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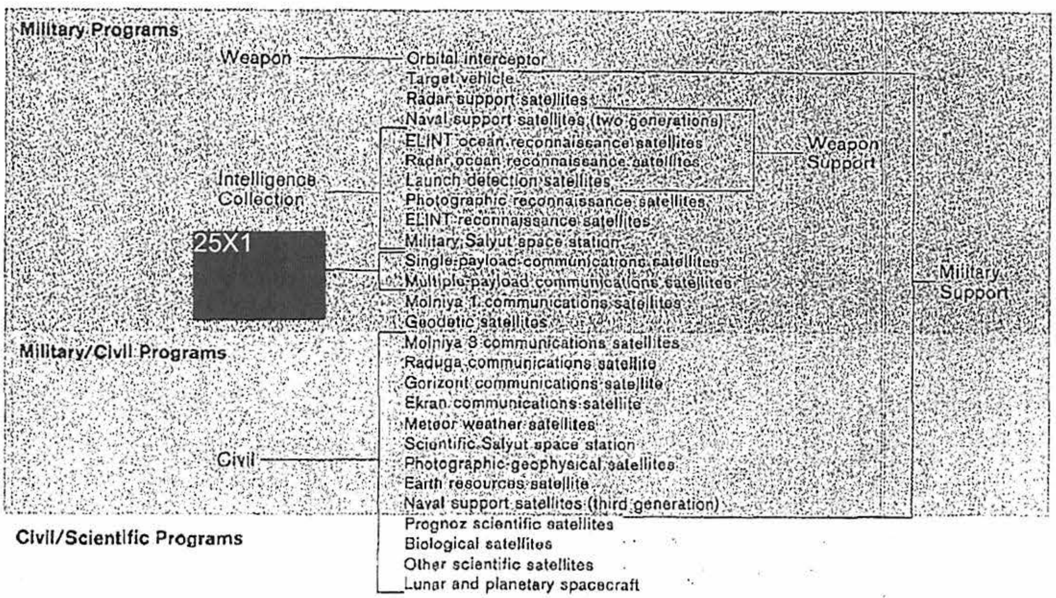
Figure 3.
Soviet Spacecraft Categories



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advances in design and propulsion. The most significant advance will be in the use of high-energy (liquid hydrogen) upper stages, which could allow the Soviets to place 180,000 kg into low Earth orbit. In addition to these large boosters, the Soviets are developing a smaller SLV with a liquid hydrogen upper stage that will probably have a payload capability of 14,000 kg to low Earth orbit.

18. We believe the Soviets will continue the use of expendable SLVs for the next decade. They are refurbishing older launch sites and building new ones. And they are increasing the production rate of their SL-12/13 SLVs, as well as preparing to introduce new, expendable SLVs. The new large space boosters that will enter flight test at Tyuratam in the mid-1980s will probably be used in the late 1980s to launch very large space stations and heavy lunar and planetary spacecraft, and could be used for orbital tests of a reusable space transportation system comparable in size and weight to the US space shuttle orbiter.

Soviet Space Hardware Costs

19. Figure 7 depicts Soviet investment in space hardware for both military and civil/scientific programs for the period 1960-79. The dollar cost estimates shown in figure 7 represent what it would cost in the United States to duplicate the Soviet programs, using US cost factors and pay rates. Costs are expressed in 1979 dollars. This hardware cost estimate excludes

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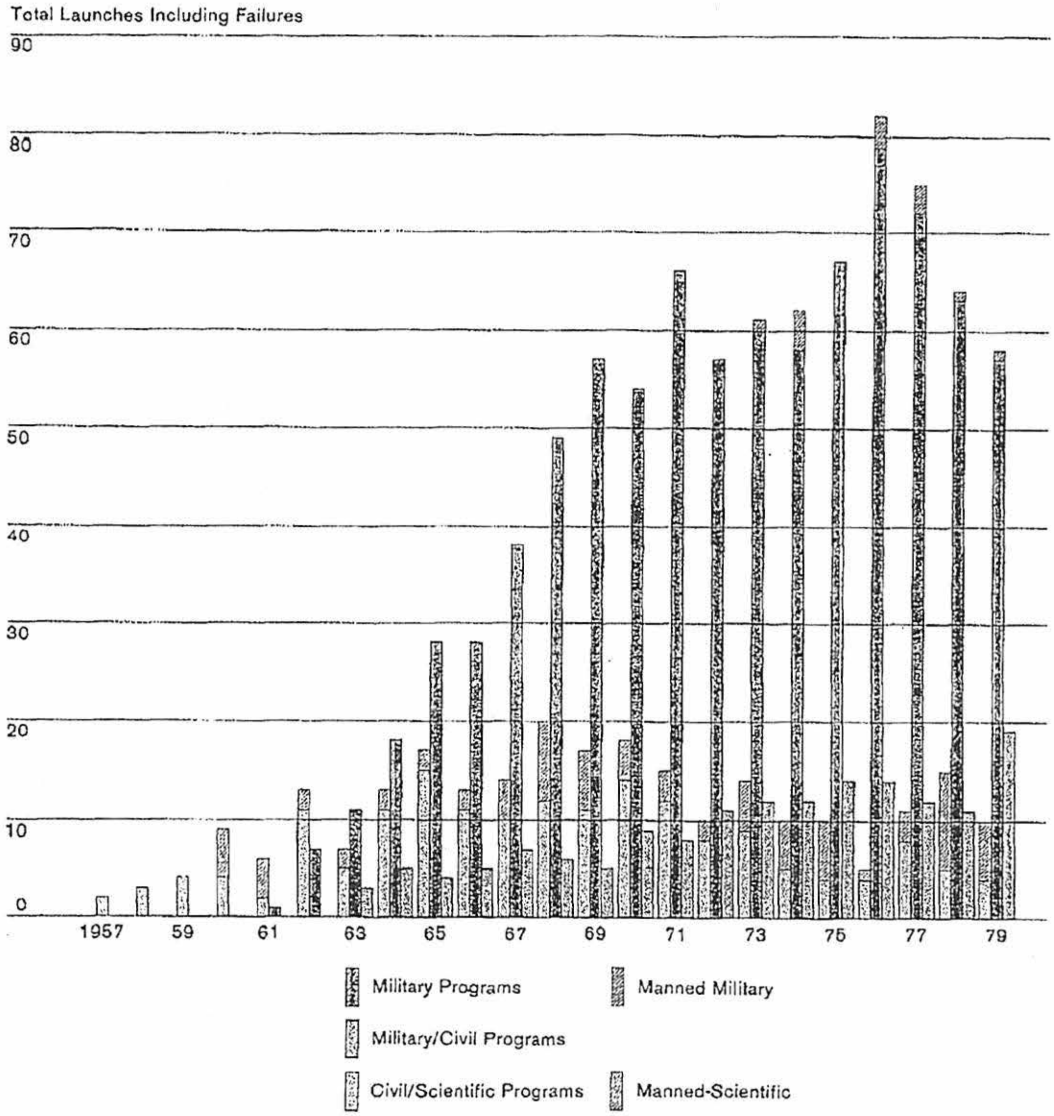
Figure 4.
Soviet Space Launches by Category



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research and development, administration, tracking and data acquisition, and the construction of new facilities. The absolute values shown for annual expenditures contain large uncertainties and should be regarded as approximations. We have more confidence in the validity of the trends depicted and in the relative costs of military and civil space hardware than we do in the absolute values for annual costs.

