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Soviet Military Capabilities and Intentions in Space

National Intelligence Estimate

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NIE 11-1-80
TCS 3166-80
6 August 1980

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NIE 11-1-80

SOVIET MILITARY CAPABILITIES AND INTENTIONS IN SPACE

Information available as of 6 August 1980 was used in the preparation of this Estimate.

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

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

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

Also Participating:

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

The Director of Naval Intelligence, Department of the Navy

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

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SCOPE NOTE

This National Intelligence Estimate assesses present and future Soviet military capabilities and intentions in space. Soviet civil space systems are addressed only insofar as they clarify the scope and magnitude of the military program. Comparisons with US space systems are made where they can serve as useful benchmarks for understanding Soviet capabilities or philosophy. The comparisons should not be interpreted as technical assessments showing superiority or inferiority of Soviet systems relative to US systems.

The Estimate treats the following elements of the Soviet military space program:

— Scope, magnitude, organization, and management.

— Technical capabilities and limitations of current Soviet space systems and prospects for new systems, as evidenced by current research, development, and testing activities, by trends in the Soviet program, and by our perceptions of Soviet requirements.

— Operational capabilities of current and prospective Soviet space systems to serve known and potential military support functions, and the USSR's dependence on its space systems.

— Current and prospective Soviet spaceborne antisatellite systems and prospects for their use.

The assessments and projections in this Estimate have been limited, for the most part, to a period covering the next 10 years. The cutoff date for information used in the report was June 1980.

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EXECUTIVE SUMMARY

1. Over the past 23 years, the Soviet space program has evolved from one emphasizing civil space accomplishments for prestige purposes to one emphasizing the use of space systems for military support. Today 70 percent of Soviet space systems serve only a military support mission, and another 15 percent serve both military and civil purposes. The Soviets conduct about 100 space launches annually and at any one time have 70 to 110 operational satellites in orbit. In support of their space program, the Soviets are developing new space launch vehicles (SLVs), building new launch sites and modifying some older ones, upgrading their land-based command, control, and tracking sites, and upgrading ships dedicated to supporting space activities.

2. Developments in the Soviet military space program tend to be evolutionary in nature. As with many other military programs, the Soviets continue to operate older satellite systems long after the introduction of improved systems. Improved payloads are often incorporated into proven spacecraft. Some completely new, technically complex systems (launch detection satellites, for example, and radar and ELINT ocean reconnaissance satellites) have suffered many problems during the flight test phase.

3. The Soviets have placed more emphasis than the United States on development of space systems directly responsive to military requirements. Both countries have developed satellite systems for photoreconnaissance, ELINT reconnaissance, communications, detection of ballistic missile launches, navigation, geodesy, and meteorology. In addition, the Soviets have developed military space systems for which there are no comparable US systems. They have radar and ELINT ocean reconnaissance systems that can provide targeting data in real time to selected naval combatants carrying antiship weapons. They have developed manned space stations for the purposes of reconnaissance and military-related research. They also have an operational orbital interceptor for destruction of satellites in near-Earth orbits.

4. Although several Soviet and US systems are functionally similar, they were not necessarily designed to satisfy identical requirements. Soviet photographic and ELINT reconnaissance satellites were not designed to acquire the precision data 25X1
25X1 These Soviet systems appear designed to satisfy requirements such as maintaining orders of battle of foreign military forces. 25X1

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25X1 the USSR has not developed space systems for interception of communications or telemetry signals, or for the collection of infrared data for intelligence analysis purposes. We believe that the Soviets have failed to develop such satellite systems because of either the availability of information from other sources or technological limitations or for both reasons.

5. All of the Soviets' current satellite systems, with the exception of those for communications and missile launch detection, use near-Earth orbits. Having to maintain several networks of near-Earth ELINT and navigation satellites, which have relatively short lifetimes, requires frequent launches of replenishment satellites. In comparison, the annual satellite launch rate of the United States is about a fourth that of the Soviet Union. The difference in launch rate is due primarily to three factors:

— US satellites have much longer lifetimes.

