for ballistic missile detection and satellite tracking, operates a large computer center, and controls all of the existing antisatellite and antimissile weapon systems. Table IV-6 describes the Soviet systems with the potential for destroying or otherwise intentionally interfering with US satellite systems. [redacted]

29. Soviet capabilities to detect and track satellites include ballistic missile detection and tracking radars and ABM battle-management radars for low Earth orbit (up to 6,000 km), satellite, optical sensors (cameras, telescopes, and lasers) for high-altitude satellites, and SIGINT (ground based) for all altitude regions. Four dual Hen House radars are dedicated to space tracking functions. Soviet telescopes and cameras for satellite observations are located in many countries but have little capability against high-altitude targets. Fifteen new optical tracking facilities are being deployed that may have a capability to detect and track the ever-increasing number of high-altitude satellites. Also, a new generation of laser trackers is being deployed, but these are probably designed to work with cooperative Soviet satellites. [redacted]

## Orbital Interceptor

30. The Soviet nonnuclear orbital interceptor has been operational since the early 1970s. Since 1968, 15 tests of the orbital interceptor have been conducted and nine were successful, the last success having occurred in March 1981. The most recent test in June 1982 was the first failure of the operational interceptor since 1977. During the period 1976-81, five tests of a developmental version of an ASAT interceptor were conducted incorporating a probable passive electro-optical sensor; all five were failures. We do not expect significant improvements in the reliability of either the operational or developmental ASAT orbital interceptors. [redacted]

31. The Soviet ASAT system includes ground-based target tracking radars to establish a projected intercept point, two launchpads at the Tyuratam Missile Test Range, and a ground control facility near Moscow. These ground facilities are not hardened against nuclear strikes, suggesting that the system would most likely be used before a nuclear attack on the Soviet Union. [redacted]

32. The ASAT orbital interceptor uses an onboard radar sensor during the terminal portion of the engagement [redacted] See figure IV-2.) Both one- and two-revolution intercepts have been successfully demonstrated. The two-revolution intercept profile requires about 195 minutes to complete the engagement [redacted] The time required for an engagement using the one-revolution profile is about 95 minutes [redacted] The one-revolution profile reduces the amount of time available for the enemy to deduce that an attack is under way and to employ evasive maneuvers or other countermeasures to prevent satellite destruction. Because the Soviet interceptor itself is destroyed when the warhead is exploded to destroy the target, a separate interceptor must be launched for each target satellite. Also, if the interceptor is unsuccessful in encountering the target, it cannot conduct a second attempt or pursue an alternative target. [redacted]

33. We do not know the readiness state of ASAT orbital interceptors at Tyuratam. If orbital interceptors are brought up to a high level of readiness, an orbital interceptor probably could be moved from the support areas at Tyuratam to the pad in one hour and launched within another one to two hours. We believe three to five orbital ASAT interceptors could be launched from each of two pads at Tyuratam during the first 24 hours of ASAT operations. The ability to successfully employ these weapons is a function of target accessibility, launchpad refurbishment requirements, and competing requirements for EORSAT/RORSAT launch and other factors. It would also be a function of Tyuratam's survivability. The minimum time between launches from the same pad may be as little as four hours. [redacted]

34. The orbital interceptor system presents a significant threat to about 25 US intelligence and military support satellites in near Earth orbits. Although it has demonstrated satellite intercepts at altitudes up to 1,600 kilometers, its maximum altitude capability is considerably higher. (See figure IV-3.) [redacted]

~~Top Secret~~ [redacted]

**Table IV-6**
**Current and Future Soviet Systems With Potential Antisatellite Capabilities**

| Systems | Status | Maximum Attack Altitude (*kilometers*) |
|---|---|---|
| Nonnuclear orbital interceptor | | |
| Current system | Operational since at least 1971 [redacted] | 3,800-8,700 [a] |
| Developmental system (modification of current system) | Five flight tests, all failed; may be operational in the mid-1980s. | [redacted] |
| High-energy lasers [b] | | |
| Ground-based | Saryshagan Complex D [redacted] may be capable of limited ASAT role in clear weather against satellites directly overhead [redacted] known ASAT test. Unable to determine if it has been tested. | 500 |
| | Saryshagan R&D Complex, [redacted] also may be capable of a limited ASAT role in clear weather against satellites directly overhead. [redacted] | 3,000 |
| Space-based | Probably still in R&D; could launch megawatt-class prototype in late 1980s, more likely early 1990s. | [redacted] |
| Direct-ascent ABM interceptors with nuclear warhead | [redacted] possible ASAT role for Galosh, but we believe such a role to be unlikely. | 1,000 |
| ICBMs | Modification required. We believe such a role is unlikely. | [redacted] |
| Space launch vehicles | No evidence of ASAT role.[e] | |
| Electronic interference | Assessed to have technological capability. [redacted] | |
| Radiofrequency weapons (including electromagnetic pulse) | [redacted] interest in ASAT application. Very low likelihood of any capability now and only moderate through 1990. | |
| Particle beams | [redacted] capability for ASAT role unlikely before early-to-middle 1990s; feasibility of ground-based system questionable, practicality of space-based system questionable. | |

[redacted]

[d] Currently, SS-18s could reach 9,000 km [redacted]

[e] Space launch vehicles, such as the SL-6 and SL-12, could be fitted with nuclear warheads, but we believe this is unlikely because of the relatively low launch rates.

