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# Defense Intelligence DIGEST

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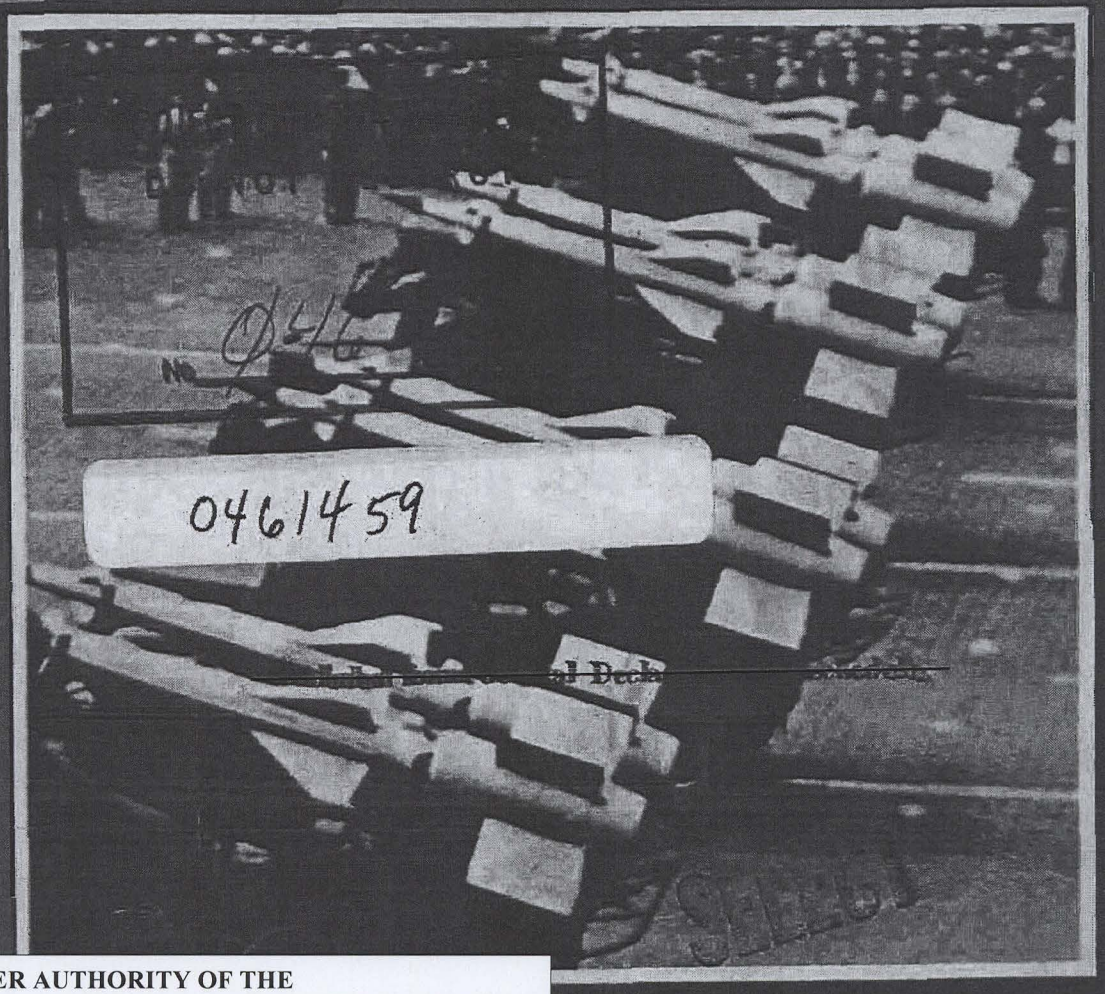

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DEFENSE INTELLIGENCE AGENCY



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# FOCUS

## SOVIETS LAUNCH ZOND-4 LUNAR PROBE

ZOND-4, launched from the Tyuratam Missile Test Range on 2 March 1968 and placed in orbit by the SL-12 launch system, is believed to be the precursor of future Soviet manned lunar flights. However, unless the Zond-4 mission was an unqualified success, further unmanned testing of the SL-12 and the Soyuz spacecraft may be required. It is quite possible that a future flight test of this launch system and spacecraft may occur within the next few months.

