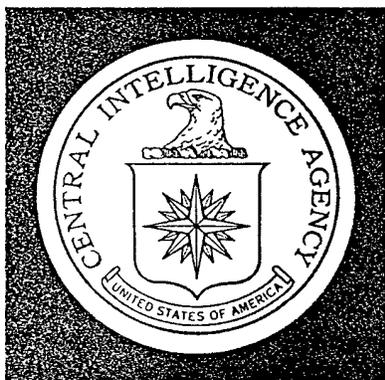


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DIRECTORATE OF
INTELLIGENCE

Intelligence Memorandum

Soviet Comsat Program: Status and Prospects

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CENTRAL INTELLIGENCE AGENCY
Directorate of Intelligence
June 1968

INTELLIGENCE MEMORANDUM

Soviet Comsat Program: Status and Prospects

Summary

The USSR's Molniya communications satellite (comsat) system, first successfully tested in April 1965, has emerged from experimental to operational status. Four Molniya satellites, all placed in highly elliptical orbits, are currently active. In addition, the USSR within the past year has established a widely dispersed network of more than 20 so-called "Orbita" ground stations which are now receiving and distributing Moscow TV programs relayed via Molniya. The USSR's first seaborne comsat terminal also has been operating since 1967 aboard the newest and largest Soviet space-support ship. In contrast to the Western-based International Telecommunications Satellite Consortium (Intelsat) system, whose satellites are used primarily for relay of international communications traffic, the Molniya system is now used mainly for TV relay inside the USSR. Soviet outlays on launches, satellites, and ground stations for the Molniya system since 1965 have now probably passed the \$250 million mark, excluding research, development, and operating costs.

In the years ahead the USSR will continue to give high priority to comsat program development and application with the intention of integrating satellite communications fully into the national long-haul telecommunications system. The number of Orbita ground stations will be increased to 30 or more by 1970. Concurrently, the USSR probably will

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undertake a program to expand the capabilities of selected Orbita stations -- now capable only of TV reception -- to include two-way multichannel communications. The USSR will seek to increase the channel capacity of the Molnias and to provide them with a capability for simultaneous relay of both multichannel communications and TV. Programs also will be undertaken to develop a multiple access capability for Molniya satellites and to further extend their useful lifetime.

Although Moscow announced formation of an independent international comsat system more than a year ago, tangible results from this decision have yet to appear. TV test transmissions via Molniya have continued between Moscow and Paris, but France recently rebuffed Soviet proposals for joint development of a new comsat. The international role of the USSR in satellite communications probably will not crystallize until after the permanent charter of the Intelsat has been negotiated in 1969. The new arrangements are unlikely to attract direct Soviet membership in Intelsat. They may, however, provide for the establishment of regional comsat systems, opening up opportunities for the USSR to develop firm working arrangements with emerging subsystems, bypassing formal affiliation with Intelsat. In the interim, the USSR will continue efforts to undermine the US concept of a single global system and to propagandize its own comsat achievements, but it will not close the door completely to eventual accommodation with Intelsat.

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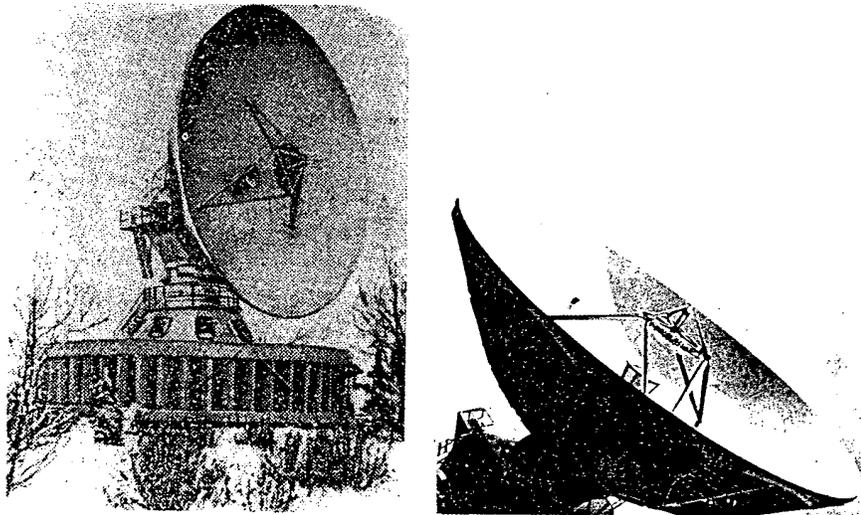
Current Status of the Molniya Program