20. In the past six years Soviet investment in space hardware is estimated to have cost the equivalent of $5-7 billion per year. Despite the large number of military spacecraft launched each year, the hardware costs of most of these missions is incrementally much smaller than that of most civil missions. In our derivation of the annual spending for space hardware, we have allocated the cost of spacecraft having both military and civil missions according to our judgment of the proportion of the program devoted to each mission. On this basis the annual cost of civil and military programs during the last two decades has been about the same. In the late 1960s the high expenditures on lunar efforts drove civil costs above military costs. In the mid-1970s the large expenditures on new military programs, principally manned military space stations, caused military costs to exceed civil expenditures. The rise in civil/scientific costs in the last few years is attributed to the deployment of more complex geosynchronous satellites for civil communications and the initiation of the Salyut-6 scientific manned space station program.

21. During the past six years the Soviet manned space effort, which has military as well as civil and scientific purposes, has been the single most costly program, accounting for 15 to 20 percent of total space hardware costs. The cumulative costs through 1979 of the Salyut-6 mission alone—consisting of the space station, 10 Soyuz ferry spacecraft, seven Progress resupply vehicles, one Soyuz-T, and 19 launch vehicles—reached almost $2 billion. During this period, expenditures for military programs have accounted for somewhat more than 3 percent of total Soviet military procurement.

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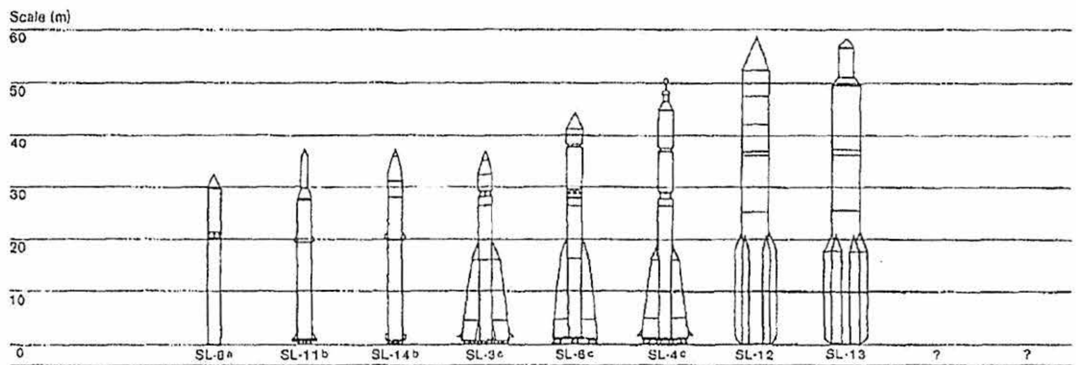
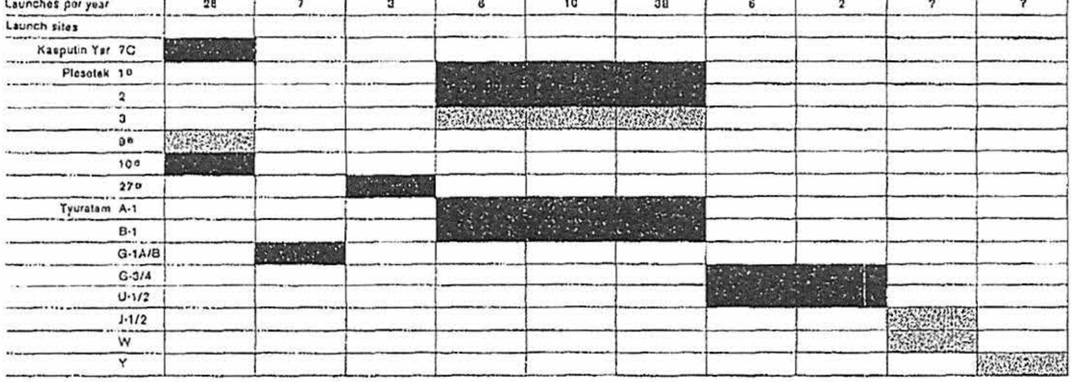
Figure 6
Soviet Space Launch Vehicles, Payloads, and Launch Sites



	SL-8[a]	SL-11[b]	SL-14[b]	SL-3[c]	SL-6[c]	SL-4[c]	SL-12	SL-13	?	?
Payload weight (kg) to 185-km orbit	1,800	4,000	5,000	5,000	7,000	7,000	18,000	19,000:	180,000	14,000
Payloads	25X1 Naval Support Geodetic ELINT (2nd Gen) Radar Support ASAT Target Scientific	ASAT Intercept Radar Reconn. ELINT Ocean Reconn.	ELINT (3rd Gen) Scientific	ELINT (3rd Gen) Meteorological	Molniya Prognoz Launch Detect	Soyuz Progress Photoreconn. Cos. 670-type	Ekran Gorizont Raduga Venera Mars Luna	Salyut Cos 929-type Dual Payload		
Launches per year	28	7	3	6	10	38	6	2	?	?



Site being refurbished, modified, or newly under construction

Active launch site

[a] Derived from SS-5 IRBM
[b] Derived from SS-8 ICBM
[c] Derived from SS-6 ICBM
25X1
[d] Those sites have two launch pads

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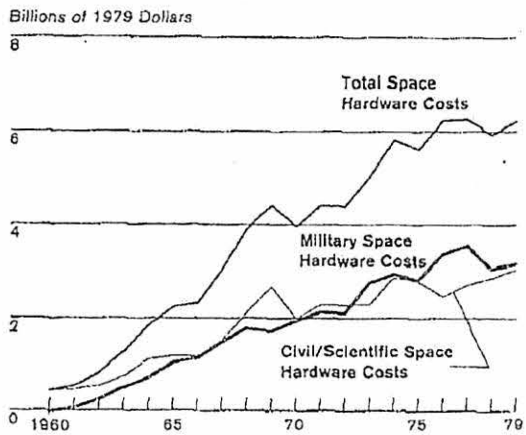
Figure 7
Soviet Space Hardware Costs



Costs of joint military/civil spacecraft have been apportioned according to mission purpose.