— The United States makes extensive use of semisynchronous and geostationary orbits to obtain nearly continuous coverage of large areas with fewer satellites than would be required in near-Earth orbits.

— One-third (about 30) of the total annual Soviet launches are photoreconnaissance satellites, all of which return exposed film. The US KH-11 electro-optical imaging system is continually in orbit, returning images in near-real time to a ground station. 25X
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6. In the 1970s, the Soviets undertook a considerable, expanding effort to develop and use techniques that deny us information useful for assessing the missions and performance of their space systems.
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Current and Prospective Soviet Space Systems for Military Support

8. We believe the Soviets will continue to use and improve virtually all of their current types of military satellite systems through the 1980s, and will introduce many new systems as well. Table 1E summarizes current and prospective Soviet military satellite systems.

9. The Soviets are developing a new military space station, and they continue publicly to discuss plans for docking multiple space stations to form a continuously manned space complex. Like previous military Salyut space stations, we expect new ones will carry both low- and high-resolution cameras to serve multiple photoreconnaissance missions. We also expect them to carry additional sensors, such as ELINT and infrared sensors. Data collected by all these sensors could undergo preliminary processing on board and then be passed via data link to Moscow in support of a number of military functions, such as providing indications and warning and maintaining orders of battle, and providing timely data for crisis management and the conduct of military operations. In addition, the Soviets may choose to use manned space stations to conduct subsystem testing of future laser weapon systems.

10. The Soviets are also developing a small reusable "space plane" that will be launched vertically and land horizontally. The spacecraft could serve as a ferry vehicle for space stations or in a reconnaissance or satellite inspection role. It could also provide valuable engineering data for a large reusable space transportation system (RSTS) comparable to the US Shuttle in size and weight. However, a large Soviet RSTS could probably not be operational before the early 1990s. The Soviets' new

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Table 1E

Current and Prospective Satellite System Functions

Satellite System Function	Status of Soviet System or Likelihood of Development [a]	Earliest Expected Operation
Multipurpose military space stations	Operational [b]	
Multipurpose (?) "space plane"	In development	Early-to-middle 1980s
Reusable space transportation system	In development [c]	Early-to-middle 1990s
Communications	Operational	
Meterological:		
Near-Earth orbit	Operational	
Geostationary	In development	Early 1980s
Navigation:		
Conventional	Operational	
Advanced (Global Positioning System type)	Moderate [d]	Late 1980s
Photoreconnaissance:		
Film-return systems	Operational	
Film scan system (store-dump)	In development	Early-to-middle 1980s
Electro-optical (real-time)	High [e]	Late 1980s–early 1990s
ELINT reconnaissance:		
Conventional near-Earth orbits	Operational	
Real-time data to naval combatants	Operational [f]	
High-altitude orbits	Moderate [d]	Mid-1980s
Radar ocean reconnaissance:		
Conventional	Operational [f]	
Advanced	High [e]	Late 1980s
Radar imaging (for intelligence)	Even chance	1990s
Early warning:		
Of ICBM launches	In development	Early-to-middle 1980s
Of SLBM launches	Moderate [d]	1990s
Infrared collection (for intelligence)	Low [e]	1990s
Communications intercept	Low [e, f]	1990s
Telemetry intercept	Low [e, f]	1990s

[a] Likelihood scale: High=85 to 90 percent; Moderate=65 to 75 percent; Even Chance=50 percent; Low=10 to 30 percent. The scale indicates likelihood Soviets will elect to develop within next 10 years.

[b] Soviets have not flown a military space station since 1977 but could launch one at any time.

[c] *The Director, Defense Intelligence Agency, believes that any Soviet program to develop a large reusable space transportation system is in no more than the conceptual design stage.*

[d] No evidence of Soviet development.

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[f] See text of the Discussion for an expansion on this assessment.

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space station and "space plane" could serve operational purposes in the early-to-middle 1980s.

