 4, 5, and 6. (See table II-6.) 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. CIA Statute

~~Top Secret~~ [redacted]

Table II-5
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 of ABM radars, space-tracking systems [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] Coverage improves with additional satellites launched in crises or wartime. New systems may prove more reliable and have a higher probability of detection.

Warning. A nine-satellite system provides on a continuous basis 30 minutes' early warning of US ICBM launch, but it has no [redacted] t supplements ground-based ballistic missile early warning radar systems. A new network of geosynchronous satellites [redacted] s 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.

This table is ~~Secret~~ [redacted]

[redacted]

Table II-6
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.
[redacted]

This table is ~~Secret~~ [redacted]

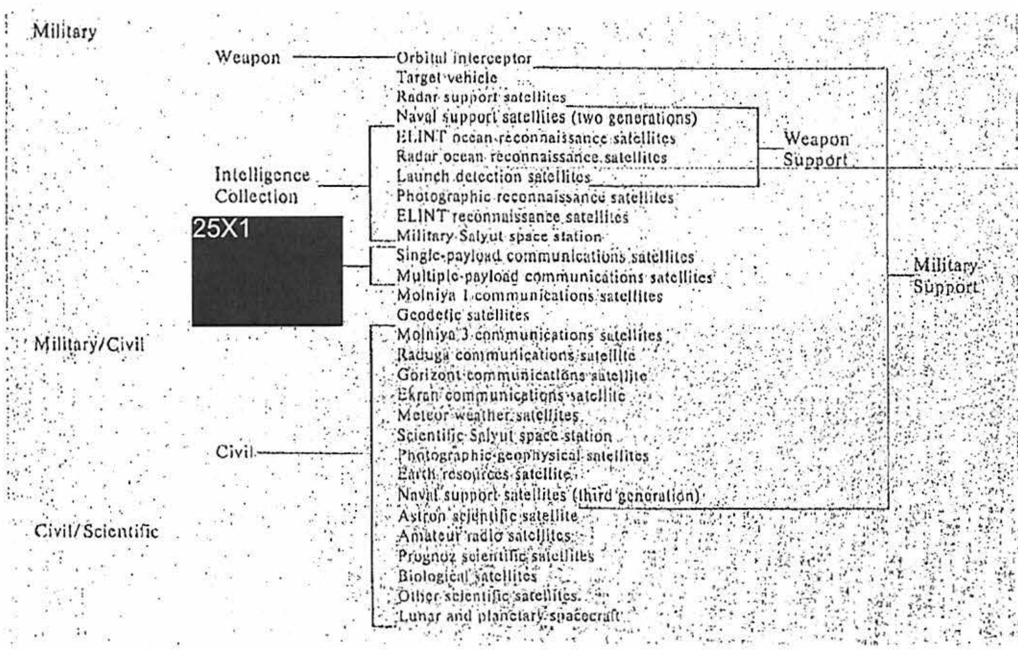
Top Secret [redacted]

CHAPTER III

SOVIET SPACE SYSTEMS

1. Clear distinctions between Soviet military and civil space systems are not always possible because some systems perform both military and nonmilitary functions. In figure III-1 all of the currently operational Soviet space systems are categorized according to their mission and function. Those space systems that perform a purely military function now account for about 70 percent of the annual launches. The number of missions fulfilling a dual military-civil function has grown steadily since the early 1970s and now accounts for more than 20 percent of annual launches. The number of missions of a scientific nature continues to