[redacted]

[redacted]

[redacted]

[redacted] We believe low-orbiting intelligence and navigation satellites are high-priority targets for the orbital interceptor. Geosynchronous satellites are too high, and satellites in highly elliptical semisynchronous orbits pass through the interceptor's engagement altitudes at velocities that are too high for the interceptor to engage successfully. [redacted]

35. We believe that a new version of an ASAT orbital interceptor will not be developed to attack satellites in semisynchronous or geosynchronous orbit. Even though such a requirement has existed for a long time, we have no evidence of a program to develop a high-altitude ASAT orbital interceptor. The new sensors being tested on the developmental version of the orbital interceptor have a short acquisition range (under 30 kilometers) and would be unlikely to be used to attack geosynchronous targets. Further, it does not appear that a large launch vehicle with a quick reaction capability like the SL-11s under development. Even if one were, the time to reach geosynchronous orbit (six to seven hours) seems excessive for use of a coorbital interceptor. Finally, we believe that emerging technologies, specifically directed energy, offer better prospects for solving the problem of attacking high-altitude targets. [redacted]

[redacted]

### Direct-Ascent ABM-Type Interceptor

36. We believe the probability is low that the USSR will expend Galosh ABM interceptors in an ASAT mission. However, certain tests of the Galosh ABM suggest that this role may have been considered. The first of four tests occurred in 1970 and the most recent occurred in July 1978. All of these tests reached final free-flight altitudes of about 900 km. [redacted] Satellites at altitudes up to about 1,000 km could be attacked by a nuclear-armed Galosh. However, the use of a Galosh interceptor with a nuclear warhead would probably result in serious disruptions to Soviet satellites. If the Galosh were fitted with a nonnuclear warhead for the ASAT mission, greater accuracy would be required for a closer approach and the maximum attack altitude would be reduced to about 500 km, unless a homing system were developed. [redacted]

### Space Launch Vehicles and ICBMs

37. Soviet space boosters with nuclear warheads could be modified to perform a direct-ascent ASAT

intercept. However, we have no evidence of a Soviet program to develop such capabilities and believe the likelihood of such developments is low. Two space boosters, the SL-6 and the SL-12 could be modified for direct-ascent, high-altitude ASAT attack, but relatively low launch rates make them unlikely candidates. [redacted]

38. We believe ICBMs are unlikely to be used in an ASAT role, although ICBMs are available in larger numbers and can reach higher altitudes than ABMs. Also, ICBMs are protected by hardened silos and control facilities. We believe the Soviets are unlikely to risk collateral damage to their own satellites by using ICBMs with nuclear warheads, and they would be wary of the risks and uncertainties about US responses if a conflict were otherwise still at the conventional force level. We do note, however, the Soviets' potential advantage in reconstituting their space systems if their launchpads remain intact. [redacted]

39. Current ICBMs probably would require some modifications and a short period of testing to be ASAT capable. The SS-18 is the most capable ICBM, but, with its standard payload of about 6,000 kg, could only achieve a maximum altitude of about 9,000 km in a direct-ascent flight profile. If the total payload were reduced to as little as 100 pounds, its maximum altitude could be 18,000 km—still well short of geosynchronous satellites. To achieve geosynchronous altitudes, a third stage similar to the type used on the SL-14 would be required. In this configuration, it could deliver a payload of up to 1,800 kg to geosynchronous orbit. But such modifications would require flight-testing, and we would expect to observe testing of a new upper stage. We have seen no evidence of such a development or testing program and believe the likelihood of such a development is low. Furthermore, an SS-18 modified in this way would not fit into existing silos and there are currently no other launchpads configured to handle the SS-18. [redacted]

40. Any use of nuclear warheads in space eventually would result in widespread collateral damage to all satellites, including those of the USSR. In addition to the prompt damage to any satellite within range of the detonation, there is long-term persistant damage from high-energy electrons created by the blast. These electrons are trapped in the Earth's magnetic field and are dispersed into shells that encompass the Earth. [redacted]

### Electronic Warfare

41. [redacted] we believe the Soviets intend to use active EW to attack both selected satellites directly and the ground-based users of space systems. We consider EW to be the most likely type of initial Soviet ASAT activity. Such a capability potentially poses the most serious threat to US space systems. Against high-altitude satellites, this currently may be the only ASAT capability. We believe that the USSR now has the technological capability using active EW to attempt to interfere with foreign space systems. Compared with other ASAT techniques, an active ASAT EW program would have relatively low cost and low risk of escalating a conflict. Further, such a role is consistent with ambitious EW programs existing throughout the Soviet military forces. However, we have no evidence of Soviet equipment or organizations with an ASAT EW mission. [redacted]

42. An alternative view is that there is insufficient evidence at this time to support the judgment of Soviet intent to use active EW against satellites. [redacted] The holder of this view points out that these military writings contain significant areas of ambiguity. For example, the use of the term EW in the writings could represent either the use of active means (jamming) or passive means (SIGINT collection, electronic emission control, or other techniques). Additionally, if the employment of active means is intended, then the writings are not clear as to whether jamming would be targeted against satellites or their ground-based users. Moreover, the holder of this view concludes that, if a

Soviet active EW capability against satellites does exist, brute force jamming would be the most likely EW technique. On the basis of available evidence, it is difficult to judge with any confidence that a Soviet technological capability would include more complex forms of jamming.[9] [redacted]

43. [redacted] While testing directly against US space systems would give the Soviets some increased confidence in the effectiveness of their ASAT EW capabilities, such testing would provide opportunities to develop more effective US countermeasures. There is a moderate probability that in peacetime the USSR will attempt occasional covert technical probes of some US space systems in an attempt to determine weaknesses. [redacted]

44. Active EW could involve either denial jamming or deception to prevent satellite systems from carrying out their missions. Intentional interference may involve command and control links, communications links, or mission sensors. [redacted]

[redacted] In general, we believe Soviet knowledge of US space systems is high and in some cases may be sufficient to attempt deception; [redacted]

47. [redacted] We see no evidence of Soviet efforts to develop a spaceborne jammer and believe there is only a low likelihood of such a capability being tested by the year 2000. [redacted]

[9] *The holder of this view is the Director, National Security Agency.* (u)

48. Potential Soviet active EW platforms include many fixed, transportable, and mobile transmitters. The fixed ground sites have the advantage of high-power transmission and accurate pointing and tracking capabilities, whereas mobile platforms, such as tactical EW equipment, space support ships, and aircraft are more widely deployable, but generally radiate less power and have less accurate pointing capabilities. [redacted]

49. Fixed ground sites and large ships offer the most severe jamming threat because of their large, steerable antennas (generally 12 or 25 meters in diameter, but up to at least 50 meters for some ground-based sites), extensive on-site processing, and cooling capabilities necessary for high-power transmitters. These sites and ships would be capable of accurate tracking of target satellites and, assuming a configuration for jamming, could project high-power levels. [redacted]

50. About 13 to 15 Soviet ground sites in the Soviet Union and one in Cuba have been associated with a SIGINT collection mission against foreign communications satellites. [redacted]