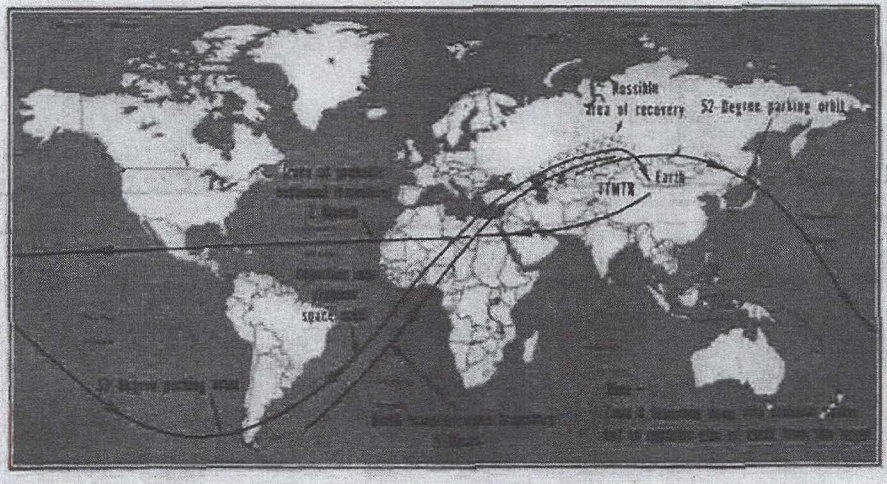
Zond-4 was launched into a parking orbit on an inclination of 52 degrees. About 75 minutes after the launch, it was ejected into a high, elliptical orbit of the earth with a period of about seven days. The orbit time lapse is approximately the same as that estimated for a circumlunar mission. Although the trajectory of this spacecraft simulated that of a lunar mission, it was launched in the opposite direction of the moon from the earth—probably to avoid the lunar gravitational perturbations on the vehicle.

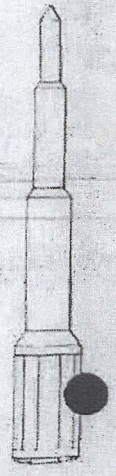
The de-orbit and attempted recovery of Zond-4 occurred on 9 March; however, the Soviets have not announced the successful culmination of this final phase of the operation, so it is not known, at this time, whether or not this mission was completely successful.

Zond-4 is the first Zond-series vehicle to be launched by the SL-12 system, which consists of the two-stage modified Proton booster plus a third stage and a restartable fourth stage. This is the largest Soviet space-booster system tested to date—it appears to be capable of placing only 10,000- to 15,000-pound payloads into elliptical orbits as far distant as the moon's orbit. The system is considered adequate for manned circumlunar flights, but inadequate for manned lunar landings and return.

The designation "Zond," translated "probe," was first used in reference to two unsuccessful interplanetary attempts in 1964: Zond-1 to Venus and Zond-2 to Mars. Zond-3 probably was an engineering flight test for the 1965 Venus probes. It also was the first satellite to relay photographs of the dark side of the moon back to earth. All of these vehicles were launched by the SL-6 booster. [S]

### Zond-4 Simulated Circumlunar Mission and Re-entry Test



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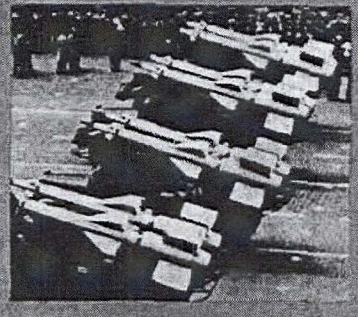

*Goa missiles on parade in Moscow. For details on their deployment to East Germany see article on page 24.* [U]


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## FOREWORD

**MISSION:** The mission of the monthly *Defense Intelligence Digest* is to provide all components of the Department of Defense and other United States agencies with timely intelligence of wide professional interest on significant developments and trends in the military capabilities and vulnerabilities of foreign nations. Emphasis is placed primarily on nations and forces within the Communist World.

