Table VII-3
Soviet Launch Capabilities

Launch System	Number of Launchpads	Estimated Pad Turnaround Time	Estimated Maximum Storage Capacity [a]	Estimated Maximum Initial Launch Rate [b] (per day)
SL-3, -4, -6	6	24 hours	42	6
SL-8	3	12 hours	43	10
SL-11	2	4-5 hours E, RORSAT or 2-3 hours ASAT	22 (combined)	6-8 [c] (combined)
SL-12, -13	4	15 days	36	1 per day for 4 days
SL-14	2	4 to 5 hours	8	6-8
SL-X-16	[redacted]			
SL-W				

[a] These figures are the theoretical maximum storage capacity without providing room for handling and preparation of the launch vehicles

[b] This column does not consider constraints on optimal launch times (for example, satellites can only be launched during certain time windows to perform their missions effectively). The major limiting factors are the availability of propellant and adequate crews for sustained operations. The sustained launch rate probably would be about half of the maximum launch rate. [redacted]

[c] The Soviets could theoretically launch 6 to 8 SL-11s initially. They may be able to launch as many as 10 in the first day, depending on fuel and personnel availability, and Soviet fuel-handling capability [redacted]

This table is [redacted]

Capabilities for Quick Launches

14. The estimated launch rate and local storage capabilities for the current series of Soviet SLVs are described in table VII-3. We believe these capabilities are adequate to meet Soviet augmentation requirements of satellites. The major limiting factors are the availability of propellant and adequate crews for sustained operations. In addition, the Soviets would face great uncertainty about the expected length of the crisis and whether or not to expand or withhold their space assets as the crisis unfolds. [redacted]

15. The demonstrated pad turnaround time for the SS-6-based systems (SL-3, -4, and -6) is 24 hours. Propellants for the SS-6-based systems are loaded from railcars at the site into the launch vehicle on the pad. This may be a constraining factor on the number of surge launches of SS-6-based systems, as it takes about 17 propellant railcars to service a single SL-4 launch.

The maximum number of assembled SS-6-based systems that can be housed within the assembly and checkout facilities at Tyuratam and Plesetsk is about 42. We are uncertain what the payload mix may be because payloads launched by the SS-6-based systems include ELINT 3, Molniya 1 and 3, high-resolution photo, medium-resolution photo, LDS, PHOTOGEO 2, Progress, Soyuz T, Meteor, Meteor 2, and Meteor 3. Assuming adequate propellants and sufficient ground crews are available, we estimate that by using both ranges six vehicles could be launched on the first day. Propellant loading time and crew availability will probably drop the sustained rate to about three launches per day. [redacted]

16. Minimum pad turnaround time for the SL-8 is assessed at 12 hours. Propellants for the SL-8 are loaded into the erected launch system from storage facilities at the launchpad. We estimate the maximum surge capacity for the SL-8 at Kapustin Yar and Plesetsk to be 10 launches per day. However, the payload mix is again uncertain because the SL-8 launches ELINT 2, NAVSAT, SPCS, and MPCS. [redacted]

17. The EORSAT and RORSAT share the SL-11 launch facilities with the ASAT orbital interceptor.

The minimum required on-pad time for the SL-11-launched EORSAT and RORSAT is not known: [redacted] This time could probably be reduced to four to five hours. The ASAT requires only two to three hours to launch [redacted] Currently, there are storage facilities for 22 SL-11 boosters and payloads [redacted] we believe that the majority of the boosters and payloads stored there would be for ASAT missions. [redacted]

18. Facilities at Tyuratam for the SL-12/13 consist of four launchpads, [redacted] and an estimated storage capacity for about 36 boosters. The SL-12/13 launch system has a demonstrated pad turnaround of 15 days. The SL-12/13 payloads include the Raduga, Gorizont, and Ekran geostationary comsats; the GLONASS navigation satellite; the Salyut space station; and the space station module. [redacted]

19. The SL-14 launch facilities at Plesetsk are similar to the SL-11 facilities at Tyuratam, but lack the necessary ground support to prepare EORSATs, RORSATs, and ASATs for launch, and none of those satellites has been launched from Plesetsk. It would be technically feasible to launch such payloads from Plesetsk, but that would entail significant operational complications, and we judge such use to be highly unlikely so long as a viable launch capability exists at Tyuratam. With the launch facilities available at Plesetsk, including the in-pad erector, four and a half hours is probably a reasonable turnaround time, but the Soviets have never attempted to launch two SL-14s in such quick succession. Third-generation ELINT satellites and scientific payloads are launched by the SL-14. [redacted]

20. Currently there is one pad capable of launching the SL-X-16; [redacted] There is considerable uncertainty regarding the quick-launch capability of the SL-X-16. [redacted] some missions for the SL-X-16 may be in a quick-reaction mode, perhaps in as little as six hours. [redacted]

Store-On-Orbit

21. The capability to store satellites on orbit and activate them when needed is an important new development that directly affects Soviet potential for augmentation. [redacted]

Timeliness of Soviet Satellite-Derived Information

22. We assess that by the 1990s the Soviets will be capable of relaying some satellite-derived information to field commanders within about two hours of collection by reconnaissance satellites. Warsaw Pact writings show that the Soviets are striving to achieve this goal [redacted]

23. [redacted]

24. By using relay satellites with increased numbers of satellite collectors in a crisis, in the future the Soviets will be able to:

— Receive information from an orbital constellation of electro-optical imaging satellites [redacted]

[redacted]

— Operate [redacted] with ELINT satellites for targets at any geographic latitude.

— Derive useful information from constellations of EORSATs or RORSATs [redacted] from tasking to decisionmaking on targets [redacted]

We expect that, under less-than-ideal conditions, human decisionmaking on sea targets will take less time than on land targets because of the relative simplicity and lack of clutter presented by a sea background. [redacted]

25. We expect that the Soviets will want 25 to 40 reconnaissance satellites operating during a crisis in the 1990s (compared with 15 to 20 in peacetime). Information would be received by a satellite "situation desk" from at least one of these satellites [redacted]

26. The Soviet GLONASS navigation satellite system now under development will provide a greater level of accuracy to platforms equipped with a GLONASS receiver. We expect that this information will permit Soviet ground, sea, and air forces to undertake highly coordinated military actions in the future. [redacted]

27. To make further improvements in timeliness, the Soviets will have to launch and operate more satellites, increase the speed of satellite tasking through increased automation, and improve their chain of analysis and communication. Even after making these technical improvements, the Soviets will be faced with the limitations imposed by human decisionmaking. [redacted]

Wartime

28. Given the probability of an extended period of escalating tensions between the United States and the USSR culminating in the outbreak of actual hostilities, the Soviets are likely to have augmented their critical space-based networks by the time war begins. The functions of most of their military space systems during wartime are the same as in peacetime. [redacted]

ASAT Operations

29. [redacted] ASAT operations apparently are integrated with military operations. [redacted]

30. We believe that there is a very low likelihood that the Soviets would initiate destructive or nondestructive interference against US space systems in peacetime, in times of tension of an exclusively political nature, or in cases of limited, local conflict not involving the two powers directly. By *nondestructive interference*, we mean various electronic warfare techniques such as electronic probing or jamming, or laser blinding or spoofing, which incapacitate a system for a limited amount of time.[24] *Destructive interference*—the use of force to damage a satellite—could include the use of the orbital interceptor, direct-ascent interceptors, or high-energy lasers. [redacted]

