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Outlook for Rapid Expansion of Soviet Space Programs Through 1986 (U)

An Intelligence Assessment

~~Secret~~

SOV 82-10155
October 1982

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Outlook for Rapid Expansion of Soviet Space Programs Through 1986 (U)

An Intelligence Assessment

The author of this paper is [redacted] of the Aerospace Industries Branch, Office of Soviet Analysis. [redacted] of the Space Missions Branch, Office of Scientific and Weapons Research, contributed. Comments and queries are welcome and may be addressed to the Chief, Defense Industries Division, SOVA, [redacted]

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Outlook for Rapid Expansion of Soviet Space Programs Through 1986 (U)

Key Judgments

Information available as of 1 July 1982 was used in this report.

The Soviets are undertaking a variety of new space programs that will result in a period of rapid expansion such as that observed during the 1960s but that will cost considerably more. We expect Soviet space hardware costs to reach the equivalent of $12 billion a year by 1986—double the current outlays. Approximately two-thirds of these costs are devoted to military programs. The increased costs reflect:

- Achievement of a permanent Soviet presence in space based on a new modular space station and increased use of manned spacecraft.
- Advances in the technology available for intelligence collection, photoreconnaissance, and military support satellites. These advances will enhance ocean surveillance capability, improve targeting for antiship weapons, improve missile launch detection, and increase the timeliness of photographic data retrieval.
- Expansion of navigation, data relay, communications, and weather satellite networks. These networks will include satellites with advanced onboard processing capabilities, increased security, and the use of higher frequencies.
- Development of a reusable spacecraft similar to the early US Dynasoar, a reusable space transportation system similar to the US shuttle, two new space launch vehicles, and increasing production of the largest of the current Soviet space launchers. [redacted]

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We expect new spacecraft to incorporate major technological advances in contrast to the past Soviet evolutionary design philosophy of developing systems as much as possible by integrating older components and subsystems with a gradual introduction of new technology. Soviet commitments to fulfill new military requirements for rapid data retrieval, permanent manned orbiting complexes, detailed search of large ocean areas, and improved targeting of weapon systems cannot be met in a timely fashion using the conventional technology solutions characteristic of the evolutionary approach. These design practices have not been abandoned, however, and will continue to be used whenever minor technology advances will meet

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changing mission requirements. When the necessary technology is not available in the USSR, the Soviets probably will attempt to follow their past practice of buying or "borrowing" it from other countries. The multispectral cameras used on current Soviet Earth resources satellites and on the Soyuz are purchased from Zeiss-Jena in East Germany, and US concepts such as the Tracking and Data Relay Satellite System (TDRSS) and the GPS/NAVSTAR navigation satellite are probably being copied to shorten development times and to reduce technical risks. [redacted]

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Soviet leaders have indicated in their writings and statements that they do not view space as an isolated area but rather as an integral part of overall military, economic, and political policy. Outlays for space hardware will require the equivalent of some $12 billion in 1986, as compared with $6 billion in 1981. Based on current projections, expenditures for space hardware could increase from about 0.6 percent of GNP in 1981 to 0.9 percent by 1986. The Soviets probably perceive that the political, military, and economic returns of rubles invested in civilian and military space programs are greater than from other investments. Nowhere is this more clear than in Soviet efforts to establish a permanent, continuously manned orbiting space station. President Brezhnev recently stated that this is a national goal. In this sense the manned orbiting space station probably has somewhat the same stature in Soviet eyes as did our national goal of placing a man on the Moon. Approximately one-half of the increase in total expenditures on space hardware between 1981 and 1986 will go for this purpose. [redacted]

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Outlook for Rapid Expansion of Soviet Space Programs Through 1986 (U)

Perspective and Historical Trends

The Soviets are undertaking a variety of new programs that will have a major impact on the level of resources devoted to space activities. These programs include sophisticated planetary and manned missions, which will probably employ a new launch vehicle similar to the US Saturn V as well as real-time photographic satellites, reusable space systems, and an extensive network of new synchronous communications satellites. We expect Soviet space hardware costs to reach the equivalent of $12 billion a year by the mid-1980s—double the current cost.[1] [redacted]

Soviet space hardware costs increased from about $450 million in 1960 to over $6 billion in 1981 (see figure 1). From 1957 to 1968, space program costs grew rapidly, reflecting the start of satellite programs. The early years were dominated by the expensive lunar and planetary programs, intelligence collection systems, and manned missions (see figure 2). These efforts provided a series of Soviet space "firsts," which were heavily publicized to enhance the image of the Soviet Union as a technical, scientific, and military power. [redacted]