1. The Soviet communications satellite (comsat) program got off to a late start but has progressed rapidly since the launching of the first Molniya in April 1965. In the past three years the USSR has successfully orbited eight Molniya comsats and has built a network of ground stations. Excluding research, development, and operating costs, Soviet outlays on launches, satellites, and ground stations for the Molniya system since 1965 have probably exceeded \$250 million. The priority attached by Soviet authorities to development of comsat technology has become especially evident since the spring of 1967 -- the USSR has successfully placed four Molnias into orbit, has installed more than 20 new special-purpose ground stations, and has put into operation its first seaborne comsat terminal.

2. The first three Molniya satellites had very short useful lifetimes -- less than six months -- owing to the degenerative effects of radiation on unshielded components. (The highly elliptical Molniya orbit causes the satellite to pass repeatedly through the Van Allen radiation belts.) Starting with the fourth Molniya, measures apparently were taken to protect components, and the useful lifetime of the satellites was increased to at least a year. Since the sixth successful launch in October 1967, the USSR has described the Molniya series as operational rather than experimental. Evidence accumulated since then supports this Soviet claim. With the launch of the eighth Molniya in April 1968, the USSR now has four active Molniya comsats in orbit (see the chart).*

* Not included in the tabulations on the chart is another satellite launched in August 1967, about which considerable uncertainty exists. This satellite has most of the same characteristics as the Molniya series, but has been identified only as "Kosmos 174" by Soviet authorities. Kosmos 174 may be associated with the Soviet space program, but its mission cannot be firmly established.

3. Until late last year, the Molniyas relayed communications traffic between only two ground stations in the USSR, one at Moscow and the other at Vladivostok. Coincident with the Soviet fiftieth anniversary celebrations in November 1967, the USSR put into operation a new network of so-called "Orbita" ground stations (see the map). As now configured, the Orbita stations are capable of receiving only one channel of Moscow TV via Molniya and relaying it by microwave radio relay or cable to local TV stations. They cannot receive telephone and telegraph traffic nor do they have a ground-to-satellite transmission capability. The Orbita network -- which enables the USSR to claim the world's first national comsat TV distribution system -- currently consists of 21 operational ground stations, most of which are located in remote areas of the USSR that cannot receive TV transmissions from Moscow by conventional means.* It is currently relaying about 40 hours per week of "live" telecasts from Moscow to areas having a total population of about 10 million.