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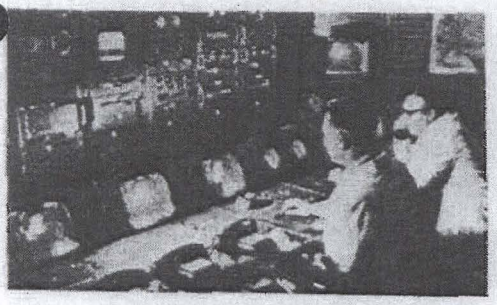
Joseph F. Carroll

JOSEPH F. CARROLL
Lt General, USAF
Director



*Moscow space control center.* [U]

# USSR SPACE AUTHORS CLOAKED IN

**In an apparent effort to reach a tradeoff between a penchant for secrecy and a desire to disseminate space data within the scientific community, the Soviets have published a limited amount of open source scientific information on their space program. Many of the articles are attributed to unnamed chiefs of various space organizations and others are believed to have been written under pseudonyms.**

THE Soviet system of authorship has created many problems in ascribing authenticity for Western observers. Generally the names of Soviet space scientists are kept secret and public tributes to these pioneers and "Heroes of the State" are awarded posthumously. As a result, death has brought belated stardom to many key personalities within the program.

Premier Khrushchev promulgated the policy after the launching of the first Sputnik; he declared that the identities of Soviet rocket scientists were being kept secret for security reasons, but said that the time would come when their names could be revealed and they would be given public honors. To date, the appropriate time has coincided with death.

Under strict enforcement of the policy, Soviet scientists cannot write and publish information that could accord the Soviet Union a more professional stature in the scientific world. To overcome the difficulty at least two chief designers apparently began using pseudonyms shortly after the launching of Sputnik I: "Professor G. V. Petrovich" is believed to be the penname of V. P. Glushko and "Professor K. Sergeyev" the penname for S. P. Korolev. V. P. Glushko is believed to be the "Chief Designer for Spaceship Engines," often mentioned by the Soviets. And S. P. Korolev was specifically identified as the "Chief Designer of Carrier Rockets and Spacecraft" at the time of his death in January 1966.

The identification of these personalities with pseudonyms and their association with various publications adds a new factor in estimating the authenticity of the articles. Previously the anonymity of "Professors Petrovich and Sergeyev" created questionable reliability. And their articles, which are couched in lay terms and contain a degree of propaganda, still should be subjected to a critical review. But the information does have an increased credibility that may be interpreted against the achievements, capabilities, and trends of the Soviet space program. In these articles, they have discussed the goals of the program and general information on its timing and methods for its accomplishment. Assuming these scientists are speaking for the Soviet Union and for their scientific colleagues, the articles take on considerable significance.

## Three-phase program

According to the articles by Sergeyev and Petrovich, the overall goal of the Soviet space program is manned interplanetary flight, which was formulated as early as 1959 and solidified by late 1961. All of the various space systems that have been developed, such as Cosmos, Luna, Zond, Polyet, Voskhod, Proton, and Soyuz, reportedly have been designed to support this goal.

The Soviet program to accomplish manned interplanetary flight also is said to be in three phases:

- The first phase is to develop long term and permanent earth orbital stations. These stations are to serve as laboratories for scientific, astronomical, and biomedical research. Their most important functions, however, will be to serve as launch facilities for manned lunar and interplanetary missions.
- The second phase is to accomplish an exploration of the moon, which is to be initiated with circumlunar flights, and climaxed by manned landings and the establishment of a permanent lunar base.
- The third phase—and the ultimate goal—is manned interplanetary flight; apparently the prime targets are Mars and Venus.