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Management and Organization of Soviet Space Program

22. Broad national space policies and goals are established by the Politburo, which also has the ultimate decisionmaking authority for space issues and policy. A key figure in the decisionmaking apparatus is the party secretary for defense affairs. This "supermanager" has responsibility to monitor all matters related to the development of military weapons and space systems. The position carries great authority, including command over resources of all party and government organizations devoted to military and civil space research, development, and production.

23. The second critical level of the decisionmaking hierarchy consists of the governmental organizations under the Council of Ministers. Figure 8 depicts the management organization at this level responsible for both military and civil space programs. The Military-Industrial Commission (VPK) oversees major development programs, enforces deadlines, and arbitrates program-related controversies. The Academy of Sciences probably exercises control over the basic research aspects of the Soviet space program. The Academy's Institute of Space Research (IKI) directs the development of prototype space instrumentation and assists the appropriate ministries in determining the best allocation of assets for making the hardware.

24. The Ministry of Defense (MOD) monitors the quality of materials and components manufactured at all facilities. Subordinate to the MOD is a Strategic Rocket Forces (SRF) organization identified as the Chief Directorate for Space Service (GUKOS). This organization is responsible for the procurement, development, and production of a large number of space systems, including evaluation, testing, and quality control. Other organizations similar to GUKOS may exist within the Navy and PVO Strany (Air Defense Forces) for the procurement of some space systems.

25. The Ministry of General Machine Building (MOM) has assigned the responsibility of designing new civil and military space systems and improving older systems within five of 13 major design bureaus. Each of these design bureaus is functionally equivalent to a US aerospace corporation. Their task is to translate feasibility studies from the scientific community and requirements from the military into operable space systems. To complete this task, design bureaus perform conceptual designs, fabricate mockups and prototypes, and conduct overall systems integration. In table 2, we have identified the principal customers for Soviet space systems and the design bureaus which we believe were responsible for developing the systems.

26. The production of space systems appears to be conducted under the supervision of design bureaus, but at plants not necessarily subordinate to them. Pilot plants, often colocated with a design bureau, may actually produce all of those spacecraft which are expended in limited quantities. In the case of frequently launched SLVs and spacecraft types, series production may occur at independent plants. In the latter case, however, we believe that the design bureaus have representatives at the plants to ensure that performance standards are met, conduct quality control measures, and suggest ways to improve production efficiency.

27. During the 23 years of their space program, there has been no significant change in the Soviets' highly standardized development process. This process, which is similar for missile and space systems, typically covers a 10- to 15-year time span. Once the decision is made to proceed with development of a new technically complex space system, an estimated seven to 10 years is required to complete the design,

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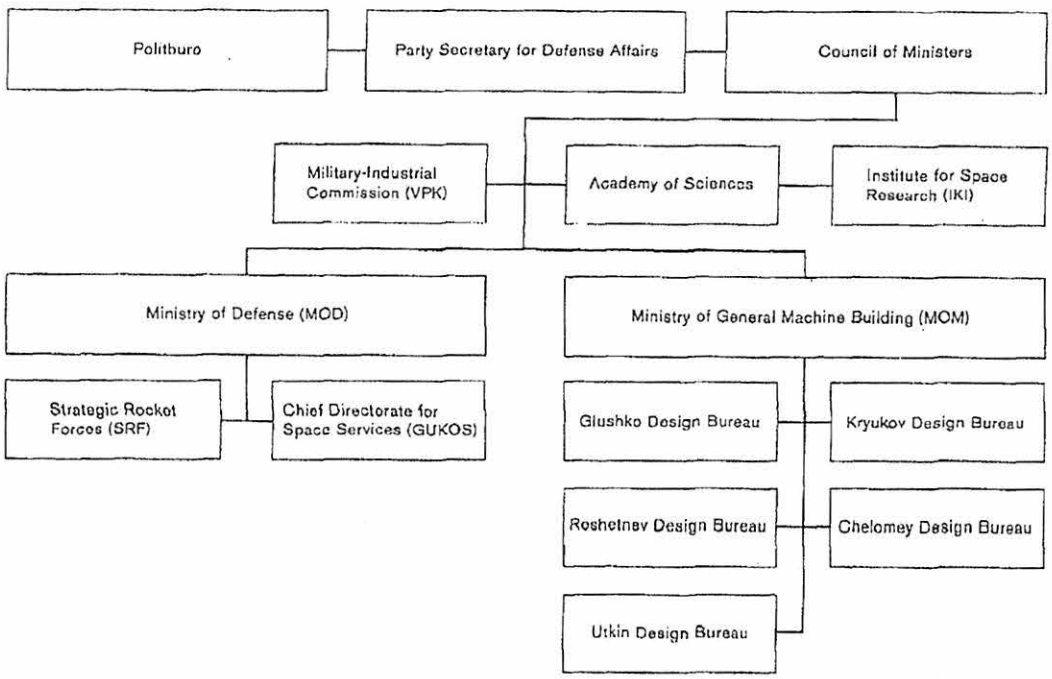
Figure 8

Management and Organization of Soviet Space Program



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engineering, and manufacturing phases of development before flight-testing of a prototype. Many of their more recent spacecraft programs have required excessive time to correct major problems that become apparent in the flight test phase, which normally lasts two to four years. Figure 9 depicts the typical time line for development of a Soviet space system if no major difficulties are encountered.

28. The Soviet method for developing space systems has several advantages, as well as disadvantages, when compared with the methods used in the United States. Because Soviet design bureaus are highly specialized and form a permanent part of the bureaucratic establishment, funding and employment levels are more stable and not subject to the frequent disruptions inherent in a competitive contracting environment. This fairly static space management process operates in a complex manner, however, and does not appear to have a central coordinating agency. Central direction is apparently attempted through various coordinating devices that in the United States have been centralized within NASA or the Department of Defense. The system is not adaptive, and it lacks the ability to recognize and solve complex problems in a short time. However, Soviet missile and space system development practices have fostered the growth of powerful individuals who often operate outside the standard channels of Soviet management to solve problems which arise within their programs. This has helped the Soviet space effort overcome some of its shortcomings.