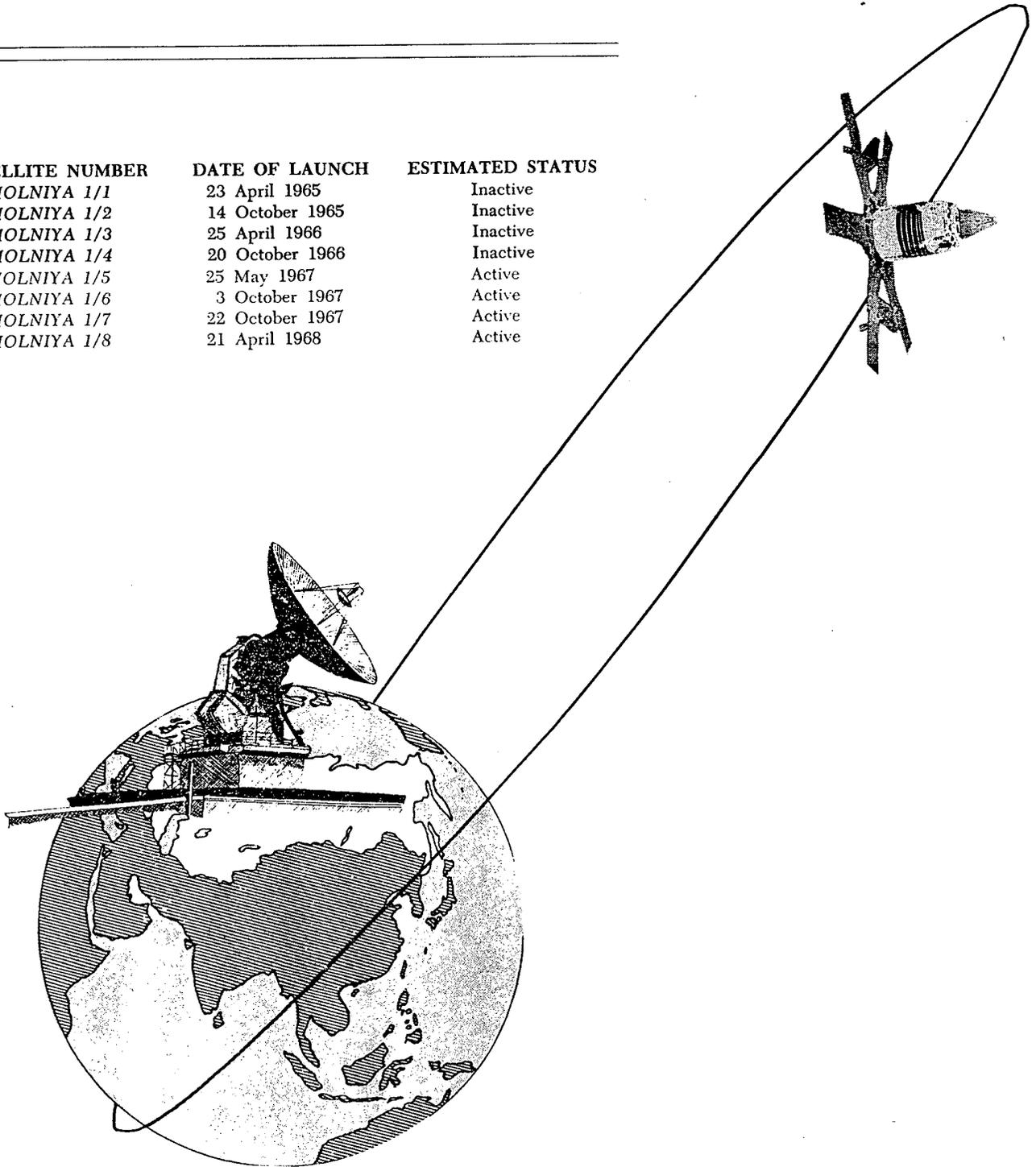
USSR: Orbita Communications Satellite Ground Station and Closeup View of the Antenna
April 1967

* An initial appraisal of the Orbita ground station program was presented in ER IM 67-43, New Soviet Initiatives in Communications Satellites and Television, June 1967, ~~SECRET.~~