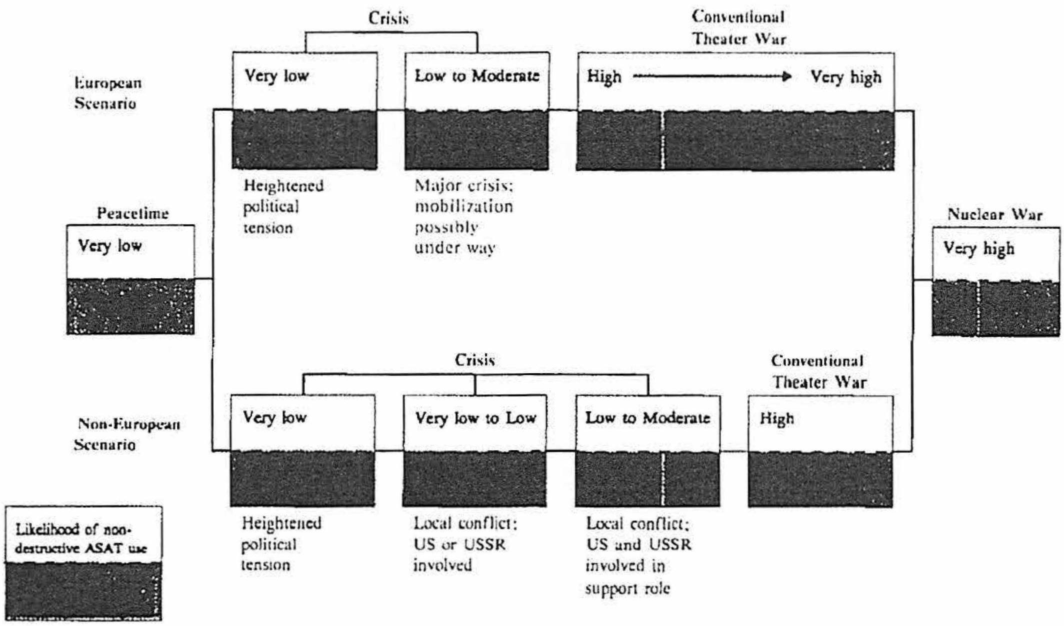
31. We do not believe that any ASAT activities would be undertaken merely for warning or demonstration purposes. In wartime, a decision to employ destructive or nondestructive interference against US space systems would presumably be based on Soviet analysis of the potential net advantages. This analysis would include a variety of factors, such as the Soviet perception of the military value of various US systems, their antisatellite capabilities, likely US responses, relative capabilities of the two sides to replenish their satellite networks, and the possibility of conflict escalation. [redacted]

32. *Non-European Scenario.* Should either superpower introduce combat forces into a local (non-European) conflict in which the other was not involved, we estimate that the likelihood of attempted destructive interference by the Soviets would continue to be very low. The likelihood of nondestructive interference would also remain very low unless the Soviets perceived that US space systems were being used in a way that would threaten Soviet political or military interests in the region. In this case, we estimate the likelihood of Soviet use of nondestructive means to interfere with US space systems would increase to low. [redacted]

33. Should both US and Soviet forces intervene in a local (non-European) conflict, with both sides playing

[24] We do not consider probing as an attempt to interfere with a spacecraft's operations, but rather an attempt to electronically elicit technical information about a spacecraft for possible future electronic warfare. See page VI-9. [redacted]

Figure VII-4
Likelihood of Soviet Use of Destructive and Nondestructive ASAT Means at Various Levels of Conflict



[a] During a general war in which large-scale use of nuclear weapons appeared imminent, there would be a very high likelihood of attempted interference, using all available means, with all US space systems.

[redacted]

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limited or specialized support roles—such as air defense—and having limited objectives, the likelihood of attempted destructive interference would rise marginally but still remain low. The likelihood of use of nondestructive means of interference would also increase somewhat to low to moderate. It is difficult to forecast what the Soviets would do, given the wide range of possible scenarios. However, Soviet assessments of the military advantages of such use in any particular case probably would be tempered by concerns of provoking an unwanted US reaction. [redacted]

34. In the event of actual large-scale, direct engagement of US and Soviet forces in a theater located outside Europe, we estimate there would be a high likelihood of attempted nondestructive interference with US space systems. The Soviets would have strong, immediate incentives to enhance the operational effectiveness of their forces by degrading US reconnaissance and command and control capabilities in the theater of conflict. Should the Soviets decide to interfere with such US space systems, in most cases active EW and perhaps low-power lasers would be used initially because their effects are not necessarily permanent and the source of interference is not easy to detect. Interference with US space systems at this point would probably not be viewed as adding appreciably to the risk of widening the conflict (to Europe, for example), whereas interference with and potential degradation of some US space systems' capabilities at this point could enhance the Soviet ability to succeed as well as to seize operational initiatives in the event of a wider war. [redacted]

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35. The likelihood of use of destructive ASAT means under these circumstances is judged to be low to moderate. Although initially the Soviets would be concerned not to provoke unwanted US escalation or add to the strength of US counteractions in the longer run, these concerns would tend to lessen if they interfered with the pursuit of their political-military objectives. [redacted]

36. *European Scenario.* During a major European crisis involving the two superpowers, in which the tension was high, mobilization was possibly under way, and the outbreak of war appeared possible, the likelihood of attempted destructive interference would be very low to low, but the likelihood of attempted nondestructive interference would be low to moderate. Nondestructive means of interference probably would be considered as a somewhat less risky option at this time. In a major crisis, the Soviets would seek to confuse Western intelligence and deny it information on the status of their forces. [redacted]

37. We estimate there is a high likelihood that, during a NATO–Warsaw Pact conventional conflict, the Soviets would attempt to interfere with selected US space systems that provide important wartime support, using both destructive and nondestructive means. The decision to use ASAT weapons against such systems during the early part of a conventional phase of such a conflict would be affected by Soviet uncertainties with regard to US responses. In such a conflict, Soviet leaders might perceive an operational advantage if both sides experience significant satellite losses because of greater US dependence on space systems. In addition, Soviet satellites can be more quickly replaced if space launch facilities remain intact. [redacted]

38. During a period of conventional combat, the Soviets would probably avoid destructive interference with space systems that provide warning of ballistic missile launch or those that specifically support US strategic nuclear forces, unless the use of strategic nuclear weapons appeared imminent. The Soviets might attempt subtle, nondestructive interference with such satellites during a conventional conflict, although in doing so the Soviets would run considerable risk of provoking a disadvantageous US reaction and, possibly, unwanted escalation of the conflict. We cannot judge the likelihood of this occurring because we cannot evaluate how the Soviets would perceive the risk that this would trigger undesirable US responses. [redacted]

39. The likelihood the Soviets would use destructive interference at the beginning of a conventional conflict would be low and would increase as the conflict approached a nuclear phase. During a general war in which large-scale use of nuclear weapons appeared imminent, there would be a very high likelihood of attempted interference, using all available means, with all US space systems. [redacted]

40. [redacted]

41. The Galosh interceptor and the orbital interceptor potentially have complementary ASAT capabilities. The orbital interceptor, because it is nonnuclear, would probably be used at lower levels of conflict than the nuclear-armed Galosh. The Galosh, however, would be less susceptible to countermeasures because its direct-ascent flight profile allows it to attack targets within several minutes from launch. Therefore, it could be used against high-priority satellites that the orbital interceptor was unable to successfully engage. If the Soviets do not use nuclear-armed Galosh interceptors against satellites until just before or at the onset of nuclear conflict, then the choice of targets would be limited [redacted]

25X1

[redacted]

25X1 [redacted]

25X1 [redacted]

Importance of Soviet Space Systems

52. The importance of various Soviet space systems to the conduct of military operations is primarily a function of the continued availability of other, non-space-based means to perform similar missions and the reduction in capability to perform specific tasks if the space systems were unavailable. It also is a function of prevailing operational conditions. In table VII-4, we have outlined the relative importance of the main Soviet space systems during peace, crisis, and conflict, according to three criteria:

High — Space asset essential; no practical or satisfactory substitute.