11. During the 1980s, the Soviets apparently intend to make considerably more use of satellites in high-altitude orbits for communications, meteorology, and navigation. This intention is indicated by the large increase in the production and launch facilities for the USSR's largest operational space booster. Also:

— The Soviets have announced plans to establish five networks with a potential total of 29 geostationary communications

satellites. By the mid-1980s these satellites will provide the Soviets with global communications to aircraft, ships, and ground forces. 25X1
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— In the early 1980s the Soviets will also place weather satellites into geosynchronous orbit. These satellites, coupled with observations from low-altitude manned space stations and medium-altitude weather satellites, will complete the Soviet "three-tiered network." This network will decrease the Soviets' dependence on meteorological information supplied by the West and will provide them valuable data for planning and executing force movements, exercises, and photoreconnaissance targeting.

— By the late 1980s the Soviets could have an advanced satellite navigation system similar to the US Global Positioning System (GPS). They could elect to incorporate the necessary GPS-type subsystems on an existing high-altitude space system such as their Molniya or Statsionar communications satellites. Unlike their current navigation satellites, a high-altitude GPS-type system would be continuously available and could be used by mobile ground-, air-, and sea-based platforms for precision navigation and accurate weapon and target positioning. In the late 1980s a GPS-type system could be used to provide new Soviet submarine-launched ballistic missiles (SLBMs) the accuracy required for effective use against hardened point targets.

12. There is little intelligence on which to project Soviet development of advanced photographic, electronic, and radar reconnaissance satellites. Judging on the basis of our views of the Soviets' perceived needs, their technological state of the art, and our knowledge of their development cycle, our projections of future Soviet space systems include the following:

— A high likelihood the Soviets will have an advanced photoreconnaissance system equipped to develop film on board automatically and transmit imagery data to a ground station.

— A high likelihood the Soviets will elect to develop a KH-11-type, electro-optical imaging system, which could be operational in the late 1980s or early 1990s.

— A moderate likelihood they will have a high-altitude ELINT reconnaissance system in the mid-1980s, which will provide

nearly continuous coverage of large areas and significantly increase tasking flexibility.

— A high likelihood they will have an advanced radar ocean reconnaissance satellite by the late 1980s, with much improved capabilities to supply targeting data in real time to selected Soviet naval combatants.

— An even chance they will have a radar imaging satellite in the 1990s to provide all-weather, day and night coverage of important targets.

All of these systems will significantly enhance the Soviet capability to obtain more timely data for purposes of indications and warning, maintaining orders of battle on mobile forces, and management of crises and limited conflicts.

13. The Soviets still lack a fully operational network of satellites for early warning of missile launches to supplement their ground-based ballistic missile early warning radars. The US launch detection satellite (LDS) program, which has been in operation for more than 10 years, uses a geostationary orbit to obtain worldwide coverage of ICBM and SLBM launches. The Soviets have been plagued with problems since 1972 in their efforts to establish an operational network. We believe, however, that development of a launch detection program is a high priority for them because of the significant gain in warning time and reliability provided by such systems. We believe that it may be as late as 1983 before the Soviets establish a network for continuous coverage of US ICBM fields. Deployment of an LDS network with coverage of all current and planned US SLBM and ICBM launch areas probably could not be accomplished before the 1990s.

14. The Soviets have both overt and covert access to significant amounts of information on US systems and their operating and performance characteristics. This access and the difficult technological problems involved lead us to conclude that the Soviets probably will not develop high-altitude satellites to intercept COMINT or telemetry or collect infrared data for scientific and technical intelligence.

Contribution of Soviet Space Systems to Military Support

15. In developing their vast array of space systems during the last 23 years, the Soviets have been striving to acquire means to provide additional support and to augment their total military capability. Most present Soviet space systems perform military support functions that can also be performed by nonspace systems. During recent years, however, more Soviet space systems perform functions that cannot be

easily duplicated by nonspace systems, thus increasing Soviet dependence on space for military support during peacetime, crisis, and conflict.