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Table 2

Principal Customers of Soviet Space Systems

Space Systems	Principal Customers	Likely Developer
Orbital interceptor	[redacted] 25X1	[redacted]
Target vehicle		
Radar support		
Launch detection		
ELINT ocean reconnaissance		
Radar ocean reconnaissance		
Naval support		
Photographic reconnaissance		
Photographic-geophysical		
Earth resources-photographic		
ELINT reconnaissance		
Single-payload communications		
Geodetic		
Military Salyut space station		
Ekran communications		
Gorizont communications		
Molniya 3 communications		
Raduga communications		
Molniya 1 communications		
Multiple-payload communications		
Meteorological		
Civil Salyut space station		
Biological		
Scientific		
Lunar and planetary		
Prognoz		

25X1 [redacted]

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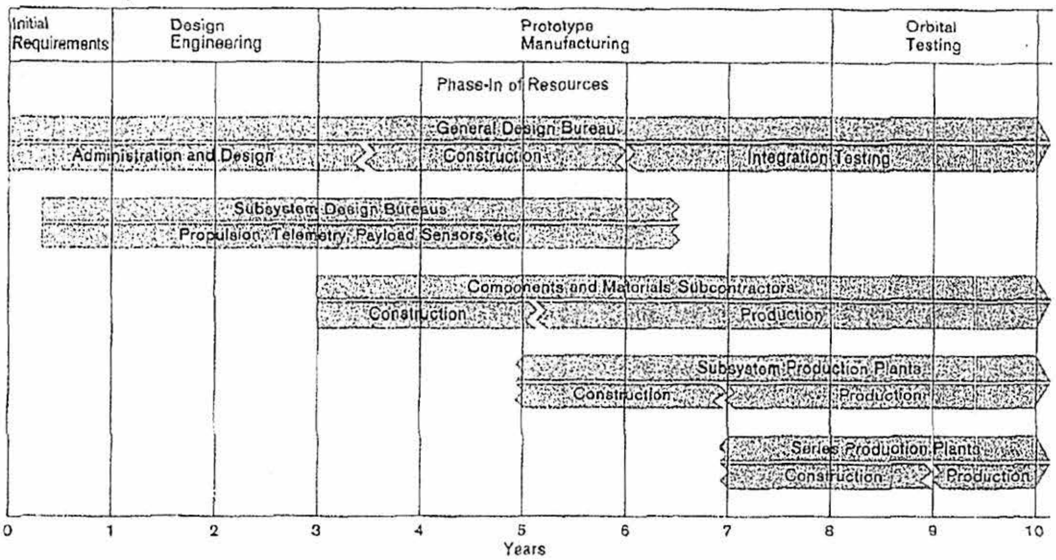
Figure 9
Stages in Typical Development Program for Soviet Space Systems

Major Development Periods



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II. CURRENT AND PROSPECTIVE MILITARY SUPPORT SPACE SYSTEMS

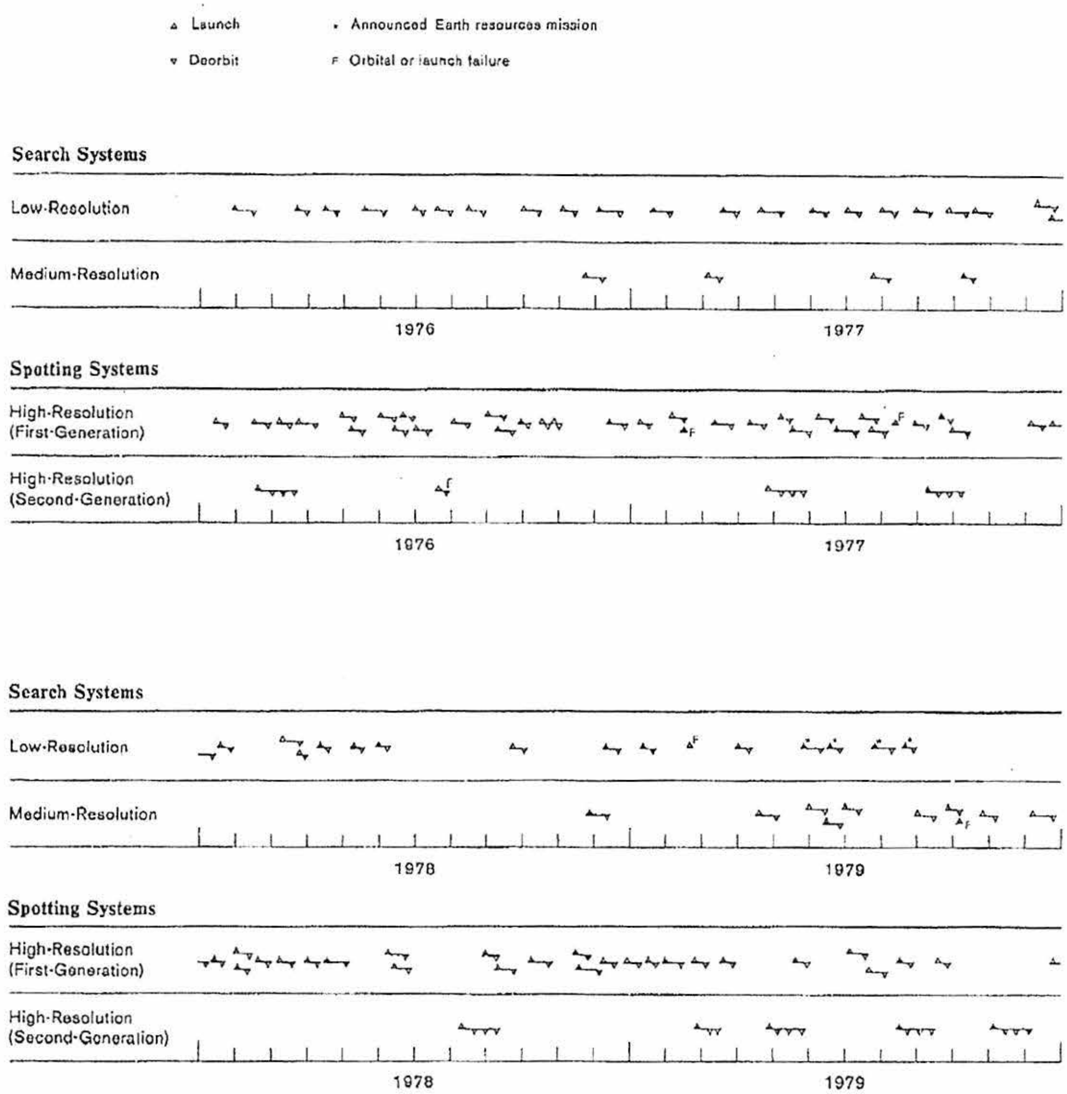
29. In this section, we address the capabilities and limitations of current Soviet military support space systems. We make near-term projections based on some direct evidence, on trends in Soviet spacecraft development, and on identified deficiencies in current systems. We make longer term projections based on our views of the Soviets' perceived needs, their technological state of the art, and our knowledge of their development cycle.