## Phase I

In addition to providing an overall picture of the Soviet space program,

# SECRECY

*V. P. Glushko*

*S. P. Korolev*

articles by Petrovich and Sergeyev elaborate on some details as to how certain elements of the program have already been accomplished and how others are to be accomplished.

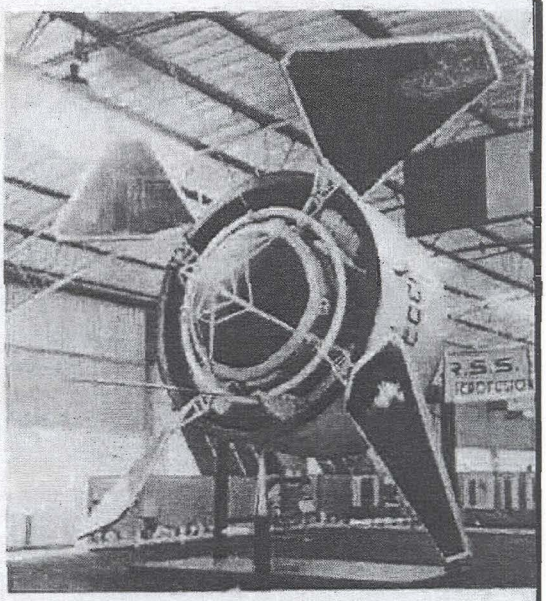
The Soviets appear to have selected the earth orbital rendezvous mode for manned lunar and manned interplanetary missions. According to the authors, this approach will require the development of earth orbital stations. Petrovich states that such stations will serve as intermediate points for lunar and interplanetary flights and will be habitable satellites manned by crews in periodic shifts. Similarly, Sergeyev states that interplanetary vehicles will be assembled under conditions of weightlessness and will start from orbit after accumulating the necessary fuel supply.

In addition to supporting lunar and interplanetary manned missions, the orbital stations will serve as laboratories for astronomical studies, investigations of radiation and solar flare phenomena, studies on biomedical effects of prolonged space flight, and the development of effective techniques for performing extravehicular activities. In 1959, Petrovich published an article indicating that the orbital stations would have perigees between 1,000 and 10,000 kilometers. These figures were revised downward in a 1961 article to a few hundred kilometers ". . . in order to make use of the protective action of the earth's atmosphere, and in order not to enter the earth's radiation belts."