After 1968 the program leveled off as most of the space effort was devoted to maintaining the established multisatellite networks; few totally new spacecraft were introduced. The manned lunar landing programs were canceled, and emphasis was redirected to manned space stations in earth orbit, probably because of the failure of the Soviet's large TT-5 space booster[2] and the inability to overshadow the successful US Apollo manned lunar program. During the 1970s, Soviet satellites were generally simple, short-lived, single-mission systems in low Earth orbit primarily devoted to military functions such as intelligence collection, communication, or navigation. [redacted]

The program is beginning to show renewed growth as the Soviets deploy more sophisticated spacecraft, expand the manned program, and establish extensive geosynchronous communications satellite networks (see table). Included are:

- New, high-technology payloads designed to provide near-real-time photographic data and to increase navigation accuracy.
- Large space station complexes to provide a permanent manned orbital base for both military and scientific purposes.
- New communications satellite networks to increase Soviet global command and control capabilities.
- A new series of sophisticated lunar and planetary probes using a new large launch vehicle. Many of these systems will push Soviet state of the art and will result—as has happened in the past when the Soviets attempted to develop such advanced systems—in longer, more expensive development cycles. [redacted]

Space Launch Vehicles

Expansion at space research and development and production facilities and construction of new or improved launch complexes are strong indicators of Soviet efforts to develop new space launch vehicles and, in general, of future Soviet intentions in space. [redacted] the Soviets are constructing new launch complexes at Tyuratam, modifying the one previously associated with the TT-5 program, and expanding launch vehicle assembly and checkout facilities at production plants. This construction appears to be related to the development and

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[1] Dollar estimates represent what it would cost to replicate the Soviet hardware in the United States and then launch and operate those systems as the Soviets would. Hardware cost estimates include launch vehicle and satellite procurement and launch and flight operations. Excluded are costs for research and development, administration, and support facilities. All costs are expressed in 1981 dollars. [redacted]

[2] The TT-5 was a Soviet space launch vehicle, comparable to the US Saturn V, that was initially flight-tested in 1969. The booster for this test exploded a few seconds after ignition, severely damaging launch pad J1 at Tyuratam and, according to several sources, killing many people. The program was finally canceled in the mid-1970s after all three flight tests ended in failure. [redacted]

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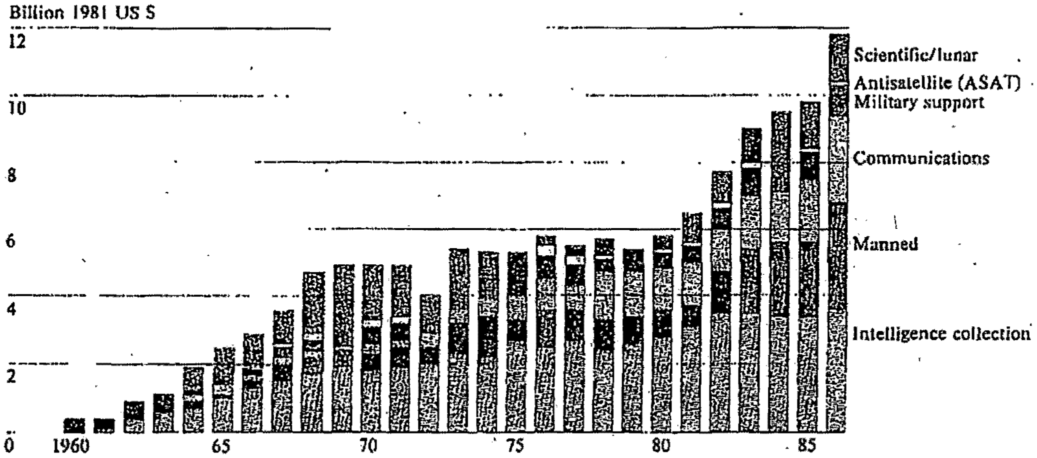
[redacted]

Figure 1
Soviet Space Hardware Costs by Mission, 1960-86[a]



[a] Does not include research and development, administration, or support facilities.