51. There are many other sites in the Soviet Union, including about 60 antennas associated with the Molniya communications satellite network, that could be used for SIGINT collection or active electronic warfare activities. In addition, Soviet missile range instrumentation ships, space event support ships, space operation control ships, and intelligence collection ships operated by the GRU also could be used to conduct active EW against US space systems. Finally, there are some land-based mobile or transportable systems that could be adapted for jamming uplinks. Transportable communication satellite terminals and mobile military terminals have been used in Cuba, Africa, and Asia, as well as in the Warsaw Pact countries. [redacted]

### Radiofrequency Damage

52. Soviet research has been conducted in the use of strong radiofrequency (RF) signals that could produce physical damage or "burnout" to the sensitive input stages of receivers or internal electronic circuits. The effectiveness of any RF ASAT weapon would be dependent on the radiated power of the weapon, the damage threshold level of the target, and detailed technical knowledge of the target. It is expected that if the Soviets were to deploy an RF ASAT weapon it would be ground-based and in times of conflict would be directed against high-priority targets such as those in geosynchronous orbit. Such a weapon would require a high effective radiated power, and the damage it caused would be more permanent than conventional electronic warfare techniques. By 1990, there is a moderate likelihood the USSR will test a ground-based RF ASAT weapon capable of physically damaging satellites. We believe it is highly unlikely that a space-based RF-damage ASAT weapon will be tested before the year 2000. [redacted]

53. Although we believe the basic technology for an RF weapon already is available, [redacted] It is noteworthy that Soviet scientists pioneered the development of power-tube technology, and there is continued interest in high-power electronics that could be applied to RF weapons. One project was begun in 1973 at a Moscow institute responsible for developing long-range radars. This project included investigation of the feasibility of destroying targets in space by ground-based microwave transmitters. [redacted]

### Lasers

54. Extensive resources have been committed to develop high-energy laser weapons. More than 100 academic and industrial organizations, including several central design bureaus, are involved, and at least a dozen laser test facilities and ranges have been located. [redacted]

55. ***Ground-Based Lasers.*** There are two test facilities at Saryshagan that are assessed to have high-energy lasers and associated optical equipment with the potential to function as ground-based ASAT weapons. We estimate that one of these facilities, Complex D, could demonstrate the capability to damage or degrade an unprotected satellite overhead, in clear weather, to a range of about 500 kilometers. The other

facility, termed the R&D Complex, probably houses a high-energy pulsed laser that may be able to damage unprotected satellites at ranges up to 3,000 kilometers and electro-optical sensors at geosynchronous altitudes. [redacted]

56. The configuration of the R&D Complex and its location at Saryshagan suggest a ballistic missile defense (BMD) or ASAT mission. An exclusive ASAT mission makes it difficult to account for all the features of the R&D Complex. Testing at one facility of the complex appears to involve either explosively driven high-energy lasers or possibly development of explosively driven power generators for laser weapons, or both. [redacted]

57. We believe that the primary purpose of the explosively driven ground-based laser development program at the R&D Complex is BMD. In addition, Project "Terra," reportedly the development of a laser for ABM purposes using an explosively driven iodine laser, has been associated with the R&D Complex. Significant work related to Terra-type lasers has been conducted since the middle-to-late 1960s. The Soviet goal of 1-megajoule energy for a single pulse would probably be sufficient for initial feasibility tests against reentry vehicles (RVs). As of 1978, power levels of 100 kilojoules had reportedly been achieved. [redacted]

58. In addition to these test lasers described, existing Soviet low-powered, ground-based lasers are potentially capable of causing in-band interference with or damage to satellite components. IR and optical surveillance systems are particularly vulnerable because they have large optical aperture systems that collect and focus energy. Because of this, low-power lasers could be suitable against satellites having electro-optical sensors or could degrade film quality on imaging satellites. Such lasers could also be used against high-altitude satellites. [redacted]

59. ***Airborne Lasers.*** Soviet research on an airborne laser weapon was well under way in the mid-1970s. Such weapons could be used to damage satellites; however, they would more likely be used for other purposes, including protecting their own airborne command and control systems and defending against cruise missiles. Airborne laser weapons are not as adversely affected by clouds and the atmosphere as are ground-based systems. However, airborne lasers suffer from aircraft vibrations and atmospheric turbulence, which affect the propagation of a precisely pointed laser beam. These factors, even if successfully overcome, and other problems would probably limit the capability of early airborne lasers to damage satellites to those in orbits below about 1,000 km. [redacted]

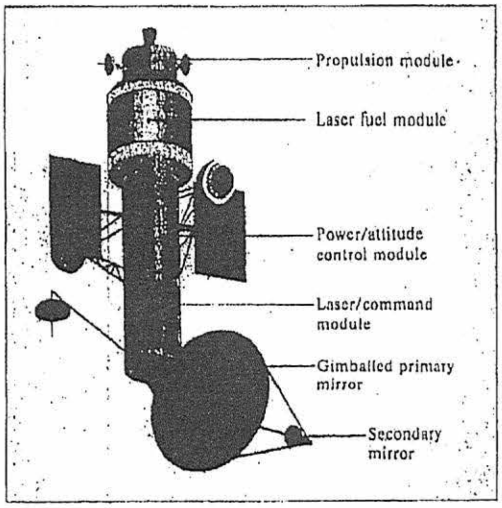
60. ***Spaceborne Lasers.*** In addition to the ground-based and airborne laser programs, Soviet research includes a project to develop laser weapons intended for use in space, probably for an ASAT application initially. If successfully developed, these laser weapons could involve either satellites launched on demand or space-based weapons maintained in orbit. This work is probably in the first of three distinct stages that the Soviets use in the development of a weapon system. During this stage, new concepts are investigated, experimental devices for testing the technology are built, and preliminary system designs may be developed. Whether the Soviets make a commitment to an operational system will depend on the outcome of their research, possibly on their reaction to US efforts in space-based laser weapons, and on any arms control agreements that they may enter into on the limitations of weapons in space. Figure IV-4 depicts one of many concepts for a space-based laser that US contractors have developed. [redacted]