30. While we believe that our current knowledge of the technical characteristics, performance, and uses of most current Soviet satellite systems is adequate, two factors limit our understanding of these systems. First, the large number of Soviet space systems operational and under development has forced us to be selective in the allocation of our collection, processing, and analytic resources. Second, [redacted] We believe they will continue using such information-denial techniques and will probably expand their use. [redacted]

Unmanned Photoreconnaissance/Imaging Satellite Systems

31. Photographic reconnaissance is by far the most active Soviet space program in terms of launch frequency. About one-third of all Soviet spacecraft launched each year have photoreconnaissance missions. Figure 10 shows the launch and recovery activity over the past four years of those Soviet photoreconnaissance satellites having a primary mission of intelligence collection. The high launch rate has been dictated by an apparent operational requirement to

Figure 10
Soviet Photoreconnaissance Satellite Activity, 1976–79



obtain nearly continuous photographic coverage using space systems that are technically limited. The Soviets' photographic satellites use space vehicles originally designed as manned spacecraft and are too heavy to be placed into sun-synchronous orbits by the booster currently used. Also, most of these satellites are battery powered and thus have limited lifetimes. As a result the Soviets have opted for short-duration missions in orbits where lighting conditions remain favorable for only limited periods of time. Further, their film technology has restricted the total capacity of their satellites. We believe these technical limitations led to a choice of 13 days for the majority of their missions. Over the last six years the Soviets developed a photoreconnaissance satellite with solar panels and the capability to deorbit multiple "buckets" from the main spacecraft, enabling them to stretch some missions to 44 days. Orbital maneuvers allowed for maintenance of favorable lighting conditions. The Soviets have no system with timeliness comparable to the KH-11, which is continually in orbit and transmits imagery to a ground station in near-real time.

32. To gain more timely data, the Soviets have on occasion launched several photoreconnaissance satellites in a short period of time. For example, during the 1973 Middle East war, they 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 launch pads because the Soviets have developed systems with short on-pad stay times. The Soviets fuel the spacecraft, mate it to the booster in a horizontal position, and perform all of their subsystems checkout in checkout buildings located near their launch sites. (Although the United States also employs a limited number of launch pads, all of these time-consuming mating and checkout functions are performed while the booster is erected vertically on the launch pad.) 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 1969, the Soviets demonstrated a minimum time of two days between successive launches from the same launch pad.

33. Table 3 lists the Soviet photoreconnaissance satellite system types and their most important capabilities. The estimated best resolution of the best Soviet system is 12 inches [redacted] The Soviets' first-generation high-resolution system and the camera system used on Salyut 5 are the only ones known to provide stereo photography. The second-generation, high-resolution system is the first to make operational use of film-return capsules and solar panels to increase mission duration. Alternatively, with this system the Soviets can increase the timeliness of the data by deorbiting capsules early without having to launch a new photoreconnaissance satellite.

34. The annual number of launches of these systems has remained relatively constant for several years. In 1979, however, the launch mix of systems changed significantly (see figure 10); this change is probably a harbinger of future activity. Two of the the Soviets' newest photoreconnaissance systems, the medium-resolution and the second-generation high-resolution, appear to be fully operational. This has given the Soviets greater flexibility in their photoreconnaissance program.

35. It appears that the Soviets have phased out the use of the low-resolution system for search missions, supplanting it with the medium-resolution system. By doing this, they have sacrificed the large amount of area coverage the low-resolution system normally provided. The Soviets could counteract this loss by launching large numbers (more than 20) of medium-resolution systems each year, which is unlikely. It is more likely that they will supplement the medium-resolution coverage with data obtained from low-resolution Earth-resources missions and space stations (when available).

36. For spotting missions, the Soviets have begun to rely more on the second-generation high-resolution system, cutting in half the number of first-generation high-resolution systems launched annually. Reducing the number of first-generation high-resolution systems decreases the amount of stereo coverage (the second-generation high-resolution system is not assessed as having a stereo capability at this time). However, the Soviets lose little if any area coverage with the apparent new mix, and gain in the amount of higher resolution photography.

37. We expect the Soviets to continue using some mix of these current satellite systems, with the possible exception of the low-resolution system, for the next several years. Evolutionary improvement in photographic quality is expected to continue. They may introduce film-return capsules on other photo systems

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Table 3

Current Soviet Unmanned Photographic Satellite Reconnaissance Systems

System	Estimated Coverage for Single Mission	Estimated Resolution	Nominal Lifetime	Number per Year	Year Introduced	Mission
	25X1 [redacted]					
Low-resolution	[redacted]				1961	Search
High-resolution (first-generation)	[redacted]				1963	Spotting
High-resolution (second-generation)	[redacted]				1974	Spotting
Medium-resolution	[redacted]				1976	Selected search
Earth resources	[redacted]				1975	Crop status, natural resources, mapping
Photographic-geophysical	[redacted]				1971	Mapping, charting, geodesy

25X1 [redacted]

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to further increase mission lifetimes. However, we expect them to maintain their ability to orbit short-duration missions quickly.

38. Additionally, we believe the Soviets perceive the many advantages of a near-real-time imaging satellite system like the US KH-11. Such a system in sun-synchronous orbit would provide them much greater responsiveness to changing collection requirements (such as during crisis), and could eliminate the need for the costly, frequent launches of their current film-return systems. We believe they will have the necessary critical technology—large arrays of electro-optic sensors or charge coupled devices—for a near-real-time imaging system, as well as that required for data-relay satellites, by the early 1980s. Although we have no evidence of Soviet intentions to develop such a system, we believe that it is highly likely they will elect to proceed with system development. If the decision has already been made, the first orbital flight test could occur in the late 1980s or early 1990s.

39. As an interim measure to acquire imagery more rapidly, the Soviets may use a photographic satellite system equipped to develop film on board automatically and transmit imagery data to a ground station. We believe they may have tested such a system during 1976 on their last manned military Salyut space station. If such an interim system proves effective, development of a real-time imaging system may be delayed.

40. A radar-imaging system could augment the USSR's photoreconnaissance satellite systems by obtaining images in all types of weather and lighting conditions. The critical technology for such a system is specialized signal and data processing, which we believe the Soviets could have in the early-to-middle 1980s. Solely on the basis of our view of Soviet perceived needs, we believe that there is about an even chance the Soviets will decide to develop such a system. If they do so, an orbital flight test is not expected before the 1990s.