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production of at least two new space launch vehicles and increased production of a third. In addition, a new runway being constructed at Tyuratam may be related to the development of a reusable manned spacecraft or space plane. [redacted]

Two launch complexes at Tyuratam appear to be designed to support launches of a new Saturn-V-type booster. One is a new space launch complex, designated Site W, which has been under construction since 1978 and is expected to be completed by late 1984. The other is Launch Complex J, the launch site for the ill-fated TT-5 program. Here the launch pads and service towers are being modified, and new propellant storage facilities are being built. [redacted] we believe the new launch vehicle that will use these two complexes will be smaller than the TT-5 but will probably use higher energy propellants to achieve a similar payload capability—150,000 kg—in near-Earth orbit. The Soviets are also expanding the Glushko Design Bureau in Kaliningrad as well as the assembly and checkout building at Kuybyshev Plant 1, which produced the TT-5 and currently produces the SL-3/4/6 boosters, the SL-12 fourth stage, and the Vostok- and Soyuz-based spacecraft. [redacted] the Soviets can produce four large boosters per year without affecting the other production lines. [redacted]

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Another new space launch facility, Site Y, is also under construction at Tyuratam. The space launch vehicle associated with Site Y [redacted] may be intended to fill the gap between the 7,000-kg payload capability of the SL-4 space launch vehicle and the 19,000-kg payload capability of the SL-13 (see figure 3). Such a medium-class launch vehicle would have the capability to launch about 14,000 kg into near-Earth orbit and could be used to launch the space plane and an improved photographic satellite. [redacted]

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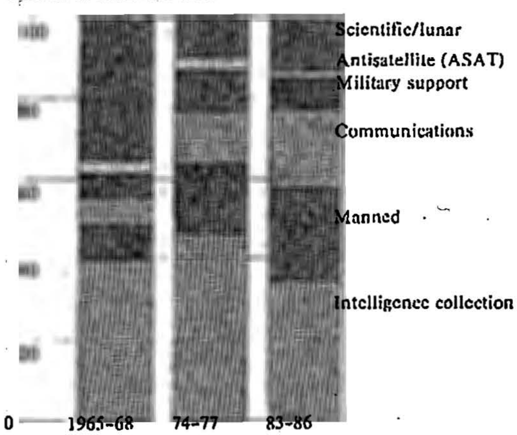
Figure 2
Soviet Program Emphasis by Mission

Percent of hardware costs



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[redacted]

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At the Moscow Missile and Space Production Plant, Fili 23, an enlarged vehicle assembly and test building [redacted] this facility, which produces the SL-12 and SL-13 space launch vehicles, more than doubled production capacity and is now capable of producing 15 to 17 launch vehicles a year. When the new SL-12/13 assembly building at Tyuratam [redacted] is completed in 1982, we expect the launch rate to accelerate to 10 to 18 from the current five or six SL-12/13 launches per year. [redacted]

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Increased use of the SL-12/13 booster and the corresponding increase in the number of high-technology missions associated with this space launch vehicle are major factors in the projected doubling of space costs by 1986. Geosynchronous communications and meteorological satellites, space station modules, and the lunar and planetary vehicles are launched on this booster. All of the spacecraft for these missions are larger and more complex—and thus more expensive—than the earlier spacecraft that were launched by the

Projected Space Systems

	Initial Operational Capability
Intelligence Collection	
Film scan photorecon	1982-83
Electro-optical photorecon	1988
Improved RORSAT	1982-83
Improved EORSAT	1985
Synchronous launch-detection satellite	1986
Communications	
GALs, Luch, Luch-P, Volna	1982-86
Data relay networks	1983-85
Military support	
GLONASS (Global Positioning System type) NAVSAT	1984
Synchronous meteorological satellite	1983
Manned program	
Modular space station	1982-83
"Space plane"	1982-83
Permanent space station	1986
Space transport system	1988
Planetary	
Lunar polar orbiter	1982-83
Lunar far side soil sample	1983
Mars soil sample return	1986
Jupiter probe	1986
Antisatellite	
Space-based laser ASAT	1989

[redacted]

SL-3/4/6 space launch vehicles. Contractor studies of Soviet launch vehicles estimate that the SL-12 is currently three times as costly to procure as the SL-4, although this ratio should decrease substantially as more SL-12s are produced. [redacted]

In addition, a new 4,500-meter concrete runway is being built at Tyuratam. This runway is about 90 meters wide, composed of two thick layers, and appears to be designed for handling very heavy vehicles. It is suitable for the recovery of manned reusable spacecraft such as a space plane. It could also be used

