Soviet space plans reach for the stars

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1975 Soyuz orbit team. American commander Thomas P. Stafford and Soviet commander Aleksei A. Leonov.

During the Columbia's triumphant descent, commentators on both sides of the television screen were heard boasting that the United States is now far beyond the Soviet Union in its space effort. The enthusiasm is welcome, but the conclusion is misplaced and misinformed.

It is well known that since the 1950s, the U.S.S.R. has carried out a long-term, well-funded space exploration program. What is far less well known is that over the past decade, the Soviets have continued to launch nearly one spacecraft per week for communications, weather, reconnaissance, or manned exploration. In 1980, when the United States performed 13 missions, the Soviets launched 89. The U.S.S.R. has clocked twice as many hours of manned space flight as the United States. And the U.S.S.R. has sent up nearly three times as many spacecraft of all types.

The current Soviet view of space exploration is appropriately summarized in an often-quoted passage from a pioneer of Russian rocketry. "Man will not always stay on Earth," wrote K. E. Tsiolkovsky in his 1903 book *Exploration of the Earth with Rocket-Propelled Instruments*. "The pursuit of light and space will lead him to penetrate the bounds of the atmosphere, timidly at first, but in the end to conquer the whole of solar space."

The idea of manned exploration of the universe has been a long-term goal of the Soviet space effort, and since the 1957 launching of Sputnik, they have developed a manned space program that now far surpasses in scale its U.S. counterpart.

The Salyut spacecraft

Throughout the 1970s, the Soviets launched a series of spacecraft into near-Earth orbit to study the long-term effects on man of the space environment. The Salyut series of spacecraft has provided the Soviets with a strong confirmation of the human ability to withstand long periods of weightlessness and near-isolation in space.

Salyut 6, launched in September 1977, provided cosmonauts with a well-equipped laboratory to experiment in materials processing, space photography, and medicine, as well as astronomy and physics. When Valerii Ryumin and Leonid Popov returned to Earth, they had set a 185-day record for continuous time in space—a half-year in zero gravity with few biological ill effects.

The longest mission by a U.S. team was an 84-day tour aboard Skylab. At the point when that ill-fated vehicle was falling to Earth because the Space Shuttle designed to boost it to a higher orbit had not been funded sufficiently, the Soviets' Salyut became the largest spacecraft in Earth's orbit.

Salyut's endurance record permitted scientific efforts that far outstripped American experiments. A crystallography laboratory aboard Salyut led to production of over 200 samples of crystal alloys, including cadmium mercury crystals impossible to form on Earth, with wide-ranging electronics application. A metal-smelting furnace in space took advantage of the zero-gravity environment to mix metals in ways impossible to achieve on Earth, including high-temperature-resistant steels and other prized alloys.

The Soviets plan to follow the Salyut success and its scientific breakthroughs with a permanently manned 12-person space station in the mid-1980s. Ten times the size of the manned Skylab scheduled to fly within the U.S. Space Shuttle, the Soviet station will be launched with at least double the thrust of the Saturn rockets that put Apollo into space. It will have multiple docking ports, permitting ships to permanently attach them-

selves to the unit with open docking ports for still more craft, in a modular "honeycomb" formation.

The Soviets clearly plan the permanently manned station as a base for planetary exploration, probably before the turn of the century. Numerous landings of unmanned Soviet craft have already occurred on Mars, performing many of the experiments needed to prepare for manned landing parties.

The Progress shuttle

During the three and a half years Salyut 6 has been in orbit, it has been visited by 28 Soviet spacecraft. The Progress series of unmanned vehicles delivers scientific instruments, fuel, and other supplies to the Salyut cosmonauts. Eleven Progress supply vehicles made visits; Progress 7 delivered a new cosmic-ray telescope and used its engines to boost Salyut to a higher orbit—the way the Shuttle was originally supposed to boost Skylab.

The Progress ships burn up on re-entry, unlike the U.S. Shuttle; the U.S.S.R. is also developing a reusable space shuttle. American specialists say the Soviet shuttle design resembles the Dyna-Soar program NASA pursued in the 1960s. In March 1978, *Aviation Week & Space Technology* reported that since 1975 the Soviets have been drop-testing a free-floating glider (like the U.S. Shuttle). *Aviation Week* suggested that the delta-winged Soviet shuttle would be launched by a totally reusable booster, perhaps launched horizontally along a runway used by commercial aircraft.

International effort

The Soviets' manned space program has another aspect that the U.S. program has downgraded by comparison. The U.S.S.R. effort is international, training cosmonauts from the East bloc, France, and developing nations, including Vietnam and India. The U.S.S.R. also signed a bilateral space agreement in 1966 with France; the two nations have conducted joint experiments in outer-space physics, studies of the Earth's magnetosphere, and joint communications transmissions.

Meanwhile the U.S.-Soviet cooperation program—which entailed an exchange of dozens of scientists and engineers in preparation for the 1975 Apollo-Soyuz mission—has languished.

In the days following the Columbia's return, Soviet President Leonid Brezhnev renewed an offer to the United States to cooperate in space development. At a point where, as in fusion energy development, future missions in space will be costly and long term, the opportunity for international cooperation is an attractive course.

The Reagan administration has made no comment as yet either on the future of the U.S. space program or on the Soviet offer of cooperation.

Aleksandrov on the Soviet space goals

On April 10, the Soviet Academy of Sciences celebrated the 20th anniversary of Yuri Gagarin's flight into space, the first ever by any man. A. P. Aleksandrov, president of the Academy and a major figure in Soviet science and technology policy, addressed the commemorative meeting in Moscow. We excerpt here from his speech.

One of the main levers for the intensive development of the national economy is technological progress, which is based on major scientific discoveries and deep penetration into the phenomena of nature. The study and mastery of space holds a worthy place in its acceleration and in solving the most urgent theoretical and practical problems of the comprehensive utilization of scientific achievements in the national economy.

In turn, the achievements of space exploration are linked to the entire course of scientific and technological progress. The very fact of the emergence and perfection of space exploration should be viewed as an integral indicator of the might of the productive forces and the scientific and technological potential of the country, the high degree of its economic development and the educational and cultural level of the population. . . .

The 20 years since the triumphant flight of Yuri Gagarin have been filled with intense and fruitful work by Soviet space explorers. Going into space has changed from an extraordinary event to a constant factor. . . . Soviet space science today means powerful rockets, satellites, automatic interplanetary stations, piloted ships, and orbiting stations. It also includes long-distance radio communication, the global collection of meteorological information, study of the Earth's environment and natural resources, and the solution of many basic problems of science. . . .

If you sum up the days spent on the Salyut-6 [space laboratory] by the four main expeditions, you get over a year and a half of constant work. Valerii Ryumin holds the record, which will not soon be surpassed, of 362 total days in space. . . . I can say with confidence today that thanks to this, the basic technical and physical problems of long-term stays by man in space have been solved.

What are the prospects for developing orbital stations? Today, comparatively small, but long-lasting, apparatuses equipped with one or more docking joints, which allow new modules and equipment to be docked to the station, are now fully justified. The main purpose of such stations is to make possible ever new types of scientific research and to develop methods of measurement especially for this apparatus. Automatic space probes will also be improved, and automatic flights will become a reliable instrument for knowing the universe.