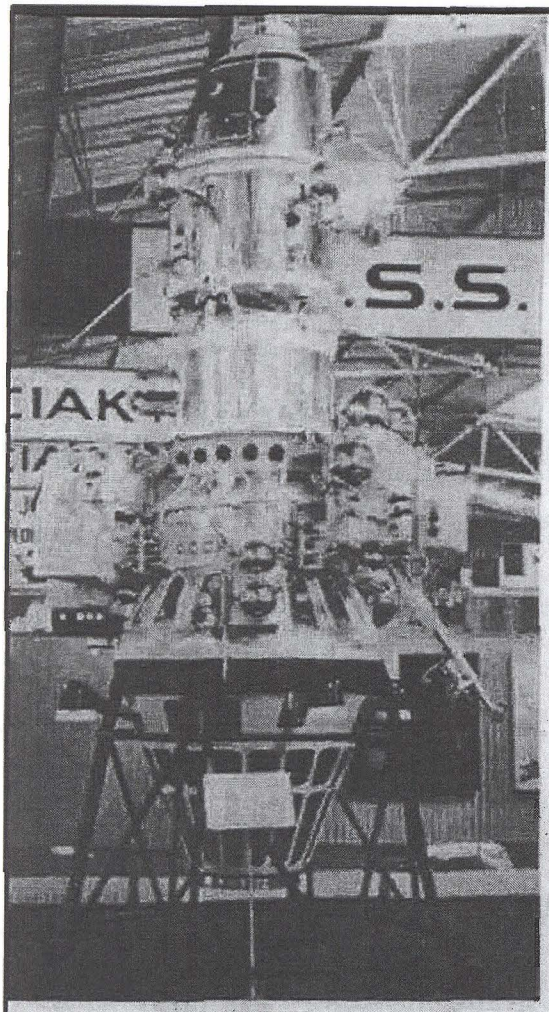
## Phase II

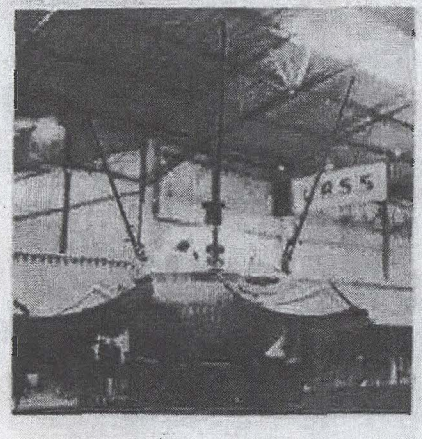
The planned sequence of Soviet lunar exploration according to Petrovich's articles involves four basic steps:

- A series of automatic lunar vehicles will be used both to orbit the moon and land on it to study cosmic rays and meteor danger and to photograph the far side of the lunar surface. In some of the circumlunar flights, animals are to be used to determine the effects of space conditions. The term circumlunar in these articles may have a different meaning than that used by the West. For example, in commenting on Luna 10 (lunar orbitor), Petrovich states, "This initiated a new stage in the study and conquest of circumlunar space."
- Soft landings are to be accomplished to broaden the type of instruments used for lunar investigations. Lunar satellites are suggested for providing radio communications with the earth. Instrumented flights are to be followed by manned lunar trips.
- Manned landings on the moon are to be preceded by a manned trail flight around the moon. Emphasis is placed on full automation of every phase from earth to soft lunar landing and return before manned lunar flight is attempted.



*Proton satellite weighs 30,000 lbs. and is used to investigate radiation.* [U]





*Luna 10 moon orbiter (above); Luna 9 soft lander (below)* [U]

• Manned flight to the moon is to be accomplished by launching two rockets simultaneously to improve safety.

In 1962 Petrovich wrote, ". . . the sixties will witness a (manned) flight to the moon." But in 1966 Sergeyev published an article stating, ". . . regrettably, this problem (manned lunar landing) is not very simple and does not stand close to reality." Sergeyev's statement was published after a series of Luna failures but just before the first successful soft landing and lunar orbitor.

### Phase III

The Soviets have designated Mars and Venus as prime targets for interplanetary missions, although a clear priority does not appear to have been established. The next two planets slated for exploration are Mercury and Jupiter, and finally, Saturn, Uranus, Neptune, and Pluto. Petrovich predicted in 1962 and again in 1966, ". . . there can be no doubt that in the seventies, man will visit Venus and Mars."

The Soviets appear to have selected a different approach to the problem of ensuring the success of both manned lunar and interplanetary missions. Instead of conducting such missions with a single vehicle, they propose to employ two or more ships traveling side by side. In this manner, sufficient redundancy can be provided and, as a bonus, a rescue capability is immediately available.

Extra-vehicular activity and self-contained life-support-airlock systems, first demonstrated by the Soviets in the Voskhod program, are integral parts of the multiship concept. If a catastrophic failure occurs on board one ship, its crew must possess a capability for transferring to another.

### Chemical propulsion

Soviet launch vehicles have been described by Western authors as having one very significant feature—they can launch heavy payloads. This capability, according to the Soviets, is not merely the result of larger boosters but of the success of combustion research that permitted them to develop large boosters. The "Chief Designer of Cosmic Engines" expressly stated this in 1962: "Major research conducted on the study of highly forced processes of combustion are what fundamentally determined the success of the whole work."