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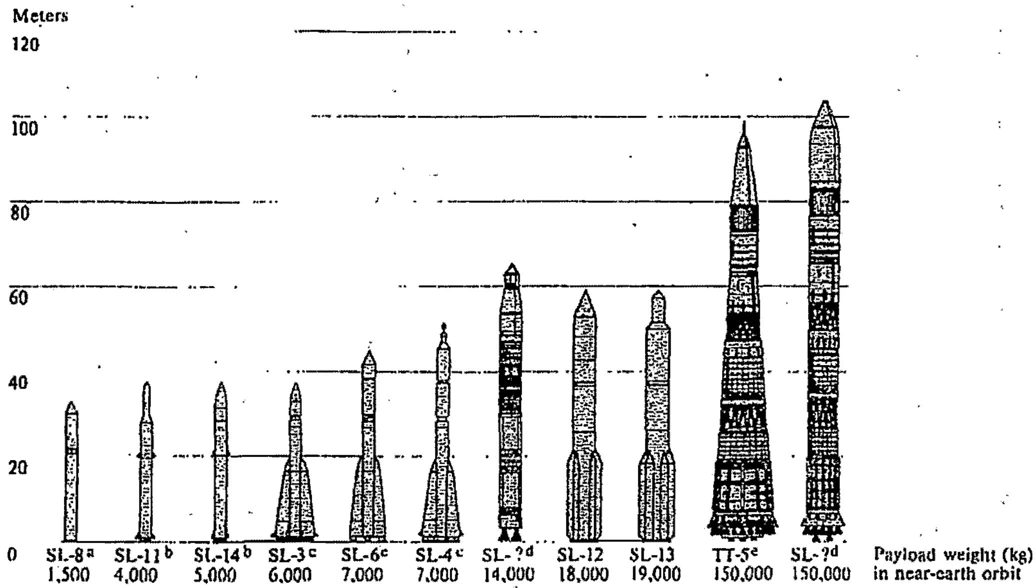
Figure 3
Soviet Space Launch Vehicles



[a] Derived from SS-5 IRBM.
[b] Derived from SS-9 ICBM.
[c] Derived from SS-6 ICBM.
[d] Under development.
[e] Cancelled in mid-1970s.

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for aircraft delivery of large space launch vehicle components and as a recovery point for flyback space boosters and larger reusable spacecraft like the US shuttle. [redacted] Withheld under statutory authority of the Central Intelligence Agency Act of 1949 (50 U.S.C., section 3507)

Planetary Probes

We believe that increased SL-12 launch vehicle production capacity in the 1980s would signify a resurgence in lunar and planetary exploration. The Soviet lunar and planetary effort since August 1976 has been limited to the launch of four Venus probes—Venera 11 and 12 in 1978 and Venera 13 and 14 in 1981. Inasmuch as the lunar and planetary program must compete with the communications and manned programs for the limited number (currently five or six) of SL-12/13 launch vehicles produced each year, an increase in production to 15 to 17 launchers per year would allow the Soviets to increase steadily the number of planetary probes from the low level of the last several years. According to Soviet announcements [redacted] the renewed program, estimated to cost over 1 billion dollars annually during 1982-86, will include lunar far-side lander/return missions with communications relayed through spacecraft in polar orbit and continuation of the Venera programs with long-duration surface probes and a surface imaging radar mission. The proposed Mars soil-sample return mission and a Jupiter probe, however, are probably dependent upon the successful development of the large Saturn-V-type booster. [redacted] Withheld under statutory authority of the Central Intelligence Agency Act of 1949 (50 U.S.C., section 3507)

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[redacted]

[redacted]

Manned Missions
During the late 1960s and early 1970s, the Soviets began to deemphasize the lunar program and to emphasize the manned space program and the development of long-duration space stations. The primary goals of the manned space program have been to gain international prestige by setting new man-in-space records and by training and flying cosmonauts from other countries, to publicize numerous scientific experiments that add to Soviet prestige as well as knowledge, and to develop and test military spacecraft components and subsystems. [redacted]

Soviet scientists have indicated in their writings and statements to US counterparts that the Soviets will attempt to introduce a modular space station consisting of multiple Salyut-size stations that can be changed according to mission requirements. In addition to modules for scientific experiments, meteorology, and manufacturing, the station could also contain military-related modules for reconnaissance, communications, or weapons. To demonstrate the feasibility of this concept, Salyut 6 is currently docked with what we believe to be a new space station module, Cosmos 1267. We estimate that Cosmos 1267 is similar to the Salyut in size. (A Salyut core vehicle with four of the new modules attached has roughly the same volume as the US Skylab.) The modular station requires separate SL-13 launches for each of the major module sections and numerous additional SL-4–launched Soyuz-T and Progress spacecraft for the crew and supplies. We estimate that the cost to procure, launch, and operate such a station would be about 1 billion dollars with an additional $300-500 million required annually to man and resupply the station. Soviet statements suggest that a larger, "permanent" structure in the Skylab class, requiring the Saturn-V-class launch vehicle, will be launched in the late 1980s as a follow-on to the modular space station. [redacted]