61. To date, the most detailed information on space-based lasers concerns a joint project in 1975-77 involving a Soviet physics institute and a space research institute. Open-source publications by individuals reported to be in the project are consistent with the project's existence and provide a guide to the project's organization. We know of a Soviet electric-discharge laser that matches the description of the laser reportedly being investigated in the joint project. However, the Soviets also have been researching chemical lasers, and we believe that such a laser device is now being developed for space-based applications. [redacted]

62. A space-based, high-energy laser weapon offers options not available with ground- or air-based systems. Space-based laser weapons might be employed for a variety of missions including ASAT, BMD, antiaircraft, and ground target engagements. Such an

~~Top Secret~~ [redacted]

**Figure IV-4**
**Concept of Space-Based Laser Weapon System**

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ASAT system would have significant advantages over the conventional orbital ASAT interceptor in that it would have multishot and long-range capabilities (for example, 1,000 to 2,000 kilometers between weapon and target). It would also be likely to have a greater capacity to overcome a satellite's defensive measures, such as maneuvering and decoy deployment. We expect to see laser weapon components tested on manned spacecraft; however, unmanned satellites seem better suited as platforms for operational directed-energy weapons. [redacted]

63. We believe there is a high probability that a prototype high-energy laser ASAT weapon will be tested in low orbit by the early 1990s. The psychological effect of the first test of a space-based laser in a weapon-related mode would be greater than the actual military significance of such a weapon in its initial application. Development of a space-based laser for antisatellite application is technologically difficult, and we are uncertain as to the approach the Soviets would take:

— One candidate for a prototype [redacted] would be a megawatt-class laser. Such a prototype probably could begin testing in the late 1980s at the earliest, but more likely in the early 1990s. If testing were successful, an initial operational system in low orbit—a few satellites, each having a megawatt-class laser weapon with an ASAT range of hundreds of kilometers—could be available by the early 1990s (if tested in the late 1980s), but such an operational system would be more likely to appear in the mid-1990s. The Soviets could elect to pursue a higher power 5-megawatt-class system (with an engagement range out to 1,000 kilometers) employing more precise pointing and tracking. Test launch and operational dates, however, would come several years later than for a system of the 1-megawatt class. [redacted]

— A candidate for a space-based prototype, [redacted] is a lower power laser (hundreds of kilowatts) in an unmanned, low-orbit satellite, with an ASAT range of tens of kilometers. This concept represents an easier technological path for testing a prototype laser weapon in space. We believe, if the Soviets are pursuing such a program, a prototype could be tested somewhat earlier than a megawatt-class prototype, and, if early tests proved successful, possibly reach an operational capability by the early 1990s. An operational system with such a short-range capability, however, would have severe operational limitations. [redacted]

64. There is a moderate-to-high likelihood that the development of low-orbit, space-based lasers coupled with a heavy-lift launch capability will result in testing of such weapons in geosynchronous orbit by the late 1990s, although we ascribe a low probability to operational deployment by the year 2000. There is an alternative view that holds that while deployment of a geosynchronous space-based laser would probably take place after deployment of a low-altitude system, there is a moderate chance of deployment of a geosynchro-

nous space-based laser by the mid-1990s.[11] Although space-based lasers will probably be restricted to the ASAT mission for the remainder of this century, technological breakthroughs conceivably could lead to capabilities to destroy ballistic missiles, aircraft, cruise missiles, and [redacted] from space in the late 1990s or beyond. [redacted]

65. Although space-based weapons for ballistic missile defense are probably feasible from a technical standpoint, such weapons require significant technological advances in large-aperture mirrors and in pointing and tracking accuracies. They would also require very large space boosters having perhaps 10 times the capacity of those now in use. We expect the Soviets to have such boosters in the late 1980s. In view of the technological requirements, we do not expect them to have a prototype space-based laser BMD system until at least the [redacted] operational system until after the year 2000. [redacted]

66. A Soviet space-based laser BMD weapon system based on these technologies would require many laser weapon satellites to be a significant threat to US ballistic missiles. The number of satellites required would depend on numerous factors. On the basis of our estimates of expected Soviet technology levels, with one laser per satellite almost 400 satellites operating at about a 400-km altitude would be required for continuous coverage of all possible US ICBM and SLBM missiles in the boost phase, before their RVs are dispersed. Once the RVs have been dispersed, the space-based laser defense task becomes much more difficult. If major Soviet technological advances in power and pointing/tracking accuracy were achieved—not expected until after the year 2000—the number of satellite weapons needed would decrease to about 100 because the system could operate at higher altitudes, increasing the coverage of a single weapon. Given the short period during which ballistic missiles are vulnerable to laser radiation, each laser would be able to negate only a few missiles. Moreover, these estimates do not include the effects of potential countermeasures that the United States could employ against low-orbiting weapon systems. Finally, each satellite would have to be an autonomous, extremely sophisticated system posing tremendous logistic, reliability, command and control communications, and cost problems for the Soviets. [redacted]

[11] *The holders of this view are the Director, Defense Intelligence Agency, and the Assistant Chief of Staff, Intelligence, Department of the Air Force.* (U)

### Space-Based Particle Beam Weapons

67. The Soviets are expending significant resources on technologies of critical importance to the development of particle beam weapons (PBWs). We have little evidence, however, of Soviet achievement in this area. Soviet efforts in PBW-related technology may have reached a level suitable for conducting experimental research on the feasibility of weapon applications. [redacted]

68. Space-based PBWs would not be subject to atmospheric propagation effects, which represent a fundamental feasibility issue for ground-based PBWs. It is more difficult to harden satellites against the effects of a particle beam than those of a high-energy laser. On the other hand, PBW beams, unlike laser beams, will not propagate into the atmosphere and thus cannot reach some lower altitude ballistic missiles. The power supplies and size of experimental PBW systems suggest that it will be difficult to develop an operationally practical space-based PBW. A PBW will be more difficult to achieve than a laser weapon. [redacted]

69. Since the early 1970s the Soviets have had a research program to explore the technical feasibility of a neutral particle beam weapon in space, an approach currently under investigation in the United States. In this effort, the Soviets have developed technically advanced components but have not assembled them into a complete test system. These weapons would be quite different from the ground-based PBWs; the particle energy and current requirements would be much lower and the systems requirements would be far less stressing. However, the technical requirements for such a system, including precise pointing and tracking, are severe, and it is unlikely that the Soviets could test a prototype space-based particle beam weapon to destroy hard targets like missile RVs before the end of the century and no earlier than 1995 for an ASAT weapon. An alternative view holds that a space-based PBW system, intended to disrupt electronics systems and requiring significantly less power than a destructive PBW, could be developed and deployed several years earlier.[12] [redacted]