Petrovich offered an illustration of the use of the combustion techniques in 1967: "The vacuum specific impulse of the RD-107 engine of the first stage of the rocket booster Vostok . . . is almost 30 seconds greater than the specific impulse of the American H-1 engine of the same thrust class and using the same oxygen-kerosene propellants. The specific impulse of the RD-107 engine is 314 seconds with a thrust of 102 tons."

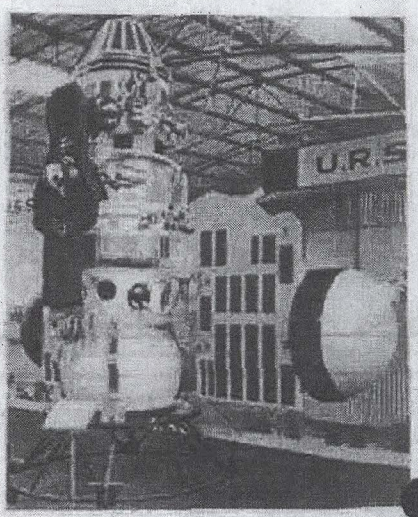
In describing the proton engine, Petrovich attributes the 3,000-degree centigrade temperature in the combustion chamber and the complete transparency of the exhaust to the high-quality combustion process. He also provides some hints about the future development of chemical boosters. In a 1962 article he predicted that the payload capability of Vostok—the largest payload at the time was 6,500 kilograms (14,000 pounds)—will be surpassed by a factor of 10 in the coming decade.

### Advanced propulsion

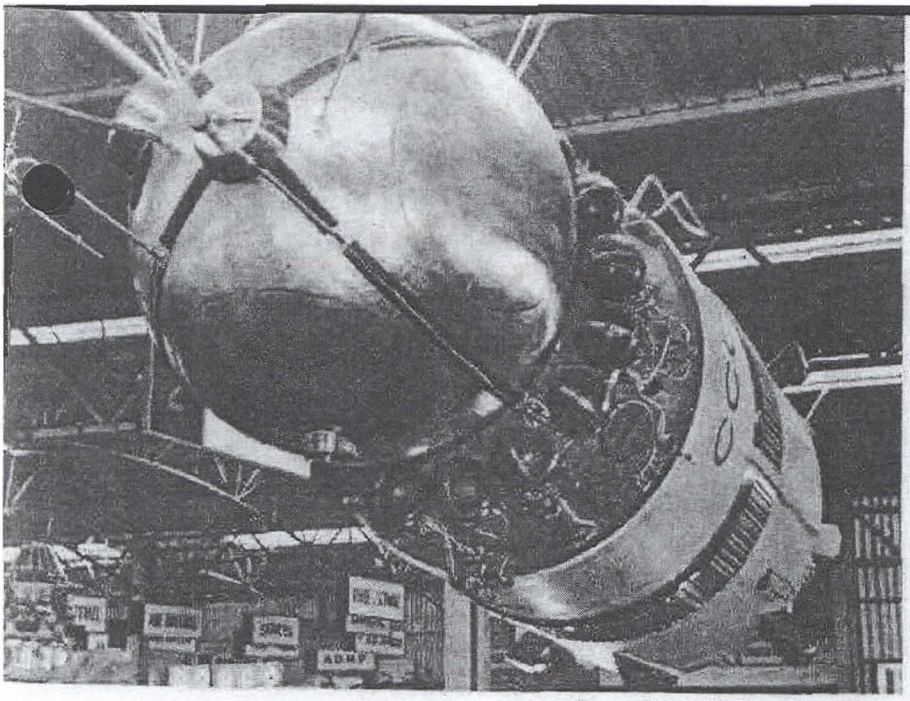
In 1964, Petrovich stated that the nuclear rocket concepts did not offer "sufficient advantages over chemical rockets." Both Petrovich and Sergeyev mentioned nuclear rockets before 1964, but no mention was made after that date. However, Petrovich discussed at great length the potential of electric rockets and pointed out that the Soviets pioneered development of electric rockets as early as 1929. Apparently the Soviets chose to develop electric rockets rather than nuclear types sometime before 1964.