Figure III-1
Soviet Spacecraft Categories



Secret

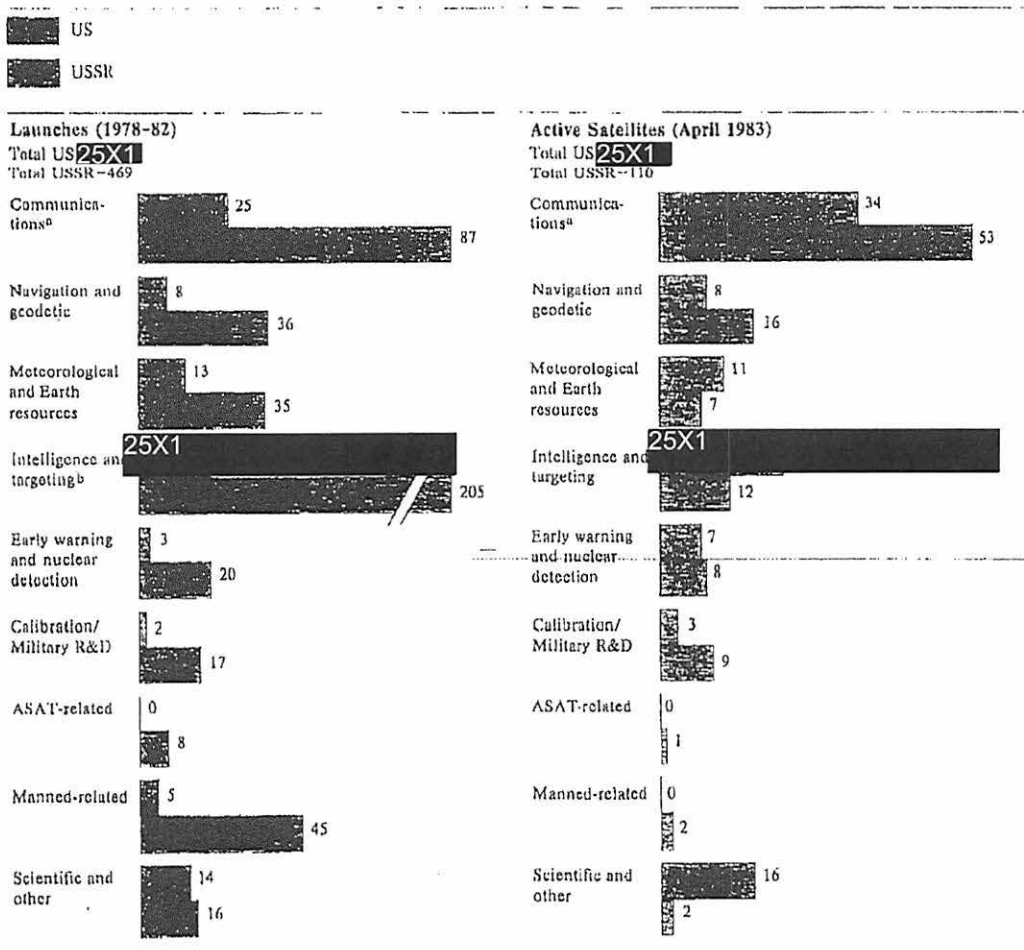
300269 6-83

C05530726

Top Secret [redacted]

[redacted]

Figure III-2
Comparison of US and Soviet Space Operations



[a] These figures do not include international telecommunications satellites (e.g., INTELSAT).
[b] The short lifetime of Soviet satellites and the use of short-duration photoreconnaissance missions result in a high launch rate.

Top Secret [redacted]

300517 8-83 TCS 606132/83

dwindle with less than 10 percent of the annual launches falling in this category. In 1982 there were none. [redacted]

2. The USSR currently maintains about 110 active satellites in orbit, providing communications, intelligence, warning, targeting, weather, mapping, navigation, and other types of support to a variety of users. This is approximately the same number of active satellites that the United States maintains in orbit, but the mix is quite different. Figure III-2 illustrates these differences, which are subdivided into nine major categories and presented both in terms of satellites launched and satellites in orbit. [redacted]

3. There are several reasons for the large difference between the annual launch rates of the United States and the USSR. First, Soviet satellites are relatively short lived, with most failing within two years, while US satellites routinely obtain lifetimes of seven years or more. Second, the Soviets have not made extensive use of geosynchronous orbit. (See table III-1.) Instead, the Soviets have relied on systems or networks of low-altitude satellites (as illustrated in table II-3 in chapter II). This, coupled with the short lifetime, results in most of the annual launches being for replenishment of these networks. Finally, almost one-third of all Soviet launches are photographic reconnaissance missions, which are of short duration (13 to 49 days). [redacted]

Table III-1
Comparison of US and Soviet Geosynchronous Missions [a]

[redacted]

This table is ~~Top Secret~~ [redacted]

4. Although we believe that our knowledge of the technical characteristics, performance, and uses of most current Soviet systems is adequate, the time required for us to define and assess new systems has increased [redacted]