[12] *The holder of this view is the Director, Defense Intelligence Agency.* (U)

### Ground Site Attack

70. In addition to attacking or interfering directly with satellites, the ground stations supporting the satellites could be attacked, thereby disabling or disrupting the operation of our space systems. This could be done covertly by agents—possibly without attribution. In addition, direct attacks by Soviet military forces are a possibility, although there is no evidence of such missions. The approaches taken could range from covert jamming of signals and cutting of electrical power to physical destruction of the facility. Such activities would be more likely to occur at US sites in foreign countries. [redacted]

### Other Space-Based Weapons

71. In addition to the space warfare systems already discussed, there are several other potential weapons systems that deserve continued close attention by the Intelligence Community. These systems are space mines, space-delivered ground-impact weapons, and space-to-space offensive missiles. The use of space mines has caused concern for years because they could be applied in time of war with little or no warning. However, the likelihood of the Soviets being able to covertly deploy and operationally maintain a space mine in orbit is low at this time, and we believe the likelihood of the Soviets' testing such a capability by the year 2000 is very low. Satellites could also be used for the delivery of ground-impact weapons from altitudes of tens of thousands of kilometers. Prior to reentry, the descending vehicles would deploy clusters of small inert reentry vehicles to kill fixed targets by hitting them at velocities up to 8,000 meters per second. We believe the likelihood of such a development is low. The use of space-launched offensive missiles against other space vehicles would be similar to an orbital interceptor stored in space. Such a system would be difficult to maintain at operational readiness for long periods of time and would have a very limited number of targets it could attack at any time. We thus believe the likelihood of such a development is low. [redacted]

### Likelihood of Interference With US Space Systems

72. There is no direct evidence to indicate the circumstances under which the Soviets would initiate interference with US space systems during crisis and conflict situations. However, the Soviets appear to be integrating ASAT operations with military operations. [redacted]

73. The Soviets presumably would base a decision to employ destructive or nondestructive interference against US space systems on a variety of factors including their perception of the military value of the various US systems, US ASAT and EW capabilities, their own perceived antisatellite capabilities, and ultimately their view of the potential net military advantages. Especially in the context of a war in Europe, Soviet leaders may perceive that US military capabilities depend on space systems to a greater degree than those of the USSR. In addition, the chances of conflict escalation, the impact of such a decision on other countries, and likely US responses also would be considered. We do not believe that any ASAT activities would be undertaken merely for warning or demonstration purposes. [redacted]

74. Given these considerations, we believe that there is a very low likelihood that the Soviets would initiate destructive or nondestructive interference against US space systems in times of tension of an exclusively political nature, as well as in cases of limited, local conflict not involving the two powers directly. [redacted]

75. During a major crisis involving the two superpowers, in which the tension was high, the likelihood of attempted destructive interference would remain very low, but the likelihood of attempted nondestructive interference would be low to moderate, as the Soviets could perceive nondestructive interference as a somewhat less risky option. [redacted]

76. Should either superpower introduce combat forces into a local conflict in which the other was not involved, we believe that the likelihood of attempted destructive interference by the Soviets would continue to be very low. Should both US and Soviet forces intervene in a local conflict, with both sides playing

limited or specialized roles, such as air defense, and having limited objectives, the likelihood of attempted destructive interference would rise marginally, but still remain low. [redacted]

77. In the event of imminent or actual large-scale, direct engagement of US and Soviet forces in a local conflict located outside Europe, we believe there would be a high likelihood of attempted Soviet 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, we believe that in most cases active EW and low-energy lasers would be used initially because their effects are not necessarily permanent and their use is not as easy to detect. Active EW and low-energy lasers would probably be the only means used at lower levels of conflict. 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 and potential degradation of some US space system capabilities at this point could markedly enhance the Soviet ability to succeed as well as to seize operational initiatives in the event of a wider war. 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]

78. We believe 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. In such a conflict Soviet leaders may 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. The decision to launch ASAT interceptors 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, including the likelihood of attacks against existing Soviet space launch sites. [redacted]

79. During a period of conventional combat, the Soviets would probably avoid interfering with space systems that provide warning of ballistic missile launch or 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, in an attempt to erode US confidence in these systems, although in doing so the Soviets would run some risk of provoking a disadvantageous US reaction. This type of interference, if detected, might be difficult to attribute initially to deliberate Soviet actions. We cannot judge the likelihood of this occurrence because we cannot evaluate how the Soviets would perceive the risk that this would trigger undesirable US responses. [redacted]

80. If a general war were under way in which the massive use of nuclear weapons appeared imminent, the likelihood of attempted interference with all US space systems is very high, using all available means. The fact that Soviet ASAT control and launch facilities are not hardened against nuclear attack probably indicates the Soviets plan to launch orbital ASATs prior to and at the onset of their initial nuclear strikes. [redacted]

[redacted]

# CHAPTER V

## SOVIET MANNED SPACE ACTIVITIES

### Current and Developmental Projects

1. The size, scope, and integrated nature of Soviet manned space activities is impressive. We believe that within 10 years the Soviets will have established a permanent manned presence in space with substantial political, technological, and possibly economic benefits. The comprehensive Soviet program will probably consist of several interrelated components including:

— A modular space station for a crew of six to 12 persons.

— A reusable space transport similar to the US space shuttle.

— A heavy-lift launch vehicle (HLLV) in the Saturn-V class.

— A reusable space tug.

— A military space plane.

— A medium-lift launch vehicle in the Titan-III class.