### Problem areas and goals

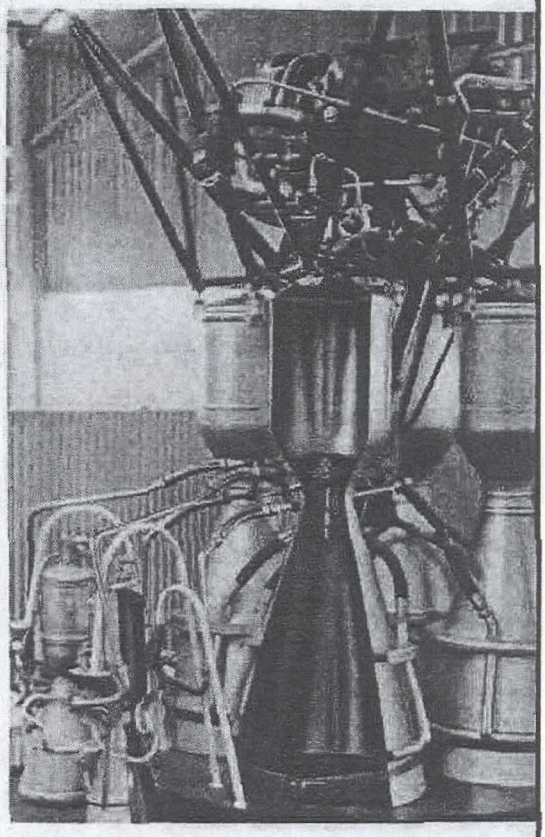
A number of problem areas and some future goals of the Soviet space program have been described. The most frequently mentioned are life-support systems, biomedical effects,



*Venus 3 capsule weighs 2,000 lbs.* [U]



*Capsule with a 7.5-foot-diameter cabin (left) and four groups of four-cluster, liquid-fueled rocket motors (below); both are components of the Vostok system (bottom).* [U]



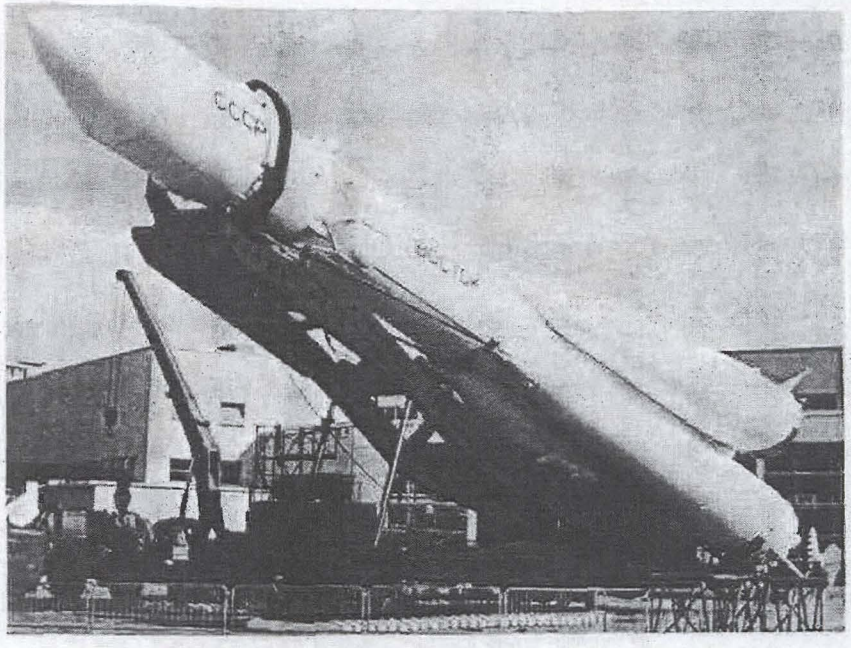
solar satellites, and passenger and freight rockets. Sergeyev indicates that long distance interplanetary flights can be attempted only after a closed-loop ecological system is perfected.