Moderate — Space asset supportive; substitutes are available but are not as convenient or do not perform the mission as well.

Low — Space asset nonessential; substitutes are available, and they are at least practical or adequate.

The judgments are not intended to evaluate the importance of various missions, but rather the importance of the space assets that perform those missions. Peacetime, for the purposes of this discussion, is the normal state of relations between the two superpowers. Crises arise when tensions build because of events that cause friction between the superpowers or their allies. This may, in some cases, include mobilization. And conflict, in this case, is the state of open warfare between the superpowers, from conventional through nuclear CIA Statute [redacted]

53. We judge that, although the USSR is not, at present, overly dependent on space systems for the effective conduct of military operations, satellites inevitably become more important as the level of conflict increases. In addition, as more near-real-time monitoring capabilities are introduced in the future (including manned platforms), we expect that space systems will become increasingly important in providing information on rapidly developing situations to both national-level decisionmakers and military commanders. Another expected improvement that will enhance the importance of Soviet space systems is the development of a geosynchronous launch detection system capable of monitoring SLBM launch areas. Finally, space systems would probably be an integral

[redacted]

Table VII-4
Importance of Key Soviet Space Systems

	Peace		Crisis		Conflict	
	1985	1995	1985	1995	1985	1995
Intelligence						
Photo (film return)	Moderate-High	Moderate	High	Moderate	Moderate-High	Moderate-High
ELINT	Moderate	Moderate	Moderate-High	Moderate	Low-Moderate	Moderate
IMSAT	[a]	Moderate	[a]	Moderate	[a]	Moderate
ELINT follow-on	[a]	Moderate	[a]	Moderate	[a]	Moderate
Over-the-horizon targeting						
EORSAT	Low-Moderate	Low-Moderate	Moderate-High	Moderate-High	High	High
RORSAT	Low-Moderate	Low-Moderate	Moderate-High	Moderate-High	High	High
IMSAT	[a]	Low	[a]	Moderate-High	[a]	High
ELINT follow-on	[a]	Low	[a]	Moderate-High	[a]	High
Early Warning						
LDS	Moderate	Moderate	Moderate-High	Moderate-High	High	High
Communications						
Military[b]	Low-Moderate	Moderate	Moderate	Moderate	Moderate-High	Moderate-High
Civilian	Low-Moderate	Moderate	Low-Moderate	Moderate	Moderate	Moderate
Meteorological						
METSAT	Low	Low	Low	Low	Moderate	Moderate
Navigation[b]						
NAVSAT	Low	Low	Low-Moderate	Low-Moderate	Moderate-High	Moderate-High
GLONASS	[a]	Low	[a]	Low-Moderate	[a]	Moderate-High
ASAT						
Orbital interceptor	Moderate	Moderate	Moderate	Moderate	Moderate-High	Moderate-High

[a] Not yet operational.
[b] The importance of military comsats and navsats increases the farther a unit utilizing the system is deployed from the USSR.

Key: High —Space asset essential
Moderate —Space asset supportive
Low —Space asset nonessential

This table is [redacted]

part of any advanced-technology strategic defense system the Soviets might develop and deploy, and we expect their own ASAT capabilities to be a critical aspect of their efforts to counter any space-based elements of a potential future US strategic defense system. [redacted]

CHAPTER VIII

LUNAR, PLANETARY, AND ASTRONOMICAL EXPLORATION

1. This chapter provides an estimate of the nature and direction of Soviet lunar, interplanetary space, and astronomy missions over approximately the next 15 years. We have identified an ambitious set of possible missions based primarily on public statements and open source publications by Soviet scientists. [redacted]

2. To date, manned space exploration has been under the direction of the Soviet Air Force and Strategic Rocket Forces, and the unmanned programs have been directed by the Academy of Sciences. But, given the scale of the manned missions in the future, we would expect a national-level effort entailing participation of both military and scientific organizations. These programs for exploring deep space not only provide a scientific return, but also enhance the Soviet image as a peaceful and technologically advanced nation. Hence, a major factor in planning Soviet exploration programs has been to achieve prominent "space firsts." A wide variety of lunar and planetary missions have been planned for the next decade or two that could provide additional space firsts for the USSR (see figure VIII-1). New planetary missions are likely to be launched within the next few years, and lunar missions are anticipated in the 1990s. The Soviets, in an unusual announcement at an international conference in March 1985, described upcoming missions to the Moon, Mars, and Venus. Several of the proposed missions could be used to test new military technologies (see tables VIII-1 and VIII-2). [redacted]

3. Most of the identified lunar and planetary missions are already technologically feasible or soon will be. Figure VIII-1 depicts planned Soviet missions to Venus, Mars, the Moon, and possibly Jupiter. For planetary missions, the estimated earliest launch dates coincide with planetary proximity. The SL-12 is the standard launch vehicle for deep-space exploration missions. However, based on Soviet statements and mission requirements, the Soviets will probably utilize the SL-W for a number of their planetary missions. Normally, two spacecraft are independently launched for each planetary mission. [redacted]

4. The Soviets ceased lunar missions in 1976, but a new series of lunar missions are anticipated, beginning with an unmanned Soviet lunar polar orbiter expected to be launched in the 1990s, which they could claim as a space first. The main purpose of the mission would be to search for subsurface ice and other volatiles near the lunar poles, possibly to support the eventual establishment of a manned lunar base. [redacted]

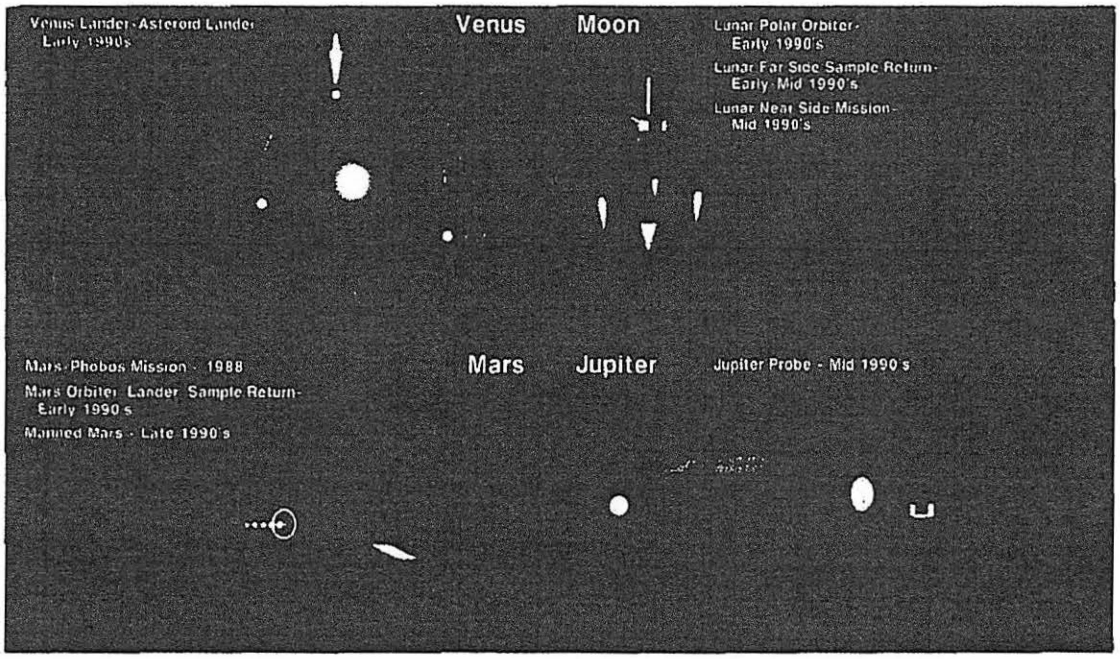
5. The lunar polar orbiter also may provide mapping and communications support for a subsequent unmanned far-side lunar landing that could include returning a soil sample. This would be another space first. If the lunar series is aimed at the eventual establishment of a manned lunar base, then we would expect to see additional lunar missions involving site surveys and exploration by lunar rover vehicles. [redacted]

