

Summit in space: The first step taken

Back on launch day, at Cape Canaveral's Kennedy Space Center, it had been in part a time for nostalgia, as the last Saturn rocket carried Tom Stafford, Deke Slayton and Vance Brand into orbit aboard the last Apollo spacecraft. But this week, the focus was different. Cosmonauts Aleksey Leonov and Valeriy Kubasov landed Monday following nearly two days