Reliability, Productivity, and Obstacles

5. During the past decade most Soviet satellites have been reasonably successful in achieving designed operational criteria. The less successful systems have been the more complex launch detection, ASAT, electronics intelligence (ELINT), ocean reconnaissance, and high-altitude communications satellites. These satellites have very demanding operational requirements. The failures are due to a wide range of technical problems, but generally reflect difficulty in translating system designs into reliable devices. [redacted]

6. In 1978 a nationwide program was begun to consolidate the work of various institutes engaged in predicting and improving the reliability of spacecraft. The reported goal of Project "Polyet" (flight) was to increase the service life of spacecraft from two to three years. Administrative control of Project Polyet was under the Ministry of General Machine Building, but overall responsibility was given to the Reshetnev Design Bureau. This organization is one of the major spacecraft design bureaus and is responsible for development and production of all communications, navigation, geodetic, and ELINT reconnaissance satellites. (See chapter II, table II-2.) [redacted]

7. Project Polyet reportedly involved the improvement of various electronic, electromechanical, and mechanical systems, such as solar panel drives, antenna steering devices, photography, and propulsion. Improvements were to center on technology, basic

design, and materials. Soviet spacecraft problems appear to be the result of poor product engineering. Our analysis of failures within specific spacecraft systems further indicates the causes are various rather than recurring. This would indicate that Soviet spacecraft manufacturers do not maintain good quality control in production and probably do insufficient simulation and environmental testing. [redacted]

8. Although the goal of improving the design life from two to three years does not seem impressive by US standards (US satellites average seven to 10 years in operation), it would be a significant improvement for the Soviets. The satellite systems that would benefit most by improving design life are those at geosynchronous orbit, because launch vehicle and satellite costs for such systems are high. Currently, Soviet geosynchronous satellites seldom achieve more than 18 months of useful life. Doubling this lifetime to 36 months would reduce replenishment costs by half. We expect the Soviets will achieve this goal by the late 1980s. [redacted]

Imagery Collection

9. Photographic reconnaissance satellites are by far the most frequently launched satellites in the Soviet space program, accounting for about one-third of all Soviet spacecraft launched each year. This high launch rate is the result of using technically limited space systems to fulfill an apparent operational requirement for a nearly continuous photographic capability. Early Soviet photographic reconnaissance systems used space vehicles originally designed as manned spacecraft that were too heavy to be placed into Sun-synchronous orbits. Also, most of these satellites were battery powered. As a result, missions are of short duration (about 14 days) and are limited to orbits in which lighting conditions remain favorable for only limited periods of time. Further, poor film technology has restricted the total capability of Soviet photoreconnaissance satellites. However, more recent Soviet photoreconnaissance satellites have been developed with solar panels and have demonstrated mission durations of 49 days. Acquisition of advanced photoreconnaissance film technology could permit the Soviets to extend their film-based reconnaissance missions. Also, orbital maneuvers now allow for maintenance of favorable lighting conditions. There are no Soviet systems with long mission durations and timely delivery of data comparable with the US KH-11, which is in orbit continually and transmits imagery [redacted] on a near-real-time basis. However, an orbital test model was launched in December 1982 and operated for 67 days. This test may have involved a near-real-time electro-optical imaging system. An operational system of this type could be ready by 1987. [redacted]

10. To gain more timely data, on occasion several photoreconnaissance satellites have been launched within short periods of time. For example, during the 1973 Middle East war, the Soviets launched seven photoreconnaissance satellites in 24 days and deorbited most of them about six days after launch. Multiple launches within short periods are possible with a limited number of launchpads because systems have been developed with short on-pad times. Spacecraft are fueled and mated to the booster in a horizontal position, and subsystems are checked out in buildings located near the launch sites. The mated booster and spacecraft are then taken to the launch site and erected; the booster is fueled and the vehicle is launched in as short a time as four hours after leaving the checkout building. In one case (1962) only one day was required to prepare the launchpad for a second launch. This is the minimum time yet observed. [redacted]

11. Table III-2 lists the Soviet photoreconnaissance satellite systems and their major capabilities. The mainstays of the Soviet space program are the second-generation, high-resolution system and the medium-resolution system. The second-generation, high-resolution system is the first to make operational use of film capsules and solar panels to increase mission duration. Timeliness is increased with this system by deorbiting each of its two capsules at desired times during the mission. The best resolution of this system is estimated to be 0.3 meter. [redacted] The medium-resolution system has replaced the low-resolution system last launched in 1979. However, the limited number of high-orbit (400 kilometers), medium-resolution missions does not provide coverage comparable with that obtained with the low-resolution system. Thus, coverage provided by the medium-resolution system probably is being supplemented with data from Earth resources photographic satellites and Salyut space stations. [redacted]