6. A lunar base remains a low probability because known Soviet research in the 1970s on lunar transports and engineering equipment for the construction of shelters, roads, and tunnels on the Moon was canceled in 1978, and there is no evidence that it has been reestablished elsewhere. However, regenerative life support technology development, which is applicable to long-term habitation on permanently manned space stations, on the Moon, and other planetary missions, has continued. [redacted]

7. Two Venus radar mapping missions were launched in June 1983. These missions involve one spacecraft in a polar orbit and one in an equatorial orbit, which are mapping the Venusian surface. Both spacecraft carry synthetic aperture radars with about a 1- to 2-km resolution and spectrometers for investigating the planet's atmosphere. [redacted]

8. An unmanned Mars-Phobos mission is scheduled for launch in late July 1988. The mission, labeled Mars-F, will consist of two spacecraft of a new design. The first spacecraft will concentrate on Mars and the larger of its two moons, Phobos. If the first mission is successful, the second spacecraft will attempt similar experiments on Deimos—the smaller moon. A landing on Phobos is expected. However, as part of soil tests, low-powered laser and/or ion beams may be fired from a spacecraft approaching to within 50 to 100 meters of the moon. These blasts are to vaporize surface material for analysis. [redacted]

Figure VIII-1
Soviet Lunar and Planetary Research Program[a]



[a] Dates indicated are for earliest launch. See table VIII-2 for likelihood of these programs.

[redacted]

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9. The Mars-F mission, like several other Soviet interplanetary missions, includes participation by other countries to obtain advanced technology and improve political relations. Soviet officials associated with the Mars-F mission have warned that only countries providing state-of-the-art technology will be allowed to participate in the mission. Sweden reportedly was excluded on such grounds, and West Germany has been similarly cautioned. [redacted]

10. An unmanned landing on Mars is likely in the early 1990s. This mission may be an orbiter/lander combination, and it may include a rover vehicle or the return of a soil sample. A landing on Mars probably would require use of the SL-W. [redacted]

11. We estimate there is a low-to-moderate probability a Soviet manned Mars mission will be conducted before the end of the century. Such a mission could require fewer resources than a lunar base and would also add considerably to Soviet prestige. [redacted] Soviet statements indicate that such a mission is being considered. This mission may require the SL-W, probably a space tug, space station support for low-earth-orbit assembly of the spacecraft, and development of an advanced propulsion system for the spacecraft. Soviet research in long-term manned spaceflight is the only clear indication of such a mission. For such a mission, we would first expect to see a Soviet simulated mission of over one year in Earth orbit, verifying that both people and equipment could sustain such long flights. Also, before a manned Mars mission we would expect additional unmanned missions to Mars. [redacted]

Table VIII-1
History of Lunar and Planetary Exploration [a]

	United States	Soviet Union
Total	89	91
Lunar	59 (1973)	42 (1976)
Venus [b]	8 (1978)	33 (1984)
Mercury	1 (1973)	0
Mars	9 (1975)	16 (1973)
Outer planets (beyond Mars)	12 (1977)	0

[a] Total launches between 1958 and 1984; year of last launch in parentheses.
[b] Includes Vega flybys of Venus en route to Halley's Comet.

This table is Unclassified.

Table VIII-2
Possible Future Soviet Lunar and Planetary Exploration Missions [a]

Mission	Earliest Expected Launch	Likelihood
Lunar		
Lunar polar orbiter	Early 1990s	High
Lunar far-side lander, soil sample return	Early-to-middle 1990s	Very low to low
Lunar near-side lander	Mid-1990s	Low
Manned lunar base	Late 1990s	Low
Planetary		
Mars/Phobos Mission	1988	High
Mars orbiter/lander/ rover/soil sample return	Early 1990s	High
Manned Mars mission	Late 1990s	Low to moderate
Venus lander/ Asteroid lander (Vesta)	Early 1990s	Moderate to high
Jupiter probe	Mid-1990s	Very low to low

[a] Resource considerations and other priorities may preclude undertaking all of these missions.

This table i CIA Statute [redacted]

12. Another project is part of an international effort involving the USSR, Hungary, and France, with minor participation by Bulgaria, Poland, Czechoslovakia, Austria, and West Germany. The project, Vega, involved launching two spacecraft in December 1984 and encountered Venus in June 1985, with Halley's Comet to be encountered in March 1986. If successful, this will be another first and will further enhance Soviet prestige, particularly because the United States has declined to undertake such a mission. When the spacecraft encountered Venus, the satellite separated into descent and flyby sections, with the descent section deploying a balloon that carried a gondola with meteorological experiments to sample the atmosphere. The descent stage continued on to a landing. This mission also is to provide navigational support to probes launched by Japan and the European Space Agency, which are scheduled to encounter the Comet soon after the Vega probes. CIA Statute [redacted]

13. Other possible Soviet planetary missions include exploration of Venus. Large balloons with gondolas carrying various meteorological sensors are being considered as part of a separate joint Soviet-French Venus mission in the early 1990s. This mission might also invlove a landing on the asteroid Vesta. Such a mission would require electronics capable of withstanding high temperatures for the two-week period envisioned. CIA Statute [redacted]

14. Exploration of Jupiter is another possibility. Soviet launch of a Jupiter mission before the planned US "Galileo" Jupiter-orbiting mission would require several sophisticated maneuvers such as "Earth gravity assist" and "aero-braking" to offset current lift and payload shortcomings. However, such maneuvers would double the flight time, requiring about four years to reach Jupiter. Such a long flight would increase the chances of spacecraft failure. Therefore, a more likely scenario would involve waiting until the SL-W launch vehicle is available to provide the necessary lift capacity without the Earth-gravity-assist maneuver, thus shortening the total flight times by about two years. CIA Statute [redacted]

15. 25X1 [redacted] the Soviets may launch as many as 10 space astronomy missions by the end of the century. (See table VIII-3.) It is unclear how many of these missions have received official approval. Included are the following:

- The Kryukov and Glushko design organizations both probably are involved in the design and development of future spacecraft with astronomy missions. Gamma-1, a dedicated gamma-ray mapping mission, has been rescheduled for launch in 1986 or 1987. An X-ray observatory that reportedly will involve extensive European cooperation and will include both West German and Dutch instruments is scheduled for launch in 1986 or 1987. Both the Gamma-1 and the X-ray observatory reportedly will be flown on modifications of the Soyuz spacecraft—a design of the Glushko organization.

— The Sigma mission, a Franco-Soviet project that is expected to collect data on galactic and extragalactic X-ray and gamma-ray sources, and that reportedly will locate these sources relative to one another with higher accuracy than is now attainable. The mission reportedly will be launched on a Venera-type spacecraft in 1987 or early 1988 and will be placed in a highly elliptical orbit.