Inherent in these projects is a design philosophy that emphasizes flexibility. For example, the HLLV will serve as the launch system for the Soviet reusable space transport, and parts of the medium-lift launch vehicle may serve as components of the HLLV. [redacted]

2. To a large extent, the Soviet manned space program reflects US concepts and designs, strongly suggesting the illegal transfer of US technology. For example, prototypes of the Soviet space plane closely resemble US lifting-body research vehicles flown in the late 1960s. Even more apparent is the Soviet reusable space transport that appears nearly identical to the US space shuttle. Furthermore, the engines that will propel the Soviet HLLV are probably copies of the liquid hydrogen rocket engines on the US shuttle. By capitalizing on US designs and technology, the USSR has developed a comprehensive, well-coordinated, and flexible space program that emphasizes the utilization of man in space. (s)

3. Soviet cosmonauts were the first to perform an extra vehicular activity (EVA) using a rudimentary space suit in March 1965. Subsequently, Soviet space suits were based on the US Apollo space suit, with modifications to reduce the preparation time required for the cosmonauts (prebreathing) before working in space. Current Soviet space suits require only about 25 minutes of prebreathing, as compared with about three and a half hours for current US space suits. We believe the Soviets also may adopt the manned maneuvering unit (MMU) first demonstrated on the US Skylab space station in 1973. A Soviet cosmonaut could use an MMU to retrieve small satellites, inspect and repair satellites, and conduct construction operations. [redacted]

### Salyut Space Stations

4. Senior Soviet officials and scientists have repeatedly stated a national goal of having permanently functioning, continuously manned, orbiting space stations. Since 1971, there has been a near-continuous presence of Soviet space stations in orbit, periodically occupied by Soviet cosmonauts. (See figure V-1.) Salyuts 2, 3, and 5 were primarily military in nature and functioned as intelligence collection platforms, although the Soviets stated their purpose as "scientific research." Salyuts 1 and 4 served primarily scientific purposes, and Salyuts 6 and 7 conducted both military and scientific experiments. [redacted]

5. The Salyut systems have brought the USSR worldwide recognition as the leader in manned space flight. Crews aboard Salyut 6 logged more man-days—1,534—than have been logged in the entire US space program. One cosmonaut established a new endurance record in 1979 of 175 days in space and then broke his own record in 1980 with a 184-day flight. In 1982, the

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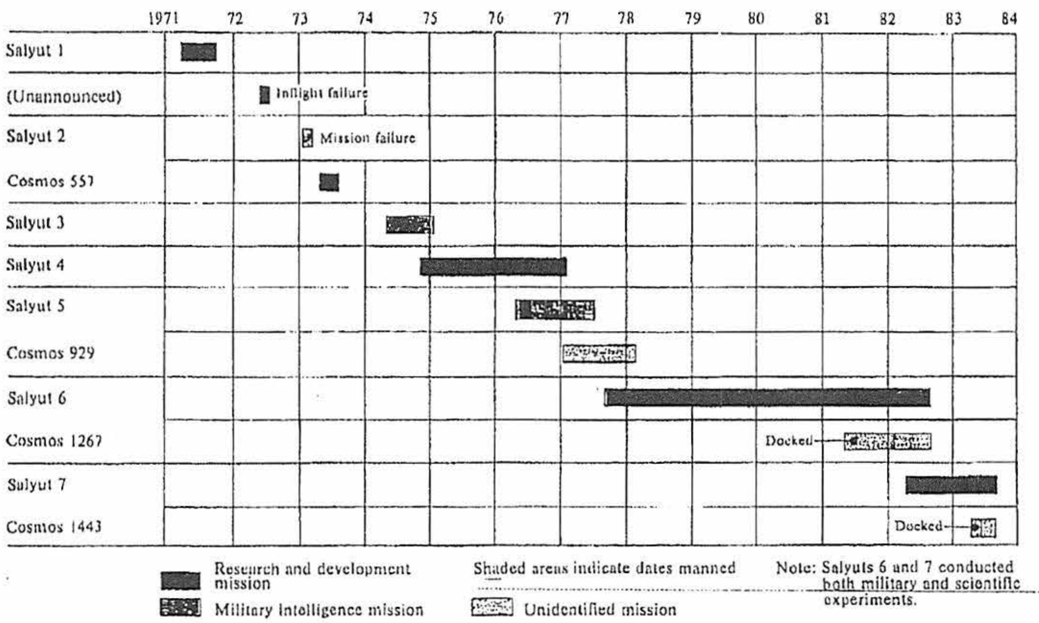
**Figure V-1**
**Soviet Space Station Systems**

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first crew to visit Salyut 7 stayed for 211 days, breaking both previous records. [redacted]

6. Salyut 6 remained in orbit for almost five years and was manned for approximately 38 percent of the time. Unlike previous space stations, Salyut 6 was equipped with a second docking port to accommodate a new vehicle, Progress, a nonrecoverable resupply spacecraft. This spacecraft was used to replenish all consumables (oxygen, food, and fuel) and to deliver replacement parts and scientific equipment. The capability to resupply consumables was necessary for the long-term missions. In addition, the cosmonauts' ability to do extensive repair work was essential to achieving such long-duration missions. [redacted]

7. Covert military-related experiments have been an important part of Soviet manned space flights. These experiments have been more numerous and complex on Salyut 7, the most recent Soviet space station. [redacted]

[redacted] a manned space station would be used in support of continuous ocean and port surveillance, especially to determine the location of US Navy battle groups. [redacted]

25X1

25X1

Cosmos 929–Type Manned Spacecraft

8. In 1977 the Soviets conducted the first flight test of a new type of spacecraft, the Cosmos 929. The missions of this spacecraft are uncertain. However, we believe they may include resupply of space stations, temporary space station modules, and independent military missions such as reconnaissance, weapons development, and satellite inspection. The Cosmos 929 spacecraft was never manned [redacted] Cosmos 929

was approximately 30 percent smaller than the Salyut vehicles and had a unique two-segment configuration consisting of a large maneuverable segment (12,500 kilograms) and a smaller but very heavy recoverable, highly dense segment (6,500 kg). The latter segment was separated from the main body after 30 days in orbit and was successfully recovered in the Soviet Union. The main body continued in orbit another 170 days performing numerous orbital maneuvers. We believe the purpose for the dense, recoverable segment is to serve as an emergency recovery system for cosmonauts and to protect them from solar radiation. In addition, we believe cosmonauts could be launched in a spacecraft similar to the Cosmos 929 with the recoverable segment serving as a launch-abort system. [redacted]