Table III-2
Current Soviet Unmanned Photographic Reconnaissance Satellite Systems

25X1 [redacted]

12. The second-generation, high-resolution photoreconnaissance satellite is the mainstay of Soviet spotting missions. The medium-resolution photoreconnaissance system, when operated at low altitudes (about 230 kilometers), also has a spotting capability. Use of these two systems allows improved resolution photography by the second-generation, high-resolution system and coverage of larger areas, at reduced resolution, by the medium-resolution system. This improved coverage, however, is achieved at the expense of eliminating stereo coverage, which was provided only by the first-generation, high-resolution system. We expect to see a mix of the current Soviet photoreconnaissance satellite systems for the next several years. Evolutionary improvements in photographic quality also are expected to continue. Film return capsules may be introduced on additional systems to further increase mission lifetimes. However, we expect that the capability to quickly orbit short-duration missions will be maintained. CIA Statute [redacted]

13. 25X1 [redacted] This may have been part of "Project Almaz," which included a plan to orbit an operational multispectral, near-real-time, imaging satellite by 1984. Reportedly, this plan called for a network of eight satellites providing data via relay satellites. The customer for Project Almaz is the General Staff, 25X1 [redacted] We believe that the critical technologies—large arrays of electro-optic sensors and wide band, high data rate transmission links—for a real-time imagery system already have been developed. We believe the purpose of the first Soviet real-time system will be for indications and warning and crisis monitoring. Our assessment of Soviet technology leads us to conclude that such a medium-resolution system would have a 2- to 4-meter ground sample distance.[4] This resolution is adequate to monitor targets, such as airfields, staging areas, and ports. CIA Statute [redacted]

14. In late 1982, a possible precursor to a near-real-time electro-optical imaging system was put into orbit. Cosmos 1426 remained in orbit for 67 days and was deorbited and probably intentionally destroyed. 25X1 [redacted]

[4] Ground sample distance is the ground area sampled by a single detector. (u)

[redacted]

15. The development of a near-real-time, electro-optical imaging system will provide a major improvement in the timeliness of satellite imagery data. We expect that a network of operational data relay satellites (either Potok or Satellite Data Relay System) will be available by 1985 or 1986 to support imaging satellites. We believe that two versions of an electro-optical imaging system will be deployed. A medium-resolution system will most likely be deployed first in 1986-87, with a high-resolution system following within a few years. A full network of two to four imaging satellites could be established by the late 1980s. The network might be expanded to eight satellites [redacted]

Radar Imaging

16. A radar-imaging system could augment the USSR's photoreconnaissance satellite systems by obtaining images in all types of weather and lighting conditions. A space-based synthetic aperture radar (SAR) is the most likely means for providing this capability. The Soviets have conducted research and development (R&D) flights of SARs on aircraft for nonacoustic antisubmarine warfare (ASW) research since 1971 [redacted] 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. A critical technology that will influence development of a radar-imaging system and should be available to the Soviets in the mid-1980s is onboard specialized signal and data processing. On the basis of our view of their perceived needs, we believe there is an even chance the Soviets will decide to develop a space-based radar-imaging system and a moderate-to-high likelihood of prototype testing at some time in the 1990s. Orbital flight tests may be possible by the mid-1990s. A system that used ground-based processing instead could be available several years earlier. [redacted]

ELINT Reconnaissance

17. The Soviets have two types of satellites that perform ELINT reconnaissance—the second-generation and the third-generation ELINT satellites. [redacted]

18. [redacted]

19. The current ELINT satellite systems appear to adequately meet the Soviet requirements for land- and sea-based radar reconnaissance and radar order of battle. The most recent type of Soviet ELINT satellite was introduced in 1970. We expect either an improved ELINT satellite to be introduced in the mid-1980s or a new generation in the late 1980s or early 1990s. The requirements for such a satellite would most likely include continuous coverage, real-time transmission, and tactical land battle support. [redacted]

20. The technology necessary to develop a high-altitude ELINT collection system is already available to the USSR, but we have no direct evidence that they intend to do so. Activity possibly related to such a development includes work on large spaceborne