[redacted]

Table VIII-3
Possible Future Soviet Astronomy Missions

Mission	Earliest Expected Launch	Likelihood
Orbiting radio telescope	1986	High
Gamma-1	1986 or 1987	High
X-ray observatory	1986 or 1987	Moderate to high
Sigma mission	1987 or 1988	Moderate to high
Astronomy module/platform	By late 1980s	Moderate to high
[redacted]		
Ultraviolet space telescope	Unknown	Low to moderate

[redacted]

This table is [redacted]

[redacted]

— According to a Czechoslovak press report of January 1985, an ultraviolet space telescope is being prepared within the Intercosmos program by scientists and technicians from East Germany, the USSR, and Czechoslovakia. [redacted]

16. The tentative Soviet launch schedule implies an ambitious space astronomy program. It represents a coordinated, well-planned program of astronomical investigation spanning the entire electromagnetic spectrum, with the possible exception of the visible region. Each spectral region provides its own special insight into some aspect of interstellar space or class of astronomical source. Ambitious as it might seem, the only aspect of the proposed program that affords much opportunity of eclipsing past US achievements lies in the area of VLBI and possibly gamma-ray astronomy. [redacted]

CHAPTER IX

INTERNATIONAL COMPETITION AND COOPERATION

1. This chapter estimates the extent to which the Soviet Union is likely to be successful in developing new or exploiting existing international organizations for cooperation in space that promote Soviet political, economic, and technology acquisition purposes. In addition, this chapter judges the prospects for Soviet commercial success in providing space launch services, remote sensing of earth resources, and other ventures [redacted] of exotic materials in space.

2. The USSR has taken a few steps toward becoming a competitor in international telecommunications and commercial space launch services. In addition, Moscow might enter the market providing Earth resources data, navigation and meteorological support, and materials processing and manufacturing in space. Success in such competition would bring increased prestige and respect, and, over the longer term, would provide the Soviet Union an important supplement to its hard currency earnings. In addition, opportunities for technology transfer could be improved by increasing Soviet invol[redacted]ommercial space ventures. [redacted]

3. In the late 1960s and early 1970s the Soviet Union established two international space organizations—Intercosmos and Intersputnik. The objectives of Intercosmos are to involve other nations in space research, take advantage of advanced technology, foster national pride among participants, and build better relationships between the USSR and other Intercosmos countries. Intersputnik provides communications services for [redacted] and Communist Bloc allies [redacted]

Intercosmos

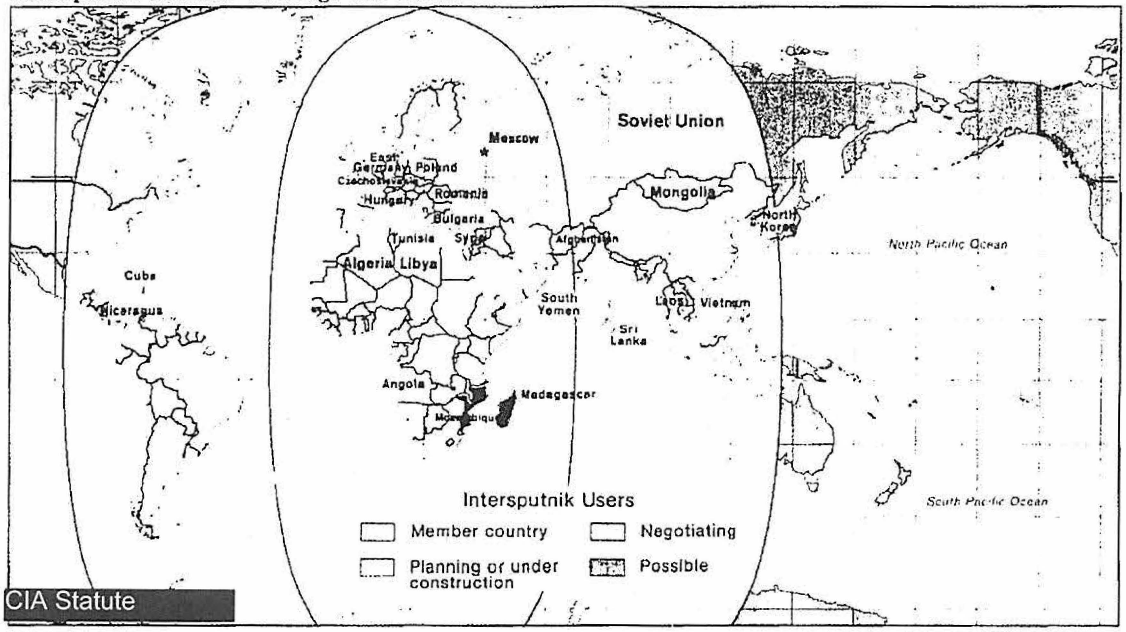
4. The Council for International Cooperation in Space Exploration (Intercosmos), under the USSR Academy of Sciences, was established in 1967. Intercosmos represents the USSR in international space matters without revealing the military control of the Soviet space program. The Council coordinates the activities of the member countries, which initially included the USSR, Bulgaria, Hungary, Poland, East Germany, Romania, and Czechoslovakia. In recent years Intercosmos has expanded to include Cuba, Mongolia, and Vietnam. In addition, bilateral cooperative agreements also have been negotiated with [redacted]Sweden, and India. There have been [redacted] cooperative projects with France, including the launch of at least three French-built satellites (Oreol 1 through Oreol 3), manned missions in Salyut 7, and the Vega mission. Sweden also has provided [redacted] Intercosmos satellites. [redacted]

5. The Soviets dominate the Intercosmos program. A Soviet official always chairs the Council, and he also coordinates the activities of the member countries and Soviet launch facilities, spacecraft, and ground control sites. Proposals for space experiments are accepted from all Intercosmos member countries, but the Soviet Union decides which proposals are to be [redacted] and the extent of non-Soviet participation. [redacted]

6. To date, 32 satellites have been launched in the Intercosmos program. This includes some missions that have not carried the official Intercosmos label, but have been part of the program. Two satellites, Astron and Prognoz 9, were launched in 1983, both into highly elliptical orbits and with instruments developed jointly by several countries, including France. The Astron satellite operated from March 1983 to about September 1984, and was widely publicized because it carried the largest space telescope thus far and made many new discoveries in deep space. Prognoz 9 operated from July 1983 until early 1984 and reportedly used a new instrument to map large portions of "remnant" radiation in space. The latter part of 1984 saw a restructuring of the Intercosmos program, as the USSR has become more selective about the participants and technology used in joint missions. In addition, emphasis is shifting more toward applied rather than pure scientific research. For example, oceanography and Earth-resources rese[redacted]sized in Intercosmos programs. [redacted]

7. We expect some continued Intercosmos participation in the Soviet manned space program, including more flights by cosmonauts from member and non-

Figure IX-1
Intersputnik Satellite Coverage and Users



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member countries as well as additional experiments. These flights have offered participating countries an opportunity to be involved in space programs that they could not undertake individually. This participation is widely publicized, and the foreign cosmonauts have been received as heroes in their own countries. As a result, national pride, government prestige, and relations with the USSR all benefit. [redacted]

Intersputnik

8. Intersputnik is an international organization designed to help member countries (all Soviet allies) meet their needs in telephone, telegraph, TV, and radio communications. Each member sits on a governing board and has one vote. This is in contrast to Intelsat, an international satellite communications consortium where voting is weighted and reflects the relative use of the system. Like Intelsat, Intersputnik requires contributions to a statutory fund in proportion to usage. The satellites are owned by Intersputnik or they are leased from members (the USSR in practice). The ground stations are owned by the individual states. (u)