ELINT Reconnaissance

41. The Soviets' program to collect ELINT began concurrently with their photoreconnaissance program. The first ELINT collection was from the second Soviet low-resolution photoreconnaissance satellite, which was launched in 1962. [redacted] Subsequent generations of satellites introduced in the late 1960s and early 1970s were dedicated to ELINT collection [redacted] It appears the Soviets have phased out the "piggyback" ELINT package on the low-resolution photo missions.

42. The Soviets have two operational satellite-borne ELINT reconnaissance systems that apparently have been designed to collect data of sufficient quality to identify land- and sea-based radar types and, in some cases, to locate radar emitters. Another system, designed for ELINT ocean reconnaissance, has been under flight test development since 1974 and may be nearing an operational status. [redacted] The Soviet systems were apparently designed to specifications that emphasized coverage of US sea-based radar systems, and to use the data primarily for the purpose of locating ships.

43. The Soviets have made evolutionary improvements to their satellite ELINT systems over the years. Their third-generation system, introduced in 1970, was the first to have an integral direction-finding capability. It also has improvements over the second-generation system [redacted]

44. In late 1974, the Soviets launched their first ELINT ocean reconnaissance satellite (EORSAT). This system has the capability to provide targeting data in real time to Soviet naval combatants, as well as to store for later transmission to Moscow. [redacted]

[redacted]

45. At least 10 Soviet naval combatants are currently configured to receive the EORSAT data. Major limitations of the EORSAT system include the following:

- Ships using emission control could go undetected.
- The time between accesses to ocean areas near the equator is excessive (measured in days).
- Demonstrated satellite lifetime is short (one to five months) relative to other ELINT collection satellites.
- Real-time ELINT data dumps must be preprogramed by Moscow.

46. We believe the Soviets will continue using their third-generation ELINT satellite and the EORSAT for the next several years. [redacted] Improvements in the USSR's EORSAT program will probably include use of multiple satellites to improve access time, more Soviet naval combatants fitted to receive the data directly, and a greatly increased lifetime.

47. Additionally, the Soviets may perceive the advantages of ELINT-collection satellites designed for operation in geosynchronous or semisynchronous orbits. Advantages of high-altitude satellite collectors, [redacted] include continuous access to areas of high interest [redacted] much greater responsiveness to changing collection requirements, and the need for fewer satellites.

48. We believe the Soviets have the necessary technology to develop a high-altitude ELINT collection

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25X1
[redacted]

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system. While we have no direct evidence that they intend to do so, we note that the Soviet military is sponsoring work on large spaceborne antennas (the 10-meter-diameter antenna deployed on Salyut 6, for example, was developed under military sponsorship). Large, high-gain antennas are required on collection satellites at high altitude to provide the necessary sensitivity for the detection of low-power signals radiated from emitters on the Earth's surface. On the basis of the listed advantages of high-altitude ELINT collection systems, continued Soviet interest in ELINT collection by satellites, and military-sponsored development of suitable antennas, we believe there is a moderate likelihood the Soviets are developing such a system. Assuming they are, we expect that the first orbital flight test could occur by the mid-1980s. If such a satellite had the necessary receiver sensitivity, frequency coverage and antenna size, it would have the capability to intercept telemetry and communications signals. Because Soviet requirements for such systems may not be compelling, we believe that the first orbital flight tests of a system dedicated to telemetry and communications intercept will not occur before the late 1980s.

Radar Reconnaissance

49. The Soviets initiated flight tests of their radar ocean reconnaissance satellite (RORSAT) system in 1967. This system uses a surveillance radar to detect and locate ships of destroyer class and larger. It can be programed to transmit the data in real time to selected naval combatants. The Soviet satellites are launched into circular orbits 280 kilometers above the Earth. After mission termination, a segment of the spacecraft containing a small nuclear reactor for generating electric power is separated and commanded into a higher (900 kilometers) orbit, where it will remain for 500 to 1,000 years, allowing time for decay of the radioactive fuel. The United States has no space-based radar system comparable to the Soviet RORSAT.

50. The RORSAT is not an imaging system. Radar return (echo) signals are processed only if they are very strong, as from a large ship. [redacted]

[redacted]

51. Major advantages and capabilities of the RORSAT system are as follows:

— [redacted]

— It permits multiple passes per day over ocean areas at high latitudes (such as, the Norwegian and Barents Seas), [redacted]

[redacted]

The RORSAT system also has some major limitations, as follows:

[redacted]

25X1

52. The RORSAT program has experienced numerous onboard system failures. Table 4 lists all the RORSAT launches to date and, where known, the cause of failures. The failures have been due to various causes, making it difficult for the Soviets to correct all problems and produce a reliable system.

53. The Soviet RORSAT program suffered a major setback in January 1978, when a RORSAT, including its nuclear reactor, made an unintentional reentry, scattering radioactive debris in Canada's Northwest Territory. The resultant adverse world reaction to the use of nuclear power sources in space led to deliberations in the UN outer space subcommittees where 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, the Soviets launched the first RORSAT since the Canadian incident in April 1980, after a 27-month standdown. The long hiatus was undoubtedly to allow time for necessary technical modifications but the modifications probably do not account for the full 27-month period, because the latest RORSAT appears to have a configuration nearly identical to that of previous satelltes in the program. A possible factor influencing the Soviet decision to resume launches in this program may have been the need to obtain better coverage of US naval activities in the Arabian Sea.

54. This most recent RORSAT launch clearly indicates the Soviets will continue their RORSAT program despite adverse world reactions to the Canadian incident. The Soviets must continue the use of the nuclear reactor in the current RORSAT design since the low orbit prohibits the effective use of large solar arrays to satisfy the large and continuous power requirements of the radar system. Soviet goals for this program probably include increasing RORSAT lifetime significantly

Table 4

Mission Duration History of Radar Ocean Reconnaissance Satellites (RORSATs)

Launch Date		Operational Lifetime (days)	Remarks
1967	27 Dec	25X1	
1968	22 Mar		
1969	25 Jan		
	1 Nov		
1970	3 Oct		
1971	1 Apr		
	25 Dec		
1972	21 Aug		
1973	25 Apr		
	27 Dec		
1974	15 May		
	17 May		
1975	2 Apr		
	7 Apr		
	12 Dec		
1976	17 Oct		
	21 Oct		
1977	16 Sept		
	18 Sept		
1980	29 April		Still active as of date of this report.