[redacted]

antennas (the 10-meter-diameter antenna deployed on Salyut 6, for example, was developed under military sponsorship). Large high-gain antennas are required on high-altitude collection satellites to provide sensitivity for the detection of low-power signals radiated from emitters on the Earth's surface. [redacted]

21. [redacted]

[redacted]

22. We expect the Soviets to test a high-altitude SIGINT system by the late 1980s, but we are uncertain whether it would be for COMINT/FIS or ELINT. According to one view, there is a low probability that a space-based COMINT/FIS system will be deployed because the information can be collected by other means. On the basis of the advantages of high-altitude

ELINT collection systems, continued Soviet interest in ELINT collection using satellites, and military-sponsored development of suitable antennas, the holder of this view believes there is a moderate likelihood that the Soviets are developing such a system. Thus, the SIGINT system forecast for testing in the late 1980s would probably be for ELINT.[5] Another view holds that there is a moderate likelihood the Soviets will test a prototype spaceborne COMINT collection system by the late 1980s.[6] [redacted]

Naval Targeting and Surveillance

23. The Soviets have two types of satellites in this category, the ELINT ocean reconnaissance satellite (EORSAT) and the radar ocean reconnaissance satellite (RORSAT), which can detect and locate surface ships [redacted]

Flight-testing began in 1967 for the RORSAT and in 1974 for the EORSAT. Both systems probably became operational by at least 1980. The Soviets often keep one satellite of each type in orbit. The maximum number in orbit has been two for each type, and on occasion there have been gaps of several months with no RORSATs or EORSATs in orbit. These two types of satellites are primarily wartime and crisis weapon targeting systems designed to provide real-time targeting data to Soviet ships and submarines having a long-range antiship missile capability, for use against aircraft carriers and naval battle groups. The required coverage for nearly continuous targeting and the demonstrated orbital spacing indicate that prior to hostilities the Soviets will attempt to expand the satellites networks to four EORSATs and seven RORSATs. [redacted]

24. Both the RORSAT and EORSAT have short average lifetimes—two and four months, respectively. However, this may not be a significant limitation to their wartime targeting mission. The Soviets probably recognize that these satellites are vulnerable and would be short lived once hostilities began. The satellites would be useful just before hostilities and as hostilities begin. We expect the Soviets to attempt to complete a full EORSAT/RORSAT network with launches by SL-11s in a matter of days. [redacted]

25. The EORSAT is a specialized ELINT satellite [redacted]

26. The accuracy of the EORSAT targeting data is generally sufficient for the associated antiship missiles (SS-N-3, SS-N-12, and SS-N-19). The probability of detection varies [redacted] About 20 Soviet [redacted]

[redacted]

This table is [redacted]

[5] The holder of this view is the Deputy Director for Intelligence, Central Intelligence Agency. (U)

[6] The holders of this view are the Director, Defense Intelligence Agency, and the senior intelligence officers of the military services. (U)

naval combatants currently are configured to receive the EORSAT data. Major limitations of the EORSAT system include:

— [redacted]

— Cannot detect ships using EMCON.

— Excessive time required for a single satellite to revisit the same targets—six to 14 hours at northern latitudes and about 28 hours at the equator. A network of at least four EORSATs is required to provide continuous targeting data—that is, no more than two hours old—at high latitudes. Such a network is not expected in peacetime, but may be launched in a crisis.

— [redacted]

— [redacted]

27. We believe the EORSAT will continue to be used for the next several years. We project changes in the system may be introduced, including improved receiver sensitivity, extended radiofrequency coverage, and improved locating capabilities. Improvements in the EORSAT program will include fitting out more Soviet naval combatants to receive the collected data directly and increasing satellite lifetime. [redacted]

28. The Soviets probably will maintain up to two EORSATs in orbit during peacetime. Peacetime functions of the EORSATs consist of ocean reconnaissance, detecting and locating naval targets, and transmitting the targeting data in real-time to Soviet submarines and ships for training during antiship missile firings and simulation exercises. [redacted]