The previous Salyut missions have tested missile launch-detection sensors, a large deployable antenna, and a film scan and data transmission photographic system that may subsequently be used on other spacecraft. The use of manned space stations for applied research and evaluation of prototype components is more cost effective than using separate launches for each new test. Other advantages include isolation of spacecraft-related errors in evaluating test results, side-by-side comparisons of different sensors, and calibration or adjustment by the cosmonauts to obtain optimum results. Crew assessment is also immediately available to identify and correct problems and to provide initial test evaluation. [redacted]

Along with their space station program, the Soviets are developing a reusable spacecraft that is roughly comparable to the US Dynasoar program of the early 1960s. This delta-wing "space plane" could be used to ferry crews (up to six cosmonauts) to the modular space stations, to perform military reconnaissance missions, or to inspect other satellites. A one-third-scale model was tested during [redacted] and the full-scale space plane may be launched in late 1982 or 1983, possibly on the new medium-class booster to be launched from Site Y. By the late 1980s, the Soviets may have a larger, shuttle-type reusable space transport system—one using a variant of the Saturn-V-type booster. As a result of the space station and reusable spacecraft, we estimate that the Soviet manned program will consume about one-fourth of the projected space hardware costs (in dollars) during the 1982-86 period. [redacted]

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Intelligence Collection Systems
Over the last 20 years, photoreconnaissance has been the largest single element of the space program, accounting for about 30 percent of total space hardware costs and one-third of the launches. This purely military program began in the early 1960s and has been supported by a relatively constant level of resources over the period. [redacted]

The Soviets currently launch approximately 35 film-return reconnaissance satellites per year, and we expect this to continue through the 1980s. In addition, the Soviets are probably developing two new photographic systems to increase the timeliness of data retrieval. [redacted] the first of these is a system that will automatically process the film on board the satellite, scan the film to convert the imagery to a digital format, and transmit the digital data to a ground station. This process is an interim step toward the second system, which will be capable

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of near-real-time data retrieval using an electro-optical system in which the film and the developing steps are eliminated. The first film-scan photoreconnaissance satellite may be launched this year. Before the end of the decade, we expect the Soviets to flight-test a near-real-time, electro-optical photoreconnaissance satellite. [redacted]

Based on our view of the Soviets' perceived needs, their technological state of the art, and our knowledge of development cycles, other projected intelligence collection programs include:

- An advanced radar ocean reconnaissance satellite (RORSAT) with dual side-looking radars to increase the satellite's field of view and improve targeting for selected naval combatants.
- An improved ELINT ocean reconnaissance satellite with greater lifetime and increased frequency range for enhanced ocean surveillance.
- A synchronous launch-detection satellite network to eventually replace the current multisatellite networks and provide continuous coverage of US ICBM and SLBM launch areas.
- A high-altitude ELINT collection satellite that will provide nearly continuous coverage of large areas and signficantly increase tasking flexibility.

During the five-year period 1982-86, we estimate that the Soviets will spend about $3.5 billion a year on space hardware to support their intelligence/photoreconnaissance program. [redacted]

Synchronous Communications Satellites
The Soviets have filed plans with the International Telecommunications Union (ITU) to establish six new synchronous communications and data-relay satellite networks in addition to those already in use. The longitude positions identified in the ITU filings indicate that two or more payloads (as many as four in some cases) of the named networks—Volna, Luch, Luch-P, and GALs—may be placed aboard a common spacecraft and will not require separate SL-12 launch vehicles—a significant reduction in launch vehicle costs. However, due to the proliferation of communications networks for both civil communications and military command and control, overall costs for these programs will rise steadily throughout the 1982-86 period and by 1986 will amount to more than $2.5 billion—about one-fifth of total space costs. By the mid-1980s, these satellites will provide global military communications to aircraft, ships, and ground forces as well as increased television and common-carrier communications capability. One of two proposed data-relay satellite networks is designed to relay digital data from peripheral ground stations to central stations. The other is designed to relay data to and from low-orbiting spacecraft to provide real-time data access. [redacted]

Military Support Satellites
In addition to intelligence collection and command and control functions, many Soviet military satellites provide navigation support to naval combatants, collect weather data, and calibrate large ABM radars. Most of these satellites are relatively inexpensive—total expenditures for support satellites will average only $800 million per year for 1982-86—but perform important military functions, such as targeting for antiship weapons, that are difficult to duplicate by nonspace means. [redacted]

The Soviets recently announced their intention to launch during the 1980s an advanced high-altitude satellite navigation system—GLONASS—similar to the US NAVSTAR/Global Positioning System (GPS). This system would be continuously available and would provide accurate position data to highly mobile platforms such as aircraft and armored vehicles. The GLONASS system also could be used to increase the accuracy of SLBMs and improve tactical battlefield operations during periods of decreased visibility or in terrain with few permanent landmarks. [redacted]