16. To measure the military contribution of Soviet space systems, we have grouped space system capabilities in 10 functional areas. Table 2E contains a summary of our assessments of the capabilities of current and projected Soviet satellite systems during peacetime and crisis and limited conflict situations. For most functions shown in the table there are several Soviet space systems that contribute to the net capability. At present, the capabilities of Soviet space systems are weakest in the functions of providing detailed scientific and technological intelligence, indications and warning, and treaty verification. This weakness is due principally to the shortcomings of Soviet ELINT and photoreconnaissance systems. Soviet capabilities are strongest in those functions related to geodesy, navigation, and radar calibration. Improvements during the

Table 2E

Capabilities of Soviet Space Systems and Soviet Dependence on Them

Functions Supported by Space Systems		Peacetime 1980	Peacetime 1990	Crisis and Limited Conflict 1980	Crisis and Limited Conflict 1990
Detailed technical intelligence analysis	Capability	Poor	Poor-Fair	Poor	Poor-Fair
	Dependence*	Low	Low	Low	Low
Calibrating radars	Capability	Excellent	Excellent	Excellent	Excellent
	Dependence	High	High	High	High
Monitoring compliance with treaties	Capability	Fair	Fair-Good	Fair	Fair-Good
	Dependence	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate
Mapping, charting, geodesy	Capability	Excellent	Excellent	Excellent	Excellent
	Dependence	High	High	High	High
Observing and forecasting weather conditions	Capability	Good-Excellent	Excellent	Good-Excellent	Excellent
	Dependence	Low-Moderate	Low-Moderate	High	High
Maintaining order of battle and targeting data	Capability	Good	Good-Excellent	Good	Good-Excellent
	Dependence	High	High	High	High
Providing indications and warning	Capability	Fair	Good-Excellent	Fair	Good-Excellent
	Dependence	Low-Moderate	Moderate	Low-Moderate	Moderate
Targeting of antiship weapons	Capability	Not peacetime functions		Fair-Good	Good
	Dependence			Low-Moderate	High
Navigation support to naval combatants	Capability	Excellent	Excellent	Excellent	Excellent
	Dependence	Low	Low	Moderate	High
Military command and control communications	Capability	Good	Excellent	Good	Excellent
	Dependence	Low-Moderate	Moderate	Low-Moderate	Moderate

* Dependence: High (no practical or satisfactory substitute).
Moderate (substitutes available but are not as convenient or do not perform mission as well).
Low (substitutes available that are at least equally practical or adequate).

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1980s in meteorological and communications satellites will lead to strong capabilities in weather forecasting and military command and control.

17. Several of the functions indentified in table 2E provide the Soviets support in peacetime, crisis, and limited-conflict situations that is either unique or difficult to acquire by other means. Most notable are the functions of indications and warning, maintaining order-of-battle and targeting data, weather forecasting, and military command and control communications. The combination of present and likely future Soviet capabilities in these areas between now and 1990 will improve the Soviets' capability for worldwide crisis management and the conduct of military operations.

18. All Soviet space systems rely on unhardened ground-based facilities for launching additional satellites, tracking and controlling satellites, and receiving data from satellites. In an unrestrained US-Soviet conflict, strikes on the Soviet Union could destroy these ground facilities, rendering virtually all of the satellites useless. In recent years, the Soviets have deployed a large number of transportable satellite communication terminals which, although unhardened, have some degree of survivability due to their mobility. The satellites associated with these communication terminals would remain viable for only a few days, however, in the absence of a survivable operational satellite control site.

19. Table 2E also summarizes our assessments of Soviet dependence on space systems. In assessing dependence, primary consideration was given to the availability of nonspace substitutes for the function performed. The three categories of dependence—low, moderate, and high—are defined in terms of such substitutes in table 2E. We assess that in the 1980s the Soviets will become increasingly dependent on space systems for military support during peacetime, crisis, and limited-conflict situations with the deployment of additional and more advanced space systems. This increased dependence will be largely in the areas of indications and warning, command and control communication, and navigation support to naval combatants. Space systems will provide them with more timely information, enhance the capabilities of weapons systems, and extend support to forces deployed outside the Soviet landmass. The Soviets' greatest dependence will be on those space systems that perform a function for which alternative approaches are either unsatisfactory or have not been developed.