29. The EORSAT system is designed to operate in conjunction with the RORSAT. The RORSAT uses a radar capable of detecting and locating ships of destroyer class and larger. Soviet RORSAT satellites are launched by the SL-11 into circular orbits 260 km above the Earth. After a mission is terminated, a segment of the spacecraft containing a small nuclear reactor for generating electric power is separated and boosted into a higher (900 km) orbit, where it should remain for 500 to 1,000 years, allowing time for decay of the radioactive fuel. [redacted]

[redacted]

31. The RORSAT system, like the EORSAT system, is primarily a weapon targeting system for use during wartime or a crisis. In a crisis the Soviets could quickly launch additional EORSAT and RORSAT satellites. A network of seven RORSATs and four EORSATs could provide targeting data about every two hours in the 50- to 70-degree latitude region (see figure III-5). Targeting data more than two hours old are usually too inaccurate for targeting solutions. The Soviets have had as many as two RORSATs in orbit during peacetime. (See chapter IV for a discussion of augmentation and replacement options open to the Soviets.) [redacted]

32. Major advantages and capabilities of the RORSAT system include:

— [redacted]

The RORSAT system also has some major limitations, including:

— [redacted]

— [redacted]

— [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

33. The RORSAT has experienced numerous onboard system failures. The failures have been due to various causes. The Soviets suffered a serious setback in January 1978 when Cosmos 954, including its nuclear reactor, made an unintentional reentry, scattering radioactive debris in Canada's Northwest Territory. The resulting adverse world reaction to the use of nuclear power sources in space led to deliberations in the UN Outer Space Subcommittees. A majority of nations supported regulations for the use of nuclear power sources, including a ban on their use in low Earth orbits. Despite these reactions, another RORSAT was launched in April 1980, after a 27-month standdown. The long hiatus was undoubtedly to allow time for necessary technical modifications. Since the Cosmos 954 incident, all RORSATs have had a backup system, which was described in Soviet reports to the United Nations. Fifty minutes after separation, the nuclear reactor core probably is ejected, normally in high storage orbit. If the primary disposal method of separating the reactor core and boosting it to higher orbit fails, the backup design calls for ejecting the core from the casing while still at low orbit. This enhances the likelihood that the radioactive material will burn up during reentry. That is what we believe happened to Cosmos 1402. The main body reentered in January 1983, and the reactor core was [redacted] during reentry in February 1983. [redacted]

[redacted] CIA Statute
CIA Statute

Figure III-5
Requirements To Achieve Adequate Target Coverage,
EORSAT and RORSAT [a]

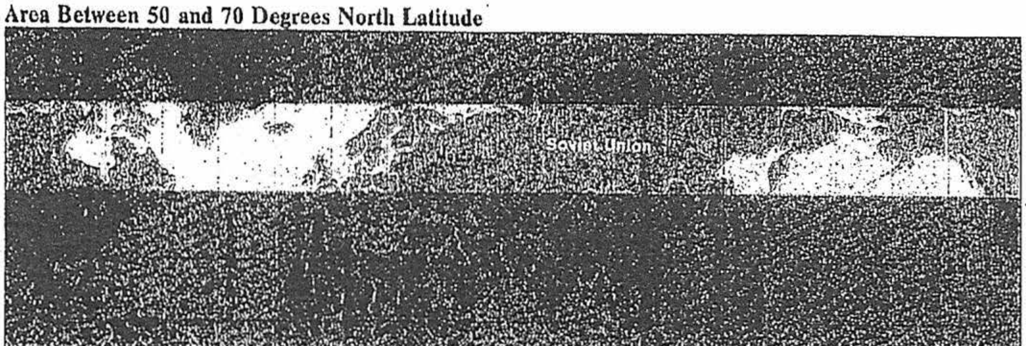
	Revisit Times at Various Latitudes *(Hours)*									
	0°	10°	20°	30°	40°	50°	55°	60°	65°	70°
1 EORSAT	28	24	24	20	16	14	12	6	6	28
2 EORSATs	14	12	12	10	8	7	6	3	3	14
4 EORSATs	7	6	6	5	4	3.5	3	1.5	1.5	7
1 RORSAT	56	54	52	46	40	32	28	22	16	8
2 RORSATs	28	27	26	23	20	16	14	11	8	4
4 RORSATs	14	14	13	12	10	8	7	5	4	2
7 RORSATs	8	8	7	7	6	5	4	3	2	1
1 EORSAT and 1 RORSAT	19	17	16	14	11	10	8	5	4	6
2 EORSATs and 2 RORSATs	9	8	8	7	6	5	4	2.3	2.2	3
4 EORSATs and 4 RORSATs	5	4	4	4	2.9	2.4	2.1	1.2	1.1	1.6
4 EORSATs and 7 RORSATs	4	3	3	3	2.4	2.0	1.7	1.0	0.9	0.9

[a] Adequate coverage is based on revisit times of two hours or less. Location data more than two hours old are usually considered too inaccurate for targeting.