9. In April 1981 the Soviets conducted the second test of a Cosmos 929-type vehicle. This vehicle—Cosmos 1267—also deorbited its recoverable segment after 30 days in orbit. In June 1981 Cosmos 1267 was maneuvered and docked with Salyut 6. Both vehicles remained unmanned, and in July 1982 they were intentionally deorbited over the Pacific Ocean. Soviet comments regarding Cosmos 1267 indicate that the purpose of the joint flight with Salyut 6 was to conduct engineering tests of two large vehicles docked together—a clear step toward building a modular station. In March 1983 another Cosmos 929-type vehicle (Cosmos 1443), was launched and docked with Salyut 7 [redacted]

10. Soviet statements suggest that versions of the Cosmos 929-type vehicle under development will have different missions, including serving as replaceable units for a modular space station and as a new class of cargo/resupply vehicle. The Soviets have often discussed the necessity of having a cargo/resupply vehicle that could return space-processed or space-manufactured materials to Earth. This procedure is unlike that of Progress, which is destroyed after it resupplies Salyut. There are many factors that lead us to conclude that there may be other purposes for the Cosmos 929-type vehicle. These factors include the following:

— **Secrecy.** Prior to the flight of Cosmos 1443, knowledge of the Cosmos 929-type vehicle was apparently restricted among Soviet space officials. Further, at international conferences most Soviets refuse to discuss the purpose of this type of vehicle, but some have referred to it as a "modular spacecraft" and a "multipurpose spacecraft." [redacted]

— **Military Association.** [redacted]

— **Spacecraft Capabilities.** The Cosmos 929-type vehicles have demonstrated some unusual capabilities:

[redacted]

- A large solar-powered electrical system capable of supplying about 3.5 kilowatts (kw) from two fixed panels.
- A propulsion system capable of performing a large number of orbital maneuvers [redacted]

11. Considering the above characteristics and other factors, we postulate several other military uses for Cosmos 929-type spacecraft in addition to resupply:

— **Ocean Surveillance Platform.** The station could be used as a platform for conducting visual and photographic reconnaissance of ports and naval units at sea. The crew could relay information to the General Staff or directly to naval commanders. This role would be consistent with the role of other spacecraft developed by the Chelomey Design Bureau. [redacted]

— **Near-Real-Time Electro-Optical Imaging System.** [redacted] The Cosmos 929-type vehicle could be used for a continuation of this effort. In such a case, cosmonauts may not continuously man the vehicle, but visit periodically to conduct setup, maintenance, and repair operations. The heavy recoverable segment could be used to recover a considerable number of the electronic subsystems for reuse on another mission. [redacted]

— **Space Weapons Component Research and Development.** A space-based laser is under development by NPO Energiya, with the Glushko Design Bureau at Kaliningrad as the leading developer. This design bureau has developed all Soviet recoverable spacecraft and also is believed to be the integrating contractor for at least the recoverable segment of the Cosmos 929-type vehicles. Weapons components and prototype subsystems could undergo testing on a Cosmos 929-type vehicle either in a manned or unmanned configuration. [redacted]

— **Satellite Inspection/Imaging System.** A Soviet capability to image or inspect another satellite has not yet been demonstrated. But the growing technological capability to conceal satellites or disguise their true mission may encourage the development of such a capability. [redacted]

12. Although these missions seem reasonable in view of current information, there may well be other possibilities. At this point, we can only conclude that the Cosmos 929 program is an important military system and its development must be monitored closely. [redacted]

## Future Projects

13. Soviet leaders perceive that their future manned space program will satisfy a number of political, military, economic, and scientific goals. The Soviet space program generates enthusiasm in the socialist countries and projects the Soviet image of world leadership in space. The program is based on reusable and common components that offer substantial flexibility and cost savings. This is consistent with Soviet design practices that stress innovation through modification, avoiding completely novel concepts whenever possible. [redacted]

## Modular Space Station

14. The next major objective in the Soviet manned space program is a modular space station, which will be a transitional element in the development of a larger space station. A Salyut-type space station and modules similar to the Cosmos 929-type spacecraft are expected to be assembled into components of a modular space complex by about 1986. Statements by Soviet scientists and cosmonauts suggest:

— Construction will start in 1984, with Salyut 8 as a primary component.

— No more than two Salyuts will be attached end to end.

— A "cactus"-type arrangement may be used—this could imply Cosmos 929 modules attached to midsection multiple docking adapters to form limbs. (See figure V-2.)

— A crew of six to 12 persons will occupy the completed station. [redacted]