20. The Soviets' recognition of the military contribution of satellites has been in part responsible for their acceptance of tacit and explicit US-Soviet agreements during the past two decades not to

interfere with space systems. The Soviets' attitudes toward noninterference have resulted from an amalgam of political and other factors, including their own increasing dependence on space systems for military support functions. Their attitude toward foreign space systems gradually changed over the years from one of general hostility in the 1950s to one of qualified acceptance. They agreed to the 1972 ABM Treaty and Interim Agreement on Strategic Offensive Weapons, which calls for the use of "national technical means of verification" without interference when used in a "manner consistent with generally recognized principles of international law." On the other hand, the Soviets agreed to the 1967 Outer Space Treaty, which prohibits the deployment in space of nuclear weapons and other weapons of mass destruction. The Soviets still hold that certain other space activities cannot be accepted as legitimate. They recognize, moreover, the importance the West places on satellites for supporting military activities.

21. Development of an antisatellite orbital interceptor clearly shows a Soviet desire to have the capability to negate foreign satellites, should the decision be made that such action was necessary. Unless the United States and the USSR agree to prohibit testing of antisatellite systems, we believe the Soviets will continue testing their orbital interceptor. They are now working on a new sensor for their current nonnuclear orbital interceptor. We expect the Soviets to continue design and engineering of a space-based laser system that would have significant advantages over their orbital interceptor for the antisatellite function. They conceivably could have a prototype spaceborne laser weapon for antisatellite testing by the mid-to-late 1980s. As part of such a development program, the Soviets might choose to use their space stations to conduct subsystem testing of low-power laser weapon prototypes.

22. Even if they proceed with development of new and improved spaceborne antisatellite systems, we believe it highly unlikely the Soviets will use them to destroy or otherwise interfere with US satellites in peacetime, crises, or conflicts not involving direct engagements between US and Soviet forces. Three factors upon which this judgment is based are (1) the Soviet desire to limit conflict escalation, (2) the Soviets' own dependence on space systems, and, less importantly, (3) the current US efforts to develop an antisatellite system. In a conflict between US and Soviet forces, the likelihood of Soviet attempts to destroy US satellites using spaceborne means would rise as the conflict escalated. The likelihood of such interference would probably be moderate as long as the Soviets' objectives in a US-Soviet conflict were limited and they believed they could contain the scope and

intensity of the fighting. We believe there is a high likelihood that the Soviets would use spaceborne antisatellite systems in a NATO–Warsaw Pact armed conflict. The likelihood of such use would be very high if the Soviets perceived that general nuclear war was imminent.

DISCUSSION

I. OVERVIEW OF SOVIET SPACE PROGRAM

1. In this section we present an overview of the Soviet space effort from 1957 to present, addressing its evolution, its scope and magnitude, and its organization and management. Subsequent sections discuss the specific capabilities of Soviet space hardware and the ways in which these systems serve the Soviet military during peacetime, as well as during periods of crisis and conflict. A separate section focuses on the Soviets' ability to use their own space systems to negate those of other nations.

2. In this section comparisons with US space efforts are included where they can serve as useful benchmarks for understanding Soviet capabilities or philosophy. These comparisons should not be interpreted as technical assessments showing Soviet satellite systems to be superior or inferior to US satellite systems. The space programs of the United States and the USSR have evolved in response to their perceived national needs, which are, in many cases, quite different. For example:

— US intelligence collection requirements resulted in satellite systems to collect 25X1 communications signals. The Soviets have no similar systems.

— Soviet military requirements resulted in an orbital interceptor for engaging satellites of other nations, radar support satellites for calibrating ABM radars, and radar and ELINT ocean reconnaissance satellites for transmitting targeting data in real time to selected naval combatants. 25X1
25X1

— Although some US and Soviet satellite systems are of the same type (photographic and ELINT collection satellites, for example), they were not necessarily designed in response to the same requirements. Therefore, while a specific Soviet satellite system may appear inferior to a similar US satellite system, it may fully satisfy Soviet requirements.