9. Today the Intersputnik system is much smaller and more limited in services than Intelsat. Intelsat now includes 107 members, 310 ground stations, and a space network of 15 satellites in contrast to the Intersputnik system, which currently is limited to 14 members with 17 ground stations using two satellites; one over the Atlantic, and one over the Indian Ocean. The potential coverage, however, includes all of South America, Central America, Africa, and Asia. (See figure IX-1.) The current Intersputnik network could expand because of the apparent Soviet willingness to undercut Intelsat's prices. [redacted]

10. Since the USSR began marketing Intersputnik circuits to developing countries in the 1980s, few non-Communist countries have joined despite Intersputnik's lower prices and easier membership requirements. In addition to the original nine Soviet Bloc countries that formed Intersputnik, only five states have become signatory members: Vietnam, South Yemen, Afghanistan, Syria, and Laos. Algeria, North Korea, and Iraq have also become users but are not signatory members. In addition, Soviet officials are

negotiating with Libya, Angola, Mozambique, Madagascar, and Sri Lanka to join Intersputnik. Nicaragua and other Latin American countries also are interested in becoming members. But, on balance, Intersputnik currently remains a distant competitor with Intelsat in the international telecommunications market. We believe Intersputnik may become more competitive in the future if prospective customers are convinced that the quality of service is comparable to Intelsat with lower prices. Also, Intersputnik may offer special services, such as domestic communications capabilities, that are not available from Intelsat. [redacted]

Intelsat and Inmarsat

11. Even though the USSR operates Intersputnik, Moscow also uses Intelsat services on a limited basis, ranking in the bottom 10 percent of the 130 users of Intelsat services. Moscow uses Intelsat in addition to the Intersputnik network mainly to gain access to areas outside of Intersputnik's realm. The Soviet Union has never become a full member because that prohibits states from offering competitive services and because of Soviet objections to US domination of the organization due to the weighted voting system, which bases each country's vote on its share of international telecommunications traffic. This would have given the USSR approximately 1-percent interest and negligible leverage in the organization. Nevertheless, recently the Soviets have indicated a willingness to join Intelsat, although the negotiations are in a preliminary stage. Soviet membership in Intelsat would require them to disband Intersputnik, or incorporate the Intersputnik organization into Intelsat [redacted]

12. In contrast to minimal Intelsat participation, the Soviet Union is a charter member of the International Maritime Satellite Organization (Inmarsat). Inmarsat was established in July 1979 to provide the space segment for international maritime communications. Currently, there are 64 countries participating in Inmarsat. The USSR currently holds 14-percent interest in the Inmarsat organization but accounts for less than 1-percent usage. However, that may change in the future. The Soviets recently commissioned their second Inmarsat terminal in Nakhodka, on the Sea of Japan. A previous terminal was installed at the Black Sea port of Odessa. Soviet ownership will probably shrink to about 7 percent as other countries join. However, we believe the Soviets have not utilized Inmarsat as extensively as possible because they have encountered delays in procuring ground receivers. The Soviets are planning on equipping almost 500 merchant ships with Inmarsat receivers. Soviet officials have publicly stated they do not intend to create another maritime satellite service to compete with Inmarsat, and the Soviets have offered the Proton as a launch vehicle for the next generation of Inmarsat satellites. They also have indicated that the Volna communications satellite system will remain limited to use by Soviet shipping only. [redacted]

Commercial Space Launch Services

13. The USSR is offering commercial space launch services, although the overall prospects for capturing a significant share of the market are not good for at least the next five years. This is because of the requirement to configure satellites to specific launch vehicles and the long leadtime in procuring satellites. Also, the projected combined US, European Space Agency (ESA),[29] and other commercial launch service capabilities may exceed the anticipated market for launch services. Nevertheless, Soviet launch vehicles have placed three Indian satellites in orbit, and agreements have been readied to launch a Swedish-built satellite. An organization similar to Aeroflot, the national airline, may be created to market commercial space launches. The Soviets recently announced the establishment of GLAVCOSMOS, an agency which will be responsible for Soviet space commercialization efforts. This is a major departure from past Soviet efforts in two ways: The Soviets are intent on actively pursuing the economic and political potential of their space program, probably with an eye toward the prospects for acquisition of Western computer and telecommunications technologies; and it represents a more open approach to a portion of their civilian space efforts. We assess that Soviet prices will continue to be competitive with and may even undercut those of the United States and ESA. In addition, Moscow will provide insurance and limited technical and reliability information on Soviet boosters. The Soviets also have indicated that some foreign access to satellite and launch support facilities may be allowed. For example, in December 1984, the Soviets released the first public pictures of the Proton (SL-12) launch vehicle. Provid-

[29] ESA was founded in 1972 by a 10-member consortium of West European countries led by France and West Germany. The purpose was to challenge NASA's monopoly on commercial space-launch services. Arianespace is the French-based marketing corporation for ESA's space-launch services. The French Space Agency is the principal shareholder (59 percent) in Arianespace and soon will take over the entire Ariane program, including the launch facilities in South America at Kourou, French Guiana. Austria became the 11th member in 1983, and Canada is an associate member. (u)

ing detailed technical information would be a sharp break with past practices, but the prospect of acquiring an important supplement to its hard currency earnings, increasing trade in high-technology products, and offsetting some space costs may outweigh security concerns in certain cases.[redacted]

14. Soviet space launch services have been offered at prices well below both ESA's Ariane and the US shuttle. For example, $24 million was quoted for a 1983 Inmarsat launch, significantly lower than US or ESA prices. A backup launch for $12 million in the event of a launch failure also was offered. The price quoted by the Soviets is $70-80 million less than what we believe Proton launches actually cost.[redacted]

15. The Proton is the Soviet's largest operational space booster and the only one that could compete with Western vehicles in launching payloads to geosynchronous orbit, and it is the only one the Soviets have thus far publicly offered. Smaller international payloads have been launched using the SL-8. By the late 1980s, about five Protons could be available each year for commercial purposes. Inmarsat has been the target of recent Soviet efforts to provide Proton launch services for the next generation of Marisats (maritime satellites) in the 1988-89 period.[redacted]

16. The new Soviet SL-W launch vehicle and space shuttle orbiter will further enhance Soviet commercial potential. Payloads designed for the US shuttle orbiter may be compatible with the Soviet orbiter. The two separate launch control facilities currently under construction for the SL-W would provide for easy separation of military and commercial launch activities. [redacted]

Remote Sensing

17. The USSR, along with France, Japan, and Canada have expressed an interest in providing remote sensing data on Earth resources similar to the US Landsat using a high-resolution, multispectral Earth resources satellite.[redacted] Moscow could take two approaches in entering the Earth resources data market. The most likely choice involves sensors currently being developed and tested on board the Meteor-Priroda (Met-P) spacecraft. These sensors are electro-optical, multispectral scanning devices with resolutions similar to the US Landsat D (30 meters). The USSR has filed for a two-satellite Earth Resources Survey System (SSIPR), which could use the Met-P-type sensors. The first operational SSIPR is expected to be launched in 1986-88. If that satellite is successful, a second in the network could be launched in the next one to two years. We believe an operational land remote-sensing system will be available in the late 1980s. The above filing indicates data would be provided to the CEMA countries, possibly on a real-time basis for the first time. Such a system would provide the opportunity to improve Soviet access to Third World countries by providing Earth resources data for national development. Soviet engineers, however, would be required to process the data.[redacted]