We expect that by late 1982 the Soviets will launch a geosynchronous meteorological satellite that the Soviets had originally announced would be launched in 1978 as part of the Global Atmospheric Research Program (GARP). This launch will complete an announced three-tier meteorological satellite system of manned space stations in low Earth orbit, Meteor satellites at higher altitudes, and a synchronous meteorological satellite. [redacted]

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Military Versus Civilian Programs
Most Soviet satellites have primarily a military mission, but a clear civilian versus military distinction is not always possible. The Salyut manned space station program consists of two distinct types. One type—Salyuts 2, 3, and 5—served as military reconnaissance platforms and as testbeds for new military-related spacecraft systems. Salyuts 1, 4, and 6 were primarily scientific, [redacted] In estimating the costs of these programs, we allocate a portion of the costs, on the basis of observed spacecraft use, to the military or civilian space programs. Since 1972 approximately two-thirds of the space hardware costs in dollars have been devoted to military programs (figure 6). The significantly higher military percentage in 1976 and 1977 is due mainly to the Salyut 5 military space station and its associated Soyuz crew launches. Less than 15 percent of the costs have been used for the purely scientific lunar and planetary missions. [redacted]

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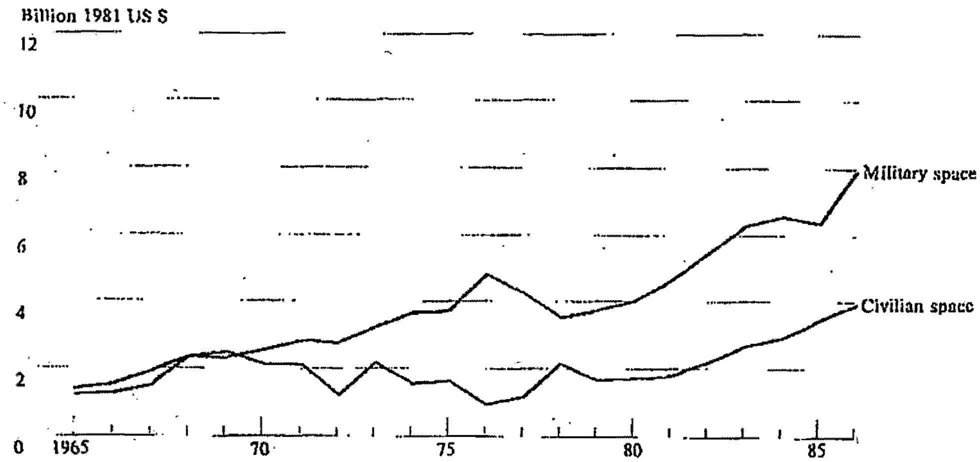
Design Philosophy and Cost Implications
The predominant Soviet design philosophy for the space program to date has stressed the gradual introduction of new technology. Evolutionary systems can be more easily developed and produced at less cost by the Soviet military-industrial sector. Existing spacecraft, subsystems, and components are used whenever possible. In most cases, to create more advanced spacecraft and satellite systems, new technology has been added in the design stage to complement existing hardware from older vehicles. The initial cost savings, however, are somewhat deceiving because a large number of satellites usually are needed to accomplish the same mission that would be performed by a single high-technology spacecraft. In addition, since few Soviet spacecraft have lifetimes exceeding 18 months, the Soviets also use multisatellite networks and frequent replacements to ensure operational reliability. Thus, the overall space hardware cost is increased because of the higher launch rate even though individual systems are cheaper to build. For the past 10 years, the Soviet launch rate has been three to four times higher than that of the United States (figure 7), even though both countries maintain about the same number of satellites in orbit. This is due primarily to the fact that US satellites have significantly longer lifetimes. [redacted]

Extensive use of subsystem commonality by the Soviets is evident in their photoreconnaissance and manned spacecraft. Because all Soviet photoreconnaissance vehicles require the recovery of film from the satellite, the Soviets initially adapted the existing recovery capsule design from Vostok—the spacecraft which launched the first man into space. The life support systems were removed, and the structure was modified slightly to allow for camera placement and film recovery. The newer, second-generation high-resolution photographic satellites are adapted from the basic Soyuz manned spacecraft as are the current Soyuz-T crew ferry vehicle and the Progress space station resupply vehicle. The Salyut space station also evolved from the basic Soyuz. [redacted]