Evolution of the Soviet Program

3. The early years of the Soviet space program were dominated by heavily publicized space flights with limited scientific objectives. The early scientific and manned missions in low Earth orbit, as well as the lunar and planetary missions, relied on space boosters derived from ballistic missiles. This general approach provided a series of space "firsts" that made headlines, had a fair probability of success, and were not overly expensive. The clear intent was to enhance the image of the Soviet Union as a technical, scientific, and military power.

4. In the mid-1960s, the Soviets began to broaden the objectives of their space program by launching newer series of satellites with practical military and economic applications. While those directed toward meteorology and civil communications received some publicity, others such as those for photographic and ELINT reconnaissance, radar calibration, covert communications, navigation, geodesy, and satellite interception were masqueraded as part of a continuing program of scientific research.

5. To move beyond their earlier publicized successes in space, the Soviets began in the late 1960s to test larger and more complex space boosters and spacecraft. They encountered serious setbacks in these programs and did not move forward as they had expected. Their failure to develop a large booster for manned lunar missions, coupled with the US lead in the Apollo Project, led the Soviets to redirect the emphasis of their man-in-space program to Earth-orbiting space stations.

6. Since the early 1970s, the Soviets have concentrated their effort on space systems for military support. They improved the capability of their ELINT and photoreconnaissance satellites, developed radar and launch detection satellites, and developed a geosynchronous communications satellite network. At the same time, they have sought to maintain the image of Soviet prowess in space by heavily publicizing the missions of the Salyut space stations.

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7. Figure 1 summarizes the proliferation of Soviet spacecraft types discussed in the preceding paragraphs. This large array of spacecraft has been developed through a building block approach which emphasizes an evolutionary design philosophy. In this approach, the Soviets have developed several basic spacecraft designs and, over time, have incorporated new missions and improved capabilities into them. Despite some setbacks during developmental flight tests, their general approach of retaining both old and new systems has resulted in a large number of different satellite types.

8. During the early 1960s the Soviets substantially increased the level of effort devoted to space system design and development. As a result they introduced many new space systems in the mid-to-late 1960s. Since then, they have maintained a fairly constant level of spacecraft design and development. Clearly, they remain committed to a diverse program to serve various military and civil programs.

Scope and Magnitude of Soviet Program

9. After the launching of Sputnik in 1957, the number of successful space launches conducted annually by the Soviet Union steadily increased, reaching a maximum of 98 in 1977. In 1967, the Soviet launch rate surpassed that of the US program for the first time since the initial year of 1957. And for the past 10 years the Soviet launch rate has been three to four times that of the United States. The annual launch rates for the USSR and the United States are shown in figure 2.

10. In terms of the total payload weight to orbit, the Soviets currently orbit about 10 times the US total each year (about 300,000 kilograms for the USSR versus 30,000 kg for the United States). While the Soviets annually deploy a considerably larger number of payloads and more total weight in orbit, the United States places a greater proportion of its payloads into higher orbit. Thus, if all launches for both countries are converted into an equivalent weight delivered to a 185-kilometer circular orbit, the ratio would be 4 to 1 in favor of the Soviets.

11. While the annual number of launches and amount of payload weight to orbit give some measure of the gross magnitude of the Soviet program, perhaps a more useful parameter is the number of active satellites, as shown in table 1. The number generally operational is about equal to the annual launch rate.

Table 1

Categories and Numbers of Soviet Satellites Usually Operational

Satellite Category	Number Usually Operational
Launch detection	1-3
ELINT reconnaissance	8-10
ELINT ocean reconnaissance	0-2
Radar ocean reconnaissance	0-2
Naval support	9-11
Geodetic	1-3
Manned/manned-related	1-3
Meteorological	6-10
Communications	37-46
Radar support	2-6
Orbital interceptor	0-1
Target vehicle	0-1
Photoreconnaissance	1-4
Scientific	4-10
Total	70-112
Subtotals: Military	46-75
Military/Civil	20-27
Civil/Scientific	4-10

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This is because many launches are for short-lived photoreconnaissance missions, and few Soviet satellites have lifetimes exceeding 18 months. The United States makes much more use of geostationary orbits, a practice that requires fewer satellites for continuous coverage of large areas. Even with fewer annual launches than the Soviets, the United States usually has about 100 satellites in operation. It maintains about the same number of satellites in operation as the Soviets because the US satellites have much longer operational lifetimes, requiring fewer "replenishment" launches.