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beyond the 74 days seen so far by eliminating system problems causing premature failures. We estimate that the quantity of onboard propellants for orbit maintenance is sufficient for mission durations of about 150 days. (The nuclear reactor power supply would be good for at least a year.) We expect the RORSAT program will evolve into new generations of space-based radar systems. On the basis of evolutionary trends in most Soviet space systems and of our estimates of current RORSAT limitations, we believe the Soviets will, by the late 1980s, develop an advanced version of the RORSAT that will be able to operate under adverse weather conditions and be able to detect small ships.

55. Data collected by both imaging and advanced nonimaging space systems will add to Soviet knowledge of the feasibility of detecting surface effects produced by ships and submerged submarines. [redacted] The feasibility of detecting surface effects of submerged submarines remains highly questionable.

Missile Launch Detection

56. The Soviets began flight tests of a missile launch detection satellite (LDS) system in 1972. The first phase of the LDS program consisted of five developmental flights—four into semisynchronous orbits and a fifth (1975) into a geostationary position over the South Atlantic. [redacted] None of these first phase satellites is currently operational.

57. A new phase of this program, which began in late 1976, represents a Soviet effort to establish an operational network of satellites using the semisynchronous orbit. [redacted]

[redacted]

58. The Soviets have been plagued with problems since 1972 in their efforts to establish an operational network. By the way of contrast, the United States has had an operational network of satellites for early warning of missile launches for more than 10 years. The US program uses three satellites designated DSP (Defense Support Program) in geostationary orbit to obtain worldwide coverage of ICBM and SLBM launches. Figure 12 shows the history of launches in the second phase of the Soviet LDS program, which began in 1976. Seven of the 12 satellites launched have broken up in orbit [redacted]

59. The Soviets successfully orbited an LDS in April 1980 and another in June 1980, after suffering a failure to orbit one in February 1980. This activity may be an indication that the Soviets believe they have successfully identified and corrected the problems that caused the breakups of earlier LDS spacecraft. The Soviets could establish a network of five satellites in less than one year, which could provide 24-hour coverage of US ICBM sites. A complete network of nine satellites providing some redundant coverage could be available about half a year later. Because we expect continued problems in this program, it may be as late as 1983 before a network providing continuous coverage of US ICBM fields is available. Deployment of an LDS network with coverage of all current and planned US SLBM and ICBM launch areas, probably could not be accomplished before the 1990s.

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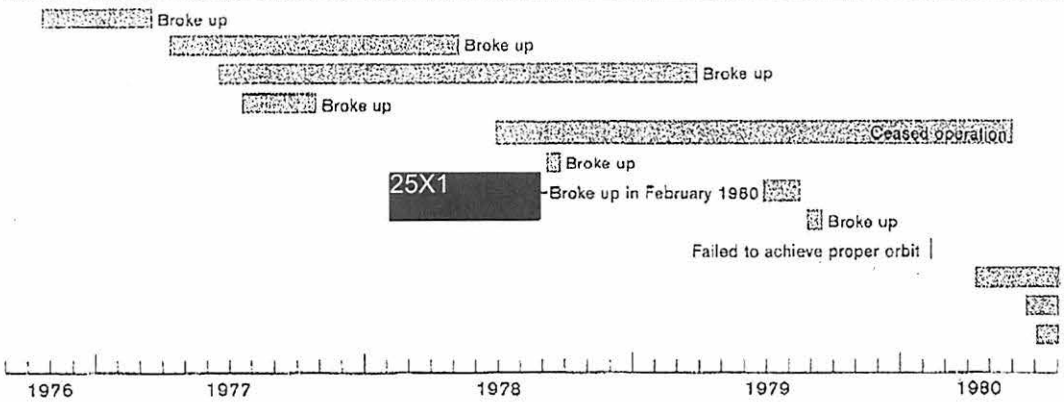
Figure 12
Lifetimes of Soviet Launch Detection Satellites Launched in Second Phase of the Program



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Manned Military Spacecraft

60. Since 1971, Soviet cosmonauts have periodically occupied two different kinds of Salyut space stations. Salyuts 2, 3, and 5 were primarily military in nature and functioned as intelligence collection platforms, although the Soviets used "scientific research" as a cover for their mission. Salyuts 1 and 4 were primarily for scientific purposes, as is their current Salyut 6, but all have supported military-related R&D programs. For example, both the military and scientific Salyuts have been used for conducting missile launch detection experiments, and these could have some application to development of future military satellites.

61. Both Salyut programs have gained the Soviets some degree of prestige worldwide. In 1979, they set a new man-in-space endurance record of 175 days aboard Salyut 6. (The United States set a manned endurance record of 84 days in 1974 aboard the Skylab space station). Long-term operation of Salyut 6 has been achieved through use of unmanned Progress spacecraft, which are used to resupply the space station with fuel and other expendables. Cosmonauts are shuttled to and from the space station in Soyuz ferry vehicles.

62. The last military Salyut, which was launched in June 1976 and intentionally deorbited in August 1977, carried both low- and high-resolution camera systems. [redacted] The space station may also have had a system for transmitting imagery data directly to a ground station. [redacted]

63. Use of data transmission systems would permit more timely recovery of photographic data than is possible with the Soviet photoreconnaissance satellite systems currently in use. The first opportunity to transmit to Moscow using the standard Soviet space

station orbit would be about eight hours after a photographic session over the United States. The first such opportunity after coverage of NATO countries would be about five to 10 minutes after the pictures were taken. It is doubtful, however, that the film could be processed for transmission that quickly. The Soviets would probably have to wait for the next pass over Moscow, some 90 minutes later.

64. The role of the cosmonauts in the photographic activity is not known. Reasonable roles would include:

— Changing the film.

— Making minor repairs or adjustments.

— Determining cloud cover conditions over areas to be photographed.

— Orienting the space station to center targets to be photographed.

— Accomplishing preliminary interpretation of photography.

65. The Soviets' writings and statements indicate that they intend to increase the frequency, duration, and scope of their manned space flights. They continue to expound on their desire to achieve continuously manned, Earth-orbiting space stations. We believe they have demonstrated the necessary technological requirements for such operations. They have frequently stated an intent to dock multiple Salyut space stations together to form a larger space complex. [redacted]

66. The Soviets have under way a number of developmental activities that will affect their future manned military space capabilities. Such activities have included the following:

— One flight test in 1977 of a new large space station consisting of a large maneuverable segment and a smaller recoverable segment. The total spacecraft [redacted] was about 70 percent the size of a Salyut space station (but apparently equal in mass) [redacted]

— Four flight tests (one failed) of the recoverable segment, [redacted] Each launch (one each year beginning in 1976) orbited two of these spacecraft, which were recovered after only one or two revolutions. [redacted]

— Six flight tests and one manned mission since 1974 of the new Soyuz T cosmonaut ferry vehicle. This new spacecraft is designed to carry a crew of three, as opposed to two for the present configuration of the Soyuz.