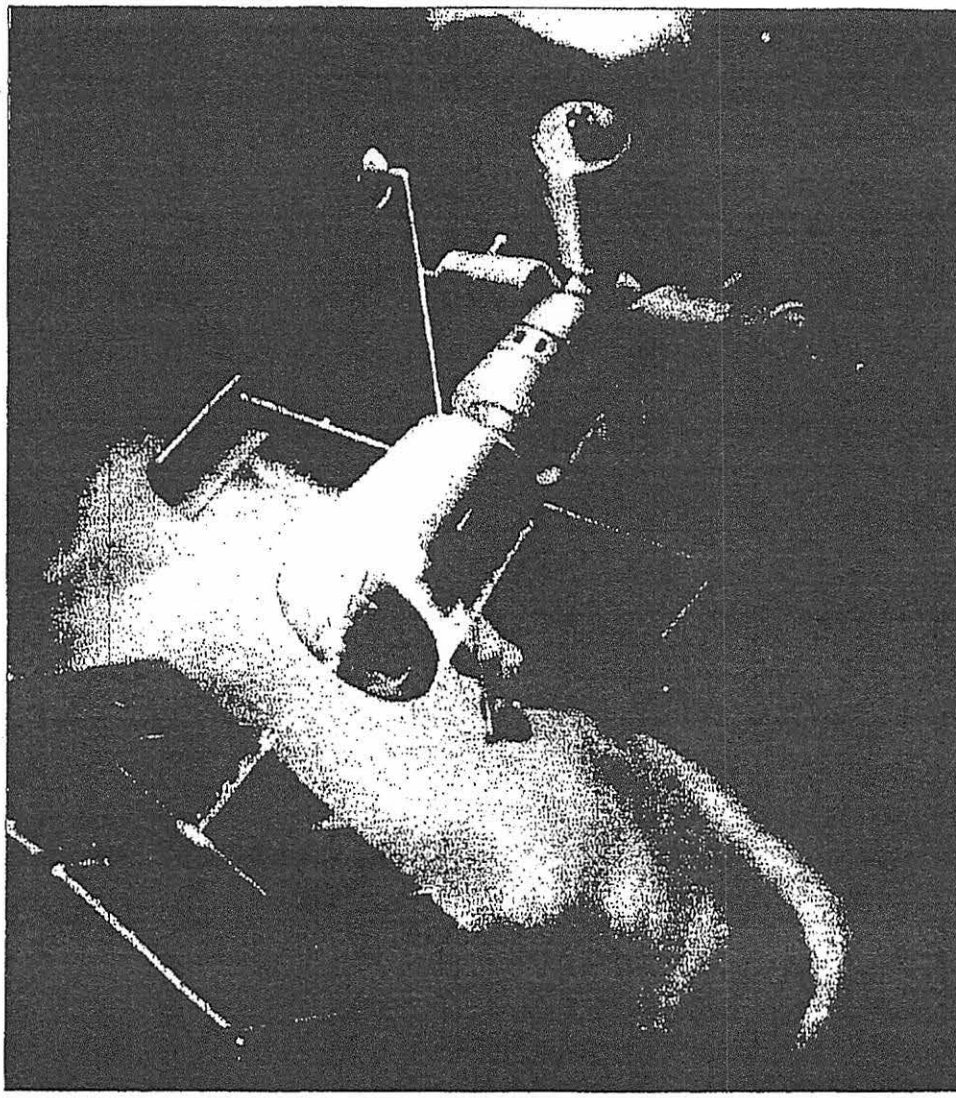
15. A modular space complex could be used for a variety of missions. For example, one module could provide the living area (eating, sleeping, and recreation), another module could contain support systems (electrical power, attitude control, and propulsion), while still other modules could be dedicated to Earth resources and reconnaissance, to materials processing, or to experimental development of new sensors and other hardware for unmanned military satellites. These last-mentioned modules could include provisions for testing of components for space-based laser weapons such as pointing and tracking subsystems. [redacted]

### New Resupply Vehicle

16. The Progress resupply vehicle began service in January 1978 and is the current spacecraft dedicated to resupply of Soviet space stations. The payload capability of Progress is approximately 2,300 kg, of which approximately 1,000 kg are fuel and approximately 1,300 kg are for life support, supplies, and spare parts, including about 120 man-days of expendables. With the advent of modular space stations, we expect a second-generation supply vehicle will be developed with a much greater payload capability. A

~~Top Secret~~ CIA Statute [redacted]

**Figure V-2**
**Soviet Concept for Modular Space Station**



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vehicle of the Cosmos 929 type is a likely candidate in that it has been described as a multipurpose vehicle. Soviet space academician Sagdeev described Cosmos 929 as a "prototype of a second-generation cargo ship." As such, we believe it would carry a payload of about 9,000 kg, almost four times that of the current Progress. In addition, the vehicle would have a recoverable front end for the return of cosmonauts or experimental and operational data. When the spacecraft has been emptied of its cargo, it could serve as a living/lounge area for cosmonauts on the modular space station. Spacecraft designer Feoktistov has also mentioned the need for something beyond Progress in his description of a Cosmos 929-type spacecraft that was docked with Salyut 6 for more than a year. Feoktistov stated that one of the functions of the multipurpose spacecraft would be that of a cargo carrier. We believe a version of the Cosmos 929-type spacecraft will become the primary Soviet space station resupply vehicle within the next five years. CIA [redacted]

### Large Space Station

17. In the early-to-middle 1990s the Soviets' experience with their modular space station probably will be sufficient to begin the construction of a large space station. The components of such a station would be modules, each in the Skylab class, that would be launched by the heavy-lift launch vehicle. We expect the assembly of such a station to take place over several years with initial crew sizes ranging from 12 to 20 persons. (Some Soviet scientists have discussed the development of a very large space base in the 1990s with provisions for crews of 20 to 100 persons.) The reusable space transport would resupply and transfer crews to the space station. The uses of such a large space station would include the maintenance, repair, and control of satellites in orbit; military R&D, including directed-energy weapon development; scientific and industrial work in a zero-g environment; the stocking of fuel and supplies for lunar or planetary expeditions; and the reception of international visiting parties, including Third World cosmonauts. In the longer term, a large manned space station would permit the assembly of interplanetary and other spacecraft that would be free of the design constraints imposed by the requirements of aerodynamic flow. CIA [redacted]

### Space Solar Power Station

18. A large space station could serve as a base from which to organize the construction of a large solar power station in geosynchronous orbit. Modules for such a station also could be assembled over many months or years in low orbit and gradually moved to geosynchronous orbit using low-thrust electric propulsion units. CIA [redacted]

19. A Soviet concept to provide solar power to Earth involves a large solar power station, about 1 kilometer in diameter. This idea may have been based on a US concept discussed in the 1970s. Such a station would require 10 to 20 payloads using the heavy-lift launch vehicle now under development. A demonstration of the power-station technology could be conducted in space by the mid-1990s, but the chances are very low that a full-scale system could be operating before the next century. CIA [redacted]

### Geosynchronous Space Station

20. Although the Soviets have never discussed the concept of a space station in geosynchronous orbit, we believe there is a low-to-moderate possibility that they might develop such a station by the mid-1990s. A station in geosynchronous orbit offers continuous access to a large area of the Earth's surface. Thus, a manned station in geosynchronous orbit could be used for surveillance purposes such as early warning or reconnaissance or for command and control. At geosynchronous orbit, a station serving such purposes would be considerably less vulnerable to attack than a low-altitude station. A geosynchronous station could also be used for space observations, including inspection and negation of other geosynchronous satellites. A geosynchronous station could be used as a service center where communications, data relay, weather, and other geosynchronous satellites could be transferred for servicing and repair. Finally, a geosynchronous station could serve as a platform from which to organize and prepare the hardware and personnel for a lunar or planetary expedition. CIA Statute

21. The new heavy-lift launch vehicle probably will have a capability to put into geosynchronous orbit a space station of the Salyut class. Similarly, an upgraded Proton (SL-12) space launch vehicle could place a