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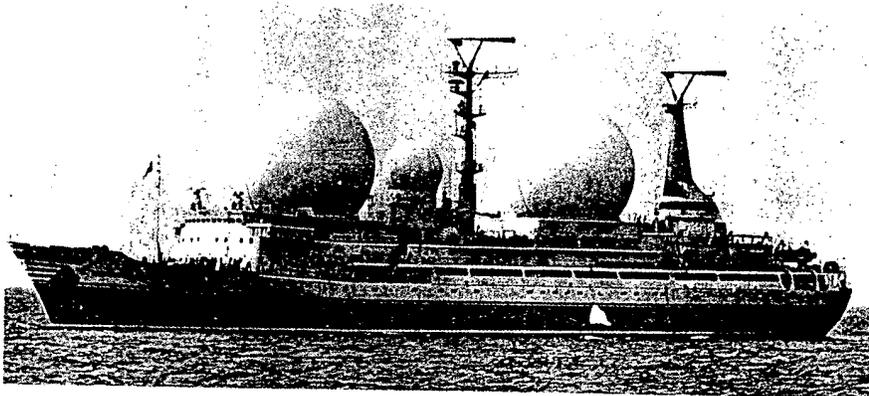
USSR: LAUNCH HISTORY AND ESTIMATED STATUS
OF MOLNIYA COMMUNICATIONS SATELLITES
June 1968

SATELLITE NUMBER	DATE OF LAUNCH	ESTIMATED STATUS
MOLNIYA 1/1	23 April 1965	Inactive
MOLNIYA 1/2	14 October 1965	Inactive
MOLNIYA 1/3	25 April 1966	Inactive
MOLNIYA 1/4	20 October 1966	Inactive
MOLNIYA 1/5	25 May 1967	Active
MOLNIYA 1/6	3 October 1967	Active
MOLNIYA 1/7	22 October 1967	Active
MOLNIYA 1/8	21 April 1968	Active



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4. Another highlight of the Molniya program in 1967 was the installation of the first Soviet shipborne comsat terminal aboard the USSR's newest and largest space event support ship, the *Kosmonaut Vladimir Komarov*. The *Komarov* can use this terminal to communicate via Molniya with the USSR from almost any point on the seas of the northern hemisphere. It is likely that the *Komarov* can also relay signals between the USSR and near-earth and lunar spacecraft. The *Komarov* thus represents not only the first Soviet comsat terminal operating outside the borders of the USSR but also a valuable addition to the Soviet space program command and control network.



USSR: Communications Satellite Terminal Aboard
the Support Ship *Kosmonaut Vladimir Komarov*

Future Directions of Soviet Comsat Technology

5. The USSR will continue to give high priority to the development and exploitation of comsat technology in the years ahead. Over the next two years or so the USSR probably will focus primarily on improving and expanding the use of Molniya satellites, but it undoubtedly also will pursue the development of a new and considerably more advanced comsat system likely to become operational in the early 1970's.

6. The USSR almost certainly will launch at least one, and possibly up to three, Molniya satellites in each of the next several years. Replacements will be required as existing Molnias become inactive, and others may be orbited in order to increase the amount of transmission time available for multichannel telephone communications between

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Moscow and Vladivostok. The number of Molnias orbited in the next few years could also be increased by a Soviet decision to assign special-purpose missions to particular satellites in support of the space program or military communications.

7. Current Soviet construction and planning indicate that 30 or more Orbita stations will be in operation by 1970. Concurrently, the performance capabilities of the network will be improved and expanded. Soviet authorities concede that the quality of the audio portion of the TV signal relayed by Orbita stations is substandard, but add that modifications are under development. There also are plans to equip the Orbita stations within the next two years to receive other types of one-way transmissions such as radio broadcasts and photofacsimile.

8. In the future the Orbita network will evolve far beyond the distribution of central TV and other types of one-way transmissions. It is clearly the intention of the USSR to integrate satellite communications into the national long-haul telecommunications system. To achieve this goal the USSR will expand the capabilities of selected Orbita stations during the early 1970's to include two-way telephone and telegraph service. A serious lack of high-capacity transmission routes still exists outside the western regions of the USSR, and creation of a ground station network capable of providing the full range of communications services will represent a long step toward overcoming this deficiency.