— Development of a military "space plane," believed to be part of a Soviet Air Force program. It is a small, delta-wing vehicle incorporating a lifting-body design for horizontal landings on a runway. A possible prototype was first seen in 1976 at the Vladimirovka Advanced Weapons and Research Center, and has been seen several times since then under the wing of a TU-95 bomber, indicating that drop tests may have taken place. The Soviets probably intend to use their largest currently operational space launch vehicle (SLV), the SL-12/13, to orbit this spacecraft. If the Soviets use the full capacity of this SLV their "space plane" could have a capability to orbit crews of two to six men.

— Refurbishment of two launch sites (estimated completion in 1982) at Tyuratam which previously were used for the Soviets' largest developmental SLV, the TT-5. Development of this SLV was canceled in about 1974 after several major failures during launch attempts. Nearby, the Soviets are building a new large launch complex, with possibly two launch pads (estimated completion in mid-1980s), which will be serviced by the same vehicle assembly building that services the older sites, and probably will use modified versions of the original TT-5 transporter-erector systems. We believe the four launch pads will all be used for a family of new SLVs designed by the Glushko design bureau. We note that the production facility at Kuybyshev, which had been responsible for TT-5 production [redacted] may now be responsible for production of the new Glushko launch vehicles. The new SLVs will have considerably more lift capability than that required for the new small "space plane." We believe that one variant will be capable of lifting a spacecraft comparable in size and weight to the US Shuttle vehicle to near-Earth orbit. A runway, which is to be at least 4,500 meters long, is also being built (estimated completion in early 1980s) near the new launch complex. The runway orientation and size are appropriate for the recovery of manned, reusable spacecraft.

67. [redacted] the US Shuttle and the Soviet Salyut, "space plane," and new space station. We have no direct evidence on what specific military or civilian objectives are to be served by these new manned programs. The projections in the following paragraphs are based largely on a logical interpretation of the available evidence and trends.

68. The new space station with the recoverable segment is probably the next generation of military space station, intended to replace the military Salyut. We project that:

- The space station will be launched with three cosmonauts on board, requiring that the Soviets' largest current launch vehicle, the SL-12/13, be man-rated.
- The orbit will probably have a higher inclination to allow photographic coverage of targets not accessible from the current orbits used by Soviet space stations.
- The current resupply vehicle, Progress, will be used for resupplying expendables.
- The new three-man ferry vehicle may be used for crew rotation every five or six months.
- The station could have a lifetime of several years.
- The recoverable segment could be used in case of an emergency or for final crew recovery. Alternatively, the Soviets could send an unmanned ferry vehicle for final crew recovery, with the recoverable segment solely for emergency use.

69. If used in the above manner, the space station could reduce the Soviet need for frequent launches of unmanned photoreconnaissance satellites. And if the space station has the automatic film-processing and imagery data transmission system suspected of having been on Salyut 5, the imagery would be much more timely (hours rather than days) than that provided by the unmanned systems. [redacted] it probably will carry low- and high-resolution cameras, and may carry other sensors—to collect, for example, ELINT and infrared data.

70. The Soviets have conducted three successful tests in which they orbited two of the recoverable segments on each flight. In each case they recovered the spacecraft after one or two orbits, indicating that their primary interest was in testing its reentry characteristics. We have evidence that they may conduct one more such test. We believe that, after they are satisfied with the performance of the recoverable segment, they will orbit and man a prototype of the new space station. This could occur as early as 1980. The mission will be to check out the space station, cameras and other sensors, and the recoverable segment. By the early-to-middle 1980s they could orbit an operational version of the new space station with three men on board, operating in the scenario outlined above.

71. In the early 1980s, the Soviets could use either the old Salyut space station or the new space station to assemble a multisegment space station. Such a station could be used for a variety of missions: for example, one space station segment could contain a complex of reconnaissance sensors, while a second could serve as a laboratory, containing numerous military experiments for developing better sensors and other hardware for unmanned military satellites. The Soviets could also conceivably use such a laboratory for developmental and feasibility testing of small, low-power lasers and of pointing and tracking subsystems. Such efforts could lead to space-based defensive and antisatellite weapon systems in the 1990s and beyond. Use of manned space stations as platforms for such weapons could provide a mission flexibility not available on unmanned systems. Chapter IV discusses this possibility in more detail.

72. The Soviet delta-wing "space plane" is probably a research vehicle that could be developed for military missions. Such missions might include reconnaissance or satellite inspection; or the vehicle might serve as a space weapons platform. The last potential mission is considered less likely because of the estimated limited payload capability. It also could be developed into a crew ferry vehicle to support space station operations. The "space plane" will probably have a crew of two to six men. It seems roughly comparable to, and may have been motivated in part by, the US Dyna Soar program of 1961-63.

73. In examining the scope and magnitude of the present and projected Soviet space effort, we see many reasons for the Soviets to pursue development of a large reusable space transportation system (RSTS). Their motivations would probably include a desire to economize on space launches, particularly in the area of large space station construction, manning and resupply, as well as the general desire to compete with the United States for prestige. The Soviets' efforts on their space plane and the runway at Tyuratam indicate that they may be in the early stages of an RSTS development program. The much smaller "space plane" will probably provide them with valuable experience and data for such a development effort. If flight tests of this vehicle occur in the early-to-middle 1980s, they could begin development of their RSTS in this time frame and conduct orbital test flights by the early 1990s.

Communications Satellites

74. The Soviets currently operate five networks of communication satellite (comsat) systems. Three of these—Molniya 1, Molniya 3, and Statsionar *—use satellites in high-altitude (semisynchronous and geostationary) orbits. These satellites use wideband transponder systems for real-time reception, amplification, and retransmittal of communication signals. The other two comsat systems—which we designate as multiple-payload communication satellites (MPCS), and single-payload communications satellites (SPCS)—use low-altitude orbits. These satellites record Soviet communications for transmittal at a later time (store-dump).

75. *Molniya 1*—The Molniya 1 comsat system consists of 25X1 [redacted] four satellites. 25X1 [redacted]
25X1 [redacted]

25X1 [redacted]

* The Soviets announced plans in the early 1970s for a geostationary comsat network called Statsionar, which is to use 11 orbital positions. To date, five of these positions have been occupied with Raduga, Ekran, and Gorizont satellites.

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25X1

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