18. As a second possibility, data could be offered from the Soviet MKF-6 multispectral camera system. This system, built by Zeiss-Jena, has been flown on Salyuts 6 and 7 and possibly on unmanned photoreconnaissance spacecraft. The MKF-6 camera takes pictures in six spectral bands with a resolution of 10 to 20 meters. Although this is better than the resolution of either the thematic mapper or multispectral scanner on the US Landsat, the data are more limited in quantity and not as timely.[redacted]

Processing and Manufacturing of Materials in Space

19. There is considerable interest in the manufacture of high-value, low-volume products in space. Extensive research in this field is under way in the United States, the USSR, Europe, and Japan. Activities on board the Salyut 6 space station between 1976 and 1981 indicate that Soviet interest has progressed beyond the initial research phase. These activities included experiments to produce unique semiconductors, superconductors, special alloys, glass, and crystals. Much of this work continued on Salyut 7.[redacted]

20. We believe the Soviets will soon move beyond the research and development phase of materials processing in space. The most likely next step would be to create a special materials processing module as part of a modular space station in the late 1980s. Most of the materials developed in the Salyut experiments have a military or scientific application. However, a Soviet modular space station also could manufacture materials for commercial markets. And Moscow might view production and sale of even small amounts of new and unique products manufactured in space as an important means of increasing its national prestige. [redacted]

Other Areas of Competition

21. There are other activities in space where the Soviets may choose to compete. This competition may

not provide direct economic benefits, but could enhance the image of the Soviet Union as a technological power and a friend to developing countries. Such competition could include the provision of data from GLONASS, the Soviet global navigation system. This system may be available to any user without charge, provided the user has the appropriate receiver and data processor. Receivers could be made available at low cost, making the system more attractive to some users. The Soviet GLONASS system is expected to be operational at about the same time as the US Global Positioning System. [redacted]

22. The launching of GOMS, a geostationary meteorological satellite delayed because of technical problems since 1978, could fill a void in weather coverage that exists over the Indian Ocean. The USSR could then offer ground terminals for receiving GOMS data, which several African and Asian countries may find useful, especially if used in conjunction with Earth-resources data. [redacted]

CHAPTER X

TECHNOLOGY TRANSFER

1. This chapter describes the scope of Soviet efforts to acquire foreign techology to support the Soviet space program. It also identifies those technologies that are believed to be particularly important to Moscow. For additional details, see NIE 11-1/7-84 and NIE 11-12-83. [redacted]

Soviet Technological Needs

2. The Soviet technology acquisition program is large, well organized, well funded, and has in place the means to collect both controlled and uncontrolled technologies by such means as trade diversions, scientific exchanges, and espionage. Through these efforts, a vast amount of valuable space-related technology already has been and continues to be obtained directly from US sources and from cooperative space programs with US allies in Western Europe and Japan. For example, between 1975 and 1980 an estimated 400,000 technical documents and 30,000 hardware samples were collected, about 10 percent of which specifically related to space programs. Among the Soviet space systems that have benefited to varying degrees from Western technology are the space transportation system, the developmental spaceplane, the Global Navigation Satellite System, and the Satellite Data Relay System. [redacted]

3. Soviet efforts to acquire space technology will increase in the face of intensified military-technological competition with the United States. The proliferation of commercial space capabilities among the Western allies and the establishment of cooperative space programs will widen the available targets for Soviet access. At the same time that Soviet technology acquisition requirements are increasing, Moscow will be faced with increasing security procedures and export controls in the West. [redacted]

4. We estimate that Soviet attempts to acquire space technology will be in areas needed to support development of future systems or follow-ons to existing space and nonspace military systems rather than for systems in current production or in an advanced state of development. Current assessments of Soviet technological capability identify 13 technology areas that are critical to possible Soviet space programs. These 13 "space technology" areas affect some 75 space systems or system options for which we believe there are Soviet military needs and corresponding intelligence collection requirements (see table X-1). The Soviets probably will not be able to satisfy all of these requirements through access to US-allied cooperative space programs. [redacted]

5. In order to separate those technologies in hand versus those not yet available to the Soviets, future systems are divided into three categories in the table:

— The first category includes those systems currently being tested or in development that we believe will be flight-tested by the end of the 1980s. In general, the Soviets must now possess the required technology for systems that are to be flight-tested by about 1989.

— The second category includes those identified systems not as far along in development as the first category or for which we believe there is a need for development of the required technology.

— The third category includes those systems for which the technical requirements are so stringent that we do not believe adequate Soviet technology will be available through the rest of the 1980s. [redacted]

The Soviet Program for Acquiring Western Technology

6. The Soviet program for acquiring Western technology is supervised by the top political leadership. The basic aim is to increase the military power of the State, advance the quality of military and space technology, and modernize key industries. The strong military orientation of the acquisition program is reflected in the dominant role played by the Military-Industrial Commission (VPK), which coordinates the development and production of Soviet weapons systems and also supervises the acquisition and assimilation of military and dual-use Western technology. [redacted]

Table X-1
Potential Soviet Targets for Western Technology Critical to Soviet Space Systems

	Space System Application	[redacted]
Technologies now available in the USSR	Modular space station	
	Space transportation system	
	Spaceplane	
	Space-to-space data relay	
	Potok digital data transmission	
	Hybrid military communications	
	GLONASS	
	IMSAT	
	Geosynchronous launch detection	
	Developmental coorbital ASAT interceptor	
	RF ASAT (ground based)	
Technologies not yet available in the USSR	Submarine laser communications	
	Megawatt-class space-based laser ASAT	
	Advanced IMSAT	
	Radar imaging reconnaissance	
	Space-based aircraft detection	
	Large space station	
	[redacted]	
More advanced technologies required; availability in 1980s doubtful	Particle-beam ASAT	
	Space-based laser ballistic missile defense	
	Space-based particle beam ballistic missile defense	
	Limited area submarine wake detection	

[redacted]

This table is [redacted]

7. The acquisition of Western equipment and scientific and technical information in support of VPK requirements is carried out by the Ministry of Foreign Trade, the Academy of Sciences and many other Soviet institutions, in addition to the KGB and the GRU. Also, East Europeans are increasingly involved in the collection program under Soviet tasking. The Soviet intelligence services now consider Western Europe and Japan better sources of technology in many areas, and they find it easier to acquire US technology there than in the United States itself. [redacted]

8. VPK requirements are issued to the collectors in great detail. The requirements generally include the items sought, their collection priorities, how long each requirement is valid, the Soviet ministry that levied the requirement, the most likely sources of the technology, and the budget for each acquisition. The VPK requirement list encompasses a broad spectrum of military hardware and related production technology and technical data. The list probably is revised annually. The VPK periodically evaluates the results and benefits of the collection program in terms of ruble and time savings for Soviet programs. [redacted]

9. Soviet space programs have clearly benefited from acquired Western space technology. These benefits include: (1) removal of technological obstacles; (2)

THE SOVIET TECHNOLOGY ACQUISITION PROGRAM AND SDI

An analysis of Soviet collection requirements for missile and space technology indicates that the four most critically sought-after technological areas were related to land- and sea-based strategic offensive missiles, ballistic missile warheads, development of space-based laser and directed energy weapons, and antimissile defense systems. Half of these were for the technologies themselves and half were for production technologies for manufacturing future weapons systems. Since these collection requirements were in effect before President Reagan's March 1983 speech unveiling SDI, they clearly do not constitute a reaction to that program. [redacted]

[redacted]

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acceleration of technological development, and the shortening of program development (R&D) times; (3) reduction of ruble expenditures; (4) the introduction of new concepts and programs; (5) aid in making decisions about cancellation of unpromising programs already under way; and (6) the evaluation of their technology relative to that of the West. [redacted]