9. Soviet authorities do not, however, view the Orbita network as a substitute for further expansion of terrestrial cable and microwave radio relay lines. They recognize that for maximum utilization of the Orbita network the ground stations must be linked by new terrestrial routes to other population centers and other trunklines. Several Orbita stations are collocated with a new tropospheric scatter network being installed in the northern and eastern regions of the USSR (see the map). Others either are now or will be connected with high-capacity microwave radio relay and cable lines currently under construction. Completion of these programs -- probably by the early 1970's -- will constitute a major advance toward the Soviet goal of a modern and diversified system of national telecommunications.

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10. The USSR undoubtedly will continue efforts to extend the useful lifetime of Molniya satellites. Although the operating lifetime of Molnias has been lengthened to approximately a year, this still compares very unfavorably with the performance of US communications satellites. The Early Bird satellite, for example, was launched in April 1965 (as was the first Molniya) and is still relaying communications between Europe and the United States. Cost considerations alone provide adequate incentive for the USSR to improve in this area, inasmuch as Soviet authorities have stated that an operating lifetime of at least one-and-one-half years is necessary to make their comsats competitive with other transmission media.

11. It also appears likely that the USSR will attempt to increase the channel capacity of Molnias and to provide them with a capability for simultaneous relay of both TV and multichannel communications. (Molniya satellites up to now have only relayed either 60 duplex telephone channels or one TV program.) There is evidence, for example, that the USSR intends within the next two years to change Molniya system transmission frequencies from the current range of 800 to 1,000 megahertz to the 4,000 and 6,000 megahertz bands. The additional bandwidth that would be made available by such a shift would permit simultaneous transmission of TV and multichannel telephone and telegraph service. Orbital stations are believed to be capable of operating in the higher frequency range, and the shift probably would improve the image and sound quality of satellite-relayed telecasts.

12. The bandwidth provided by higher frequencies also would facilitate the development of a multiple access capability for Molniya satellites. At present, the Molniya satellite allows simultaneous communications between only two ground stations. (Full multiple access would permit any number of appropriately equipped ground stations to communicate with each other simultaneously by sharing the bandwidths of orbiting satellites.) The USSR has stated its intention to develop ground station equipment for handling a small number of channels (possibly twelve), and this equipment could be used in a multiple access network of limited scope. It is doubtful, however, that the USSR will be able to achieve an operational multiple access capability before the early 1970's.

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13. Within the next year or two the USSR also may launch a geostationary comsat -- that is, one placed in orbit over the equator and programmed to move synchronously with the earth. The highly elliptical Molniya orbit provides excellent coverage of the USSR but scant coverage of most of Africa and Latin America and none of the South Atlantic or Indian Oceans where Soviet ships are deployed to support space activities. A geostationary comsat could serve these areas but would reduce somewhat coverage of the far northern USSR. The energy needed to place a satellite of useful size into geostationary orbit from the Soviet Union would require the use of the largest and most expensive booster the USSR currently has in operational status. Thus the USSR may launch one or more experimental geostationary comsats by the early 1970's but is expected to emphasize elliptical orbits for the next several years.

The USSR's International Comsat Role

14. The USSR is well aware of the economic and political advantages of participation in international comsat systems. However, the only systematic ventures by the USSR into the international comsat field have been with France as part of a broader program of Franco-Soviet space cooperation. Since late 1965, color television test transmissions have been relayed via Molniya satellite between Moscow and the French ground station at Pleumeur-Bodou near Paris. These experimental Molniya transmissions have been more frequent in the past year but do not appear to be the forerunner of a truly international Franco-Soviet comsat system. France recently rebuffed an initiative by the USSR for a jointly developed Franco-Soviet comsat and has reiterated its commitment to Intelsat.

15. The USSR may establish a highly circumscribed Molniya-based international comsat system, but it would be unlikely to pose serious competition for the 62-member Intelsat. Following a Moscow conference on space cooperation attended by the Eastern European countries, Cuba, and Mongolia in April 1967, the USSR announced formation of an independent international comsat system and invited the participation of non-socialist countries. Tangible results from this decision, however, have yet to appear.