By incorporating the required components into operationally proven designs, the time and expense of developing a new satellite system are significantly reduced. Initial development of the ELINT ocean reconnaissance satellite (EORSAT) was completed within two years as compared with about a five-year development period for the radar ocean reconnaissance satellites (RORSAT), because many of the major subsystems such as propulsion, attitude control, data transmission, and command are nearly identical to those of the RORSAT. The two systems are used in a complementary role for ocean surveillance. A recent cost analysis of the Molniya 2 communication spacecraft also revealed that development costs would have been over 50 percent higher without design inheritance. [redacted]

Soviet commitments to fulfilling new military requirements for near-real-time photographic data, permanent manned orbiting complexes, detailed search of large ocean areas, and improved targeting for weapon systems cannot be met in a timely fashion using the conventional technology solutions that are characteristic of the Soviet evolutionary design approach. As

Figure 6
Soviet Space Hardware Costs, 1965-86



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the Soviets substantially broaden their spacecraft design efforts, many of the new spacecraft and space launch vehicles will incorporate more advanced technology. In the recent past, Soviet spacecraft designers have not taken maximum advantage of the new technology available, both in the USSR and in the West, but have relied instead on existing components and subsystems whenever possible. New spacecraft were developed through a series of incremental steps with the gradual introduction of new technology only where necessary—a hallmark of the evolutionary design philosophy. Although this design practice conforms to the limitations of the Soviet industrial base, it restricts system performance and flexibility. Soviet scientists and engineers, using their own indigenous technological base and, where necessary, "borrowing" from the West, are capable of pushing the state of the art, but deficiencies in Soviet production machinery and techniques as well as inefficient managerial practices have kept them back. Advanced technology requiring close tolerances, high reliability, clean production facilities, and defect-free production materials represents a real challenge to the manufacturing capabilities of most Soviet plants. New products and processes also make it more difficult to fulfill gross output quotas, which are essential to career advancement and bonuses. [redacted]

When the Soviets attempt to meet new strategic challenges with advanced technology, they make an early commitment of resources and persistently pursue the objective in spite of failures and delays. For example, technical problems with advanced solid propellants have prolonged the preflight development stage of the new medium solid-propellant ICBM from the usual seven or eight years to about 14 years. Their most pronounced success with advanced technology, the titanium-hulled A-class submarine, was deployed only after an extensive research and development program lasting more than two decades. [redacted]

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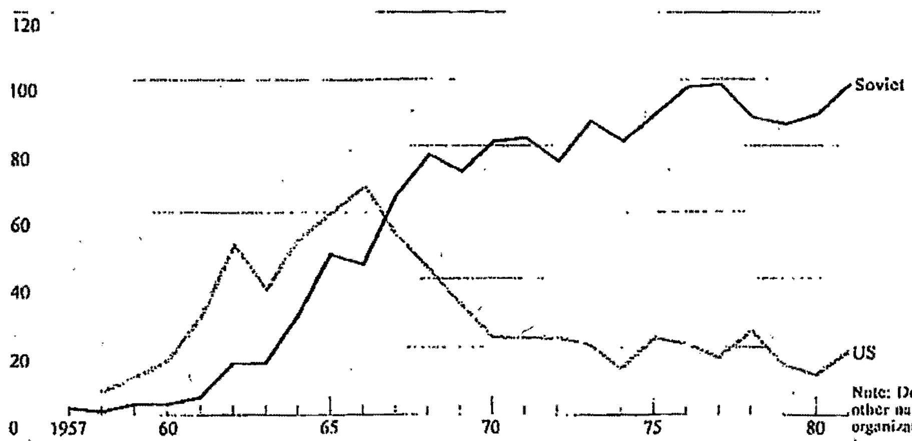
Figure 7
Number of Successful Launches Per Year, United States Versus USSR



Note: Does not include launches for other nations or international organizations.

Although the United States launches fewer satellites annually, it maintains about the same number of satellites in operation as the Soviets because of longer lifetimes.

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Military requirements for a variety of new space systems, such as a continuously manned orbiting space complex, film-scan and electro-optical photographic satellites for rapid indications and warning response, synthetic aperture radars for detailed coverage of large ocean areas, and space-based lasers for multishot, long-range ASAT operations drive the Soviet design bureaus to the leading edges of technological state of the art. Current research and development programs indicate that the Soviets are also likely to incorporate more advanced technologies in other weapon systems such as direct casting of propellant into the motor case for solid-propellant ICBMs and IRBMs, high-bypass turbines and advanced materials and fastening technologies for wide-bodied transport aircraft, and laser weapon systems. Apparently the Soviets feel that the increase in military effectiveness and political benefits gained from advanced systems justify the additional risks of schedule slippage or failure and the increased costs. The evolutionary design practices have not been abandoned, however, and will continue to be used whenever minor technology advances will meet changing mission requirements. [redacted]