The importance of understanding the effects of weightlessness and radiation have been stressed by both authors. Studies of these effects will be conducted primarily in earth-orbital laboratories staffed with crews consisting of scientists and medical personnel.

As early as 1958, instrumented satellites were predicted as useful for solar monitoring to provide advance warning to the flight crews of impending increases in solar radiation. There are several indications that such a system might be launched in the near future. For example, the description of the capability of the Proton booster indicates that it will be used to launch solar probes. Also, Petrovich announced that S. A. Zhevakin's theory on "variable stars" enabled a ". . . number of new interesting predictions . . ." to be made. Soviet astronomers have advanced the proposition that the sun is "spectrum variable," which might be important for predicting periods of increased solar activity and solar flares.

The Soviets have displayed an open awareness of the possible use of rockets and aerodynamic re-entry vehicles to carry freight and passengers. This concept is described as not only being a method of providing manned communications between the earth and orbital satellites but also as a benefit to the "national economy." This interest suggests that some form of aerospace aircraft will play a role in the Soviet space program.

Space information such as this has been openly described for the last 10 years by at least two authors, both of whom are believed to have been in key positions. Although one is deceased, the other is believed to be continuing in a prominent position in the space program. [END]



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## SOVIET SPACE PROGRAM DIRECTOR PROMOTED

ONE of the directors of the Soviet Manned Space Program, Nikolay Petrovich Kamanin, 59, veteran Soviet pilot and much-decorated World War II hero, was recently promoted to guards colonel general of aviation.

General Kamanin entered the Soviet Army in 1927 and successively completed air force basic and pilot training. Beginning in 1929 he served in the Special Red Banner Far East Army as junior and senior pilot and as flight and detachment commander.

In 1934, for participating in the rescue of stranded arctic explorers on board the ship *Chelyuskin*, he received the title "Hero of the Soviet Union," one of the first to be awarded the honor. In 1937, while attending Zhukovsky Air Forces Engineering Academy, he was promoted to captain, and on graduation a year later was appointed commander of a brigade at Kharkov.

His rise was rapid thereafter: In 1940 he was Deputy Commander, Central Asia Military District; in 1942 he was Commander, 291st Ground Attack Division, and a major general; and through 1945 he commanded an air corps of the 2d Air Army, fought on two *fronts* in four campaigns, and became a lieutenant general of aviation.

He was named Deputy Chief of Civil Aviation in 1964. Two years later he became Chairman of the Central Committee of the Voluntary Society for Cooperation with Aviation, and when that organization merged into the society for all services (DOSAAF), he was designated Deputy Chairman of the Organizational Committee. Later he became First Deputy Chairman.

General Kamanin has been associated with the Soviet manned space program since 1960. He is known variously as Chief of Cosmonauts, Commander of the Cosmonauts, and Commander of the Cosmonauts Training School. He has played a primary role in the selection of cosmonauts and has served as air forces representative on the state commission for the launch of the Vostok manned spaceship. He has accompanied the cosmonauts on their foreign travels and has been the spokesman for them; he has also written many articles for the space program and has served as a member of the editorial board of *Aviatsiya i Kosmonavtika* (Aviation and Cosmonautics), the journal of the Soviet Air Forces.

He has been a member of the Communist Party since 1937. In 1950 he was named to the Central Electoral Commission for the Supreme Soviet. He was twice elected deputy to the Moscow City Soviet, in 1953 and 1963. He received the Order of Lenin in March 1965. ~~[C]~~