12. Clear distinctions between Soviet military and civil space programs are not always possible because some systems perform both military and nonmilitary functions, as shown by the spacecraft categories in figure 3. For example, although the scientific Salyut space station program is primarily civil, the Soviets have conducted some experiments on board the Salyut that have important military, as well as civilian, applications. Figure 4 illustrates Soviet space launches since 1957 for each of these categories. It shows that the space programs serving only the military are by far the most active, usually accounting for about 70 percent of the launches each year. It also shows that the dual military/civil programs have grown significantly since the early 1960s and account for around 15

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Figure 1
Proliferation of Soviet Space Systems, 1957–79

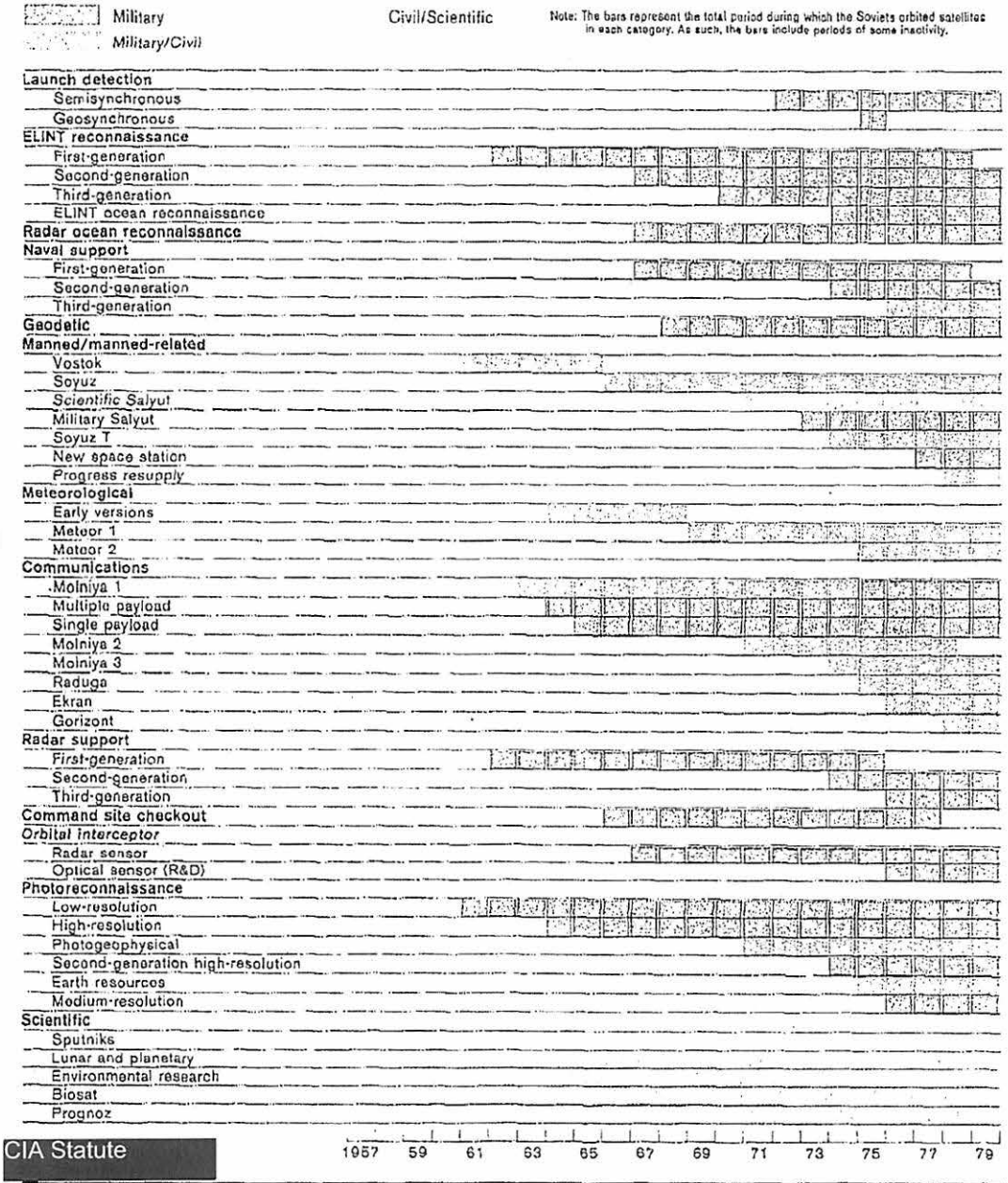

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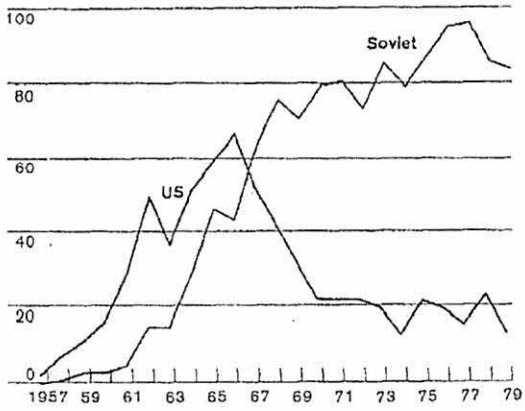
Figure 2
Number of Successful US and Soviet Space Launches, 1957–79



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

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percent of the annual total. The purely scientific systems account for less than 15 percent. By comparison, the approximately 100 operational US systems are about 50 percent civil and 50 percent military or military support. The latter category includes intelligence collection systems, which account for 25 percent of the US total.

13. To support their large number of operational satellites, the Soviets have deployed an extensive network of ground stations, all within the USSR. The growth of this network has corresponded with the growth in numbers and types of spacecraft, and continues even today. The expanse of the Soviet Union permits ground stations within the country—shown in figure 5—to have a large amount of access time to Soviet satellites. However, the Soviets have still found it necessary to supplement this network with a fleet of space support ships for supporting space events (such as deorbit or orbital injections), and six smaller instrumentation ships for support of space launches. 25X1