When the necessary technology required for new systems such as the Saturn-V-type booster and the space plane is not readily available within the Soviet Union, it is purchased legally or illegally, or stolen from other countries. The multispectral cameras used on Earth resources satellites and on the Soyuz are purchased from Zeiss-Jena in East Germany. US concepts such as the Tracking and Data Relay Satellite System, Dynasoar delta-wing space plane, and GPS/NAVSTAR navigation satellite have been copied to shorten development times for new Soviet systems and to reduce technical risk. [redacted]

Resource Implications
Soviet leaders have indicated in their writings and statements that they do not view space as an isolated

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area but rather as an integral part of overall military, economic, and political policy. Outlays for space hardware will require the equivalent of some $12 billion in 1986, as compared with $6 billion in 1981. Based on current projections, expenditures for space hardware could increase from about 0.6 percent of GNP in 1981 to 0.9 percent by 1986. The Soviets probably perceive that the political, military, and economic returns of rubles invested in civilian and military space programs are greater than could be expected from other investments. Nowhere is this more clear than in Soviet efforts to establish a permanent, continuously manned, orbiting space station. President Brezhnev recently stated that this is a national goal. In this sense the manned orbiting space station probably has somewhat the same stature in Soviet eyes as did our national goal of placing a man on the Moon. Approximately one-half of the increase in total expenditures on space hardware between 1981 and 1986 will go for this purpose. [redacted]

Not only will the prestige returns be great from the orbiting space station, but there will be important military and economic payoffs as well. For example, the Soviets intend to manufacture semiconductors and special alloys aboard the space station. These manufacturing experiments have been publicized as having economic value, but they probably will have direct military applications as well. Although we are uncertain as to which military experiments are to be undertaken, the Soviets are likely to pursue research in ASW, ASAT, early warning, and other important defensive and offensive missions. Successful space-based ASW sensor development would dramatically improve the Soviets' ability to detect submarines over large ocean areas. Space-based laser systems could be used to negate other satellites or, eventually, to destroy missiles. [redacted]

Expenditures for the military portion of the space program, amounting to two-thirds of the total, will increase during a period of temporary declines in the procurement for other systems such as strategic missiles. Thus, the increased expenditures for space will not be reflected in any significant change in the overall level and trend in Soviet defense expenditures. In addition to funding a portion of the manned space stations, military space programs include communications satellites for enhanced command and control, space-based intelligence collection, satellites for calibrating the large ABM radars, and ocean surveillance satellites to improve targeting of antiship weapons. [redacted]

The civilian space program—one-third of the total—includes purely civilian projects like the multispectral photography provided by Earth resources satellite missions. This photography is of key importance to Soviet agricultural, energy, and mineral resources studies including crop yield estimates, the extent of crop damage or disease, data on mining, gas, and oil exploration from widely scattered areas in the USSR, and plankton movement to locate fish concentrations. Since 1979 Soviet interest in these areas has significantly increased, and we expect that at least six of these missions will be launched annually through 1986 in addition to the studies conducted aboard the manned space stations. The increase in civilian space programs in dollar terms amounts to some $400 million annually. [redacted]

The Soviet space program continues to preempt a growing share of the nation's most modern production and research and development facilities and many of the finest scientific, engineering, and managerial talents of the economy, and it must be subject to considerable review in light of current economic performance. On balance, the Soviets probably regard space systems as a cost-effective means to increase military power, enhance prestige at home and abroad, and gather data applicable to a variety of economic uses. [redacted]

Outlook

Current Soviet space activities underscore the utility of man in space, the usefulness of satellites to support military operations, and the international prestige associated with space exploration. Although the new space programs will result in increased costs over the next few years, we expect space hardware costs to level off in the late 1980s as the new satellite networks are established and prove their reliability. The overall

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satellite launch rate, which is currently about 100 per year, should peak at about 120 launches per year during the mid-1980s as the Soviets continue to orbit both old and new systems until the reliability of the new systems has been established. The launch rate should then fall below 90 launches per year by 1990 as the older systems are phased out and the Soviets exploit the increased sophistication and longer lifetimes of the new systems. The development of reusable space systems, the reduced launch rate, and satellites with increased lifetimes in the late 1980s will help prevent further rapid increases in space costs. As their capabilities in space increase, the Soviets also will become increasingly dependent upon the new systems for intelligence collection, navigation support, and maintaining order-of-battle and targeting data. [redacted]

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