10. Open source publications, particularly NASA documents and NASA-funded contractor studies, constitute the largest and most important source of US space technology. We estimate that well over half of the Soviet intelligence acquisitions in the aerospace category have been unclassified. This technical information has been used directly in a variety of Soviet space research and development projects ranging from the developmental space shuttle to space medicine. [redacted]

11. The Soviet intelligence services work closely with the State Committee for Science and Technology (GKNT) and the Academy of Sciences at times to support legal purchases of Western technology for which scarce hard currency is made available. Also, Soviet intelligence services exploit scientific exchanges with Western universities and research centers. In addition, key production technologies such as powder metallurgy and numerically controlled machine tools have been acquired through legal trade arrangements. [redacted]

12. Soviet scientific cooperation, particularly with the United States and France, is a significant source of technology transfer. Soviet and East European technical exchange delegations are generally of high quality, and all are used for intelligence collection. Through social contacts, scientific meetings, and direct access to hardware and facilities, the collection of militarily significant technology has been facilitated. [redacted]

13. For example, the Franco-Soviet space cooperation agreement has spanned two decades [redacted] nd recently has been renewed until 1993. [redacted]

[redacted]

14. The Soviets also gain knowledge of Western technology through participation of other countries in Soviet space missions. For example, Soviet officials have attempted to ensure that participants provide more advanced technology by warning them that they may be excluded from future missions unless they provide state-of-the-art technology. [redacted]

15. Soviet collection requirements that cannot be satisified by open sources, exchanges, or legal purchases become targets for illegal purchases or other clandestine methods. The Soviet intelligence services and the Ministry of Foreign Trade have developed fairly successful methods of diverting legal trade into illicit channels. We have identified some 300 companies operating from 30 countries that engage in illegal technology trade with the Soviets. Most of the goods we have identified in illegal trade are dual-use products, controlled by COCOM (the coordinating committee responsible for controlling the export of technology to the Soviet Bloc) but diverted by Western brokers or by Soviet-controlled dummy companies in the West to destinations in the USSR. In particular, the USSR has obtained through such channels a sizable amount of high-quality microelectronics coating equipment, computer-aided design and manufacturing systems, lubricants, composite technology, advanced instrumentation (particularly Western mass spectrometers), and production technology for rocket engine casings, reactants for rocket fuels, and fiber-optic systems. [redacted]

16. The communications of US defense contractors also are monitored by Soviet intercept facilities in the USSR and Cuba, by ships at sea, [redacted] This capability is increasing and probably includes the capability to monitor the full range of US satellite borne communications. [redacted]

17. Soviet intelligence operations against Western space technology are designed primarily to enhance Soviet military space efforts. US companies involved in the research, development, and production of space technologies are the main target. NASA headquarters and three of its associated research centers also are prime targets. Large West European and Japanese firms, along with government agencies engaged in space activities, also are targeted. [redacted] Although the overall volume of material collected by Soviet intelligence through clandestine means has been small compared with the vast amounts collected overtly, the space technology acquired clandestinely has had a greater impact on an item-by-item basis on Soviet military programs. [redacted]

18. Even though new technologies become available in the development phase of a new Soviet space system, they often are not used until a follow-on modification stage is reached because of the Soviet practice of requiring that the technology used be well proven before proceeding with the development of a weapon program or space system. This often results in a lag of some five to 10 years between the acquisition of a new technology and its appearance in a fielded system. However, the Soviets have such confidence in Western technology that they will accept and incorporate much of it without the extensive testing that accompanies indigenous technological development. We have examples of technology incorporated into a fielded weapon or space system within two to three years of its acquisition. [redacted]

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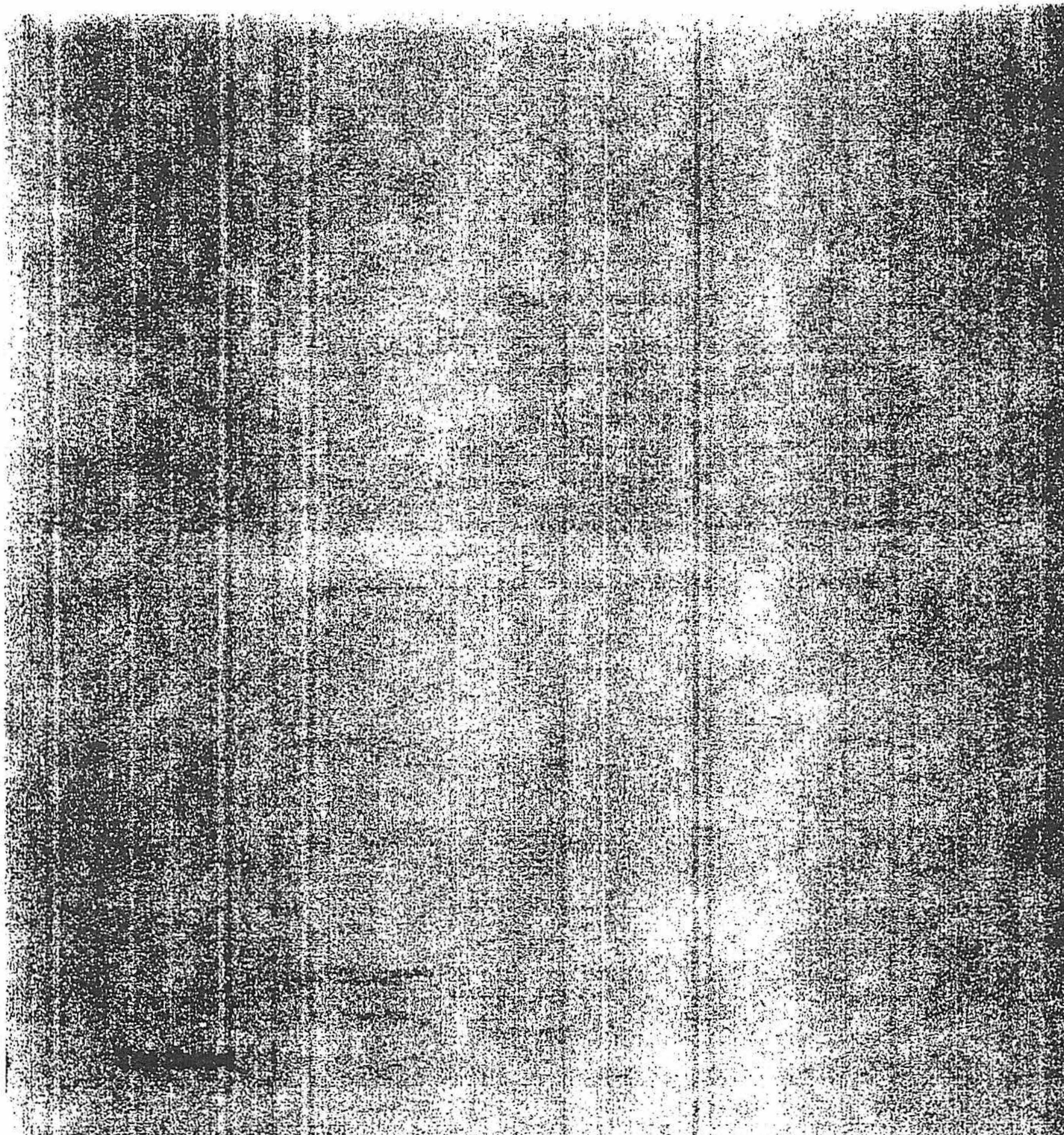

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