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16. Construction has yet to begin on a ground station promised to Cuba by the USSR a year and a half ago. Mongolia announced about six months ago that the USSR was going to provide it with an Orbita station, but there are no indications that construction has begun. Similarly, there is no sign of a Soviet commitment to build comsat ground stations in Eastern Europe. This may be explained by the absence of any real economic justification to do so, as existing networks are capable of handling Soviet communications with Eastern Europe and will continue to be adequate for the foreseeable future.

17. There is the possibility that the USSR may seek to further internationalize the operating area of the Molniya system by offering ground stations to certain of the less developed countries. Ground stations initially offered probably would be of the Orbita type, rather than full-range stations capable of handling multichannel communications as well as TV, owing to several practical advantages. First, Orbita stations are much less expensive and are simpler to operate. Second, they are nearing the status of "off-the-shelf" production items for the USSR. Third, Soviet telephone and telegraph requirements with the less developed countries are far too small to warrant installation of costly full-range stations. The most likely candidates for such stations would be countries in the Middle East and Northern Africa* which are alienated from the West and uncommitted to participation in Intelsat. From the standpoint of live telecasting, these areas would be more desirable because time zone differences with Moscow would be minimal. Despite the possibility that the USSR could move in this direction, however, there is no evidence that Moscow currently has such an initiative under serious consideration.

18. Direct Soviet membership in Intelsat is unlikely, because the USSR regards the Consortium as a body firmly under the thumb of the United States. Nevertheless, over the past year or so the USSR has modified its previous adamant rejection of any cooperation with Intelsat. In April 1967 the USSR permitted live telecasting via Intelsat of Moscow

* *Sub-Saharan Africa is beyond the reception range of the Molniya orbit.*

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ceremonies celebrating the inauguration of direct air service between the USSR and Japan. The USSR also agreed to participate in the first global telecast in June 1967 that was to have used a Molniya satellite in conjunction with three Intelsat satellites. The USSR rescinded this agreement because of the Middle East crisis, but the initial willingness to cooperate provided further evidence of a more flexible attitude toward working with Intelsat facilities. Soviet leaders have reinforced this impression with numerous (albeit vague) statements over the past year calling for international cooperation in the comsat field. Moreover, the USSR undoubtedly will again make indirect use of Intelsat facilities to obtain TV coverage of the 1968 Olympic Games in Mexico.

19. The ultimate role of the USSR in the international comsat arena probably will remain ambiguous until after the permanent charter of Intelsat has been negotiated in 1969. It is unlikely that control and management arrangements within Intelsat will be altered sufficiently to attract formal Soviet membership in the Consortium, but there is a strong possibility that the new arrangements will make provision for regional comsat systems in one form or another. (Intelsat members that hope to benefit from such systems include France, West Germany, Canada, Japan, India, and Pakistan.) Should this be the case, the USSR could be expected to seek establishment of firm working arrangements with the emerging regional subsystems, thus bypassing formal affiliation with Intelsat.

20. In the interim -- especially between now and the Intelsat negotiations in 1969 -- the USSR almost certainly will continue efforts to undermine the concept of a single US-dominated global system and will play up its own international comsat potential. The USSR probably will stress in public forums that international comsat systems should be controlled by the UN and will underscore the theme of US domination of Intelsat to European countries in an effort to maximize the changes introduced into the new permanent arrangements. The USSR also will seek to reap the greatest possible propaganda value from any future Soviet comsat achievements. Over the next several years, these might include successful orbiting by the USSR of a geostationary satellite; completion of Molniya-served ground

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stations in Cuba and possibly other countries; and establishment of regular TV, telephone, and telegraph service via satellite between Moscow and Paris. Simultaneously with these challenges to Intelsat, however, the USSR probably will continue to speak of international comsat cooperation, and the door to eventual accommodation with Intelsat will be kept open.