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14. The United States has nearly an equal number of facilities, for telemetry, tracking, and command. It does not regularly use ships to support missions, but has placed ground stations on foreign territory worldwide. The US stations are independent and support specific space missions (those of the Defense Department or NASA, or intelligence, or domestic communications satellites). For the most part, the Soviet stations form a unified network under the guidance of a single central authority, providing them considerable flexibility in command and control of their space systems.

Space Launch Vehicles

15. The Soviet space program, like its US counterpart, has relied heavily on the use of ballistic missiles as space launch vehicles (SLVs). The Soviet family of SLVs includes vehicles based on the SS-5 intermediate-range ballistic missile and the SS-6 and SS-9 intercontinental ballistic missiles (see figure 6). By using these proven missile systems along with a series of upper stages, the Soviets have greatly simplified SLV development.

16. In mid-1965, the Soviets began flight-testing a large new two-stage space booster comparable to the US Saturn IB in size and to the US Titan IIIC in function. By 1968, they had successfully developed three-stage (SL-13) and four-stage (SL-12) versions of this booster, which they refer to as the "Proton." The Proton-based SLVs represent the only launch vehicles successfully developed by the Soviets strictly for use as SLVs.

17. Nearly concurrent with development of the Proton, the Soviets were busy trying to develop an even bigger booster. This vehicle, which was comparable to the US Saturn V in size (but not in performance), was identified as the TT-5 within the Intelligence Community. The TT-5 had an estimated lift capability on the order of 100,000 kg to near-Earth orbit and about 35,000 kg for lunar return missions. The Soviets made three attempts during the period 1969-72 to test-fly this booster, which was intended for manned lunar missions. All three attempts ended in failure, and the program was apparently canceled in 1974. We believe the Soviets are currently developing a family of new large space boosters that will use many of the launch and support facilities originally constructed for the TT-5. The new vehicles probably will be about the same size as the TT-5, but some variants could have a greater lift capability due to