

Pre-Salyut Soyuz Space Flights

As the core vehicle for Soviet-manned space activities since 1967, the Soyuz has accomplished diversified objectives, many of them directly related to the growth of the Salyut space station program. Capable of flying with or without crews, Soyuz has served as a test bed to observe the physiological effects of long- and short-term spaceflight on human beings (as well as animals and plants), to evaluate rendezvous and docking techniques, and to appraise Earth remote-sensing equipment and new spacecraft systems. *

In early Soyuz flights, cosmonauts exercised skills later to be integrated into operations of the Salyut space stations. Specifically, the space complex resulting from the docking of Soyuz 4 and 5 in January 1969 was described by the Soviets as "the world's first space station"⁴—a somewhat puzzling description, as there was no connecting hatch. During the few hours when the two craft were linked in power, control, and communications, two cosmonauts from Soyuz 5 donned self-contained life-support systems, left their craft through a hatch in the Orbital Work Module and, using handrails, transferred into the docked Soyuz 4. This orbiting complex provided a total working volume of 632 cubic feet, the largest attained to that date.

Although most observers contend that a true space station should allow its occupants to move from one part of the facility to another without having to resort to spacewalking, the experience gained in the Soyuz 4 and 5 complex was valuable in the design and development of larger space station configurations.

In October 1969, the Soviets launched Soyuz 6, 7, and 8. In spite of their apparent failure to

● Unfortunately, in demonstrating this latitude of functions, four cosmonauts lost their lives in two separate accidents, one in Soyuz 1 and three in Soyuz 11.

⁴This phrase was first used in a question by the Tass correspondent at the Cosmonauts' press conference in Moscow, Jan. 24, 1969. (Summary World Broadcasts, Su/2984/c/4). This same claim could have been made earlier, when two pairs of unmanned Soyuz prototypes previously achieved successful rendezvous and docking—except, of course, that some third vehicle would have been required to ferry a crew to staff them.

dock two of the vehicles, they succeeded in flying the three spacecraft with their seven cosmonauts in coordinated, close formation. At the time, the Soviets commented that the joint exercise evaluated autonomous navigation devices for use in close-formation flying and achieved a "rational distribution" of control between man and machine.

Acting on the assumption that the construction of future space stations would require a mastery of in-space welding techniques, the Soviets included a test unit on Soyuz 6. The device was operated remotely in vacuo and manually within the pressurized Orbital Workshop Module. Three welding techniques were tried in vacuo: 1) low-pressure compressed arc, 2) electron beam, and 3) arc with consumable electrode. Only the second was reported to be a complete success. More recently, the Soviets claimed those experiments can now be "seen as an impetus to the practical development of space technology."⁵

From its first use in April 1967 to the landing of Soyuz 9 in June 1970, and the initiation of space station operations, Soyuz spacecraft flew 15 persons on eight missions for a total of nearly 44 days of operations in space. At the close of this period, Soviet personnel—on Vostok, Voskhod, and Soyuz spacecraft—had accumulated a total of some 2,550 hours in space. By comparison, the total at this juncture for U.S. Mercury, Gemini, and Apollo spaceflight was far greater, being slightly over 6,260 personnel hours.

An apparent objective of the *Soyuz program* was to provide a multipurpose spacecraft to be used in connection with an orbital space station. Among its many roles, Soyuz was to be a temporary base for checking out the station, a supply and transport shuttle, and a vehicle for conducting additional independent studies. Given the growing proficiency the Soviets had shown with Soyuz, there remained no major technological barriers to their Salyut space station program.

⁵V. Kubashov, *Pravda*, Moscow, Apr. 26, 1980, p. 3.