☐ Adequate target coverage

~~Secret~~

Area Between 50 and 70 Degrees North Latitude



634924 8-83

34. Seven RORSATs were launched between the Cosmos 954 and Cosmos 1402 incidents, indicating the Soviets' desire to continue the RORSAT program despite adverse world reactions. Nuclear reactors are used on the RORSAT because low orbit complicates the effective use of large solar arrays. A probable Soviet goal would be to increase RORSAT lifetime significantly beyond the 50-day average mission duration. We believe the system was designed for a much longer operational life, because the quantity of onboard propellants for orbit maintenance is sufficient for mission durations of about 210 days and the nuclear reactor power supply should last at least a year. We expect the RORSAT will evolve into a new generation of space-based radar systems. Although we have no evidence of such a system, we believe an advanced RORSAT will be deployed by the late 1980s that will be able to operate in adverse weather conditions and may be less susceptible to jamming and electronic countermeasures. [redacted]

Submarine Detection

35. During the past several years we have learned that the Soviet research program to detect submarines from space is much more extensive than we had previously believed [redacted] Data collected by the various imaging and advanced nonimaging space systems will add to the knowledge of the feasibility of detecting surface effects produced by ships and submerged submarines. [redacted]

36. [redacted] Future Soviet high-altitude data relay satellites could service networks of sonabuoys for submarine detection. But, to provide useful, real-time data directly to a user, the satellite would require an onboard signal processor. We are uncertain whether such a capability could be achieved in the next 10 years [redacted]

37. We have limited knowledge of the precise nature and degree of success of the Soviet submarine detection program. [redacted] Therefore, we cannot state with confidence that they have not had some success in their research. 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 were to occur, 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 simultaneously track a substantial fraction of the US nuclear-powered ballistic missile submarine (SSBN) force. We are more uncertain, and hence more concerned, about the capabilities that could potentially be realized and deployed in the mid-to-late 1990s. [redacted]

38. An alternative view [6] is that the preceding text understates our knowledge of the extent of the Soviet research program to detect submarines from space [redacted] Further, the holder of this view believes the Soviets have not had significant success in these techniques and are unlikely to achieve a technological breakthrough in remote sensing of submarine-generated effects during the next 10 years. The holder of this view believes that the US Navy's understanding of the basic phenomenology of submarine detection is sufficiently advanced to support the conclusion that an effective broad area search and detection capability will not emerge from Soviet R&D activity during the next decade. For many years the US Navy has had an intensive R&D program in submarine detection. One of the objectives of this program has been to examine the detectability of submarines by sensors utilizing the same procedures observed in Soviet R&D activity. None of these sensors has shown an adequate detection performance to be able to have a significant impact on Soviet ASW capabilities for broad area search. The US Navy continues to examine extensively phenomena that might permit the detection of submarines. So far, there are no phenomena known to the US Navy that could be exploited by the Soviet Union to develop an operationally significant detection capability against US SSBNs within the foreseeable future. [redacted]

[6] *The holder of this view is the Director of Naval Intelligence, Department of the Navy.* (U)

Warning and Attack Assessment

39. The Soviet launch detection satellite (LDS) system currently provides continuous, real-time coverage of the US ICBM fields. Such coverage is being achieved by eight satellites in appropriate semisynchronous orbital positions. We expect a nine-satellite LDS system will be completed during 1983, providing continuous redundant coverage. Operational satellites can detect both isolated and massive launches of US ICBMs and can provide about 30 minutes' warning before impact. We believe they can also provide limited attack assessment information. These satellites are not intended, nor can they be effectively used, to provide coverage of submarine patrol areas. (See figure III-6.) [redacted]

40. [redacted]

[redacted]

[redacted]

[redacted]

25X1

25X1

44. The Soviets experienced reliability problems early in the LDS program (see figure III-7), but they

Figure III-7

25X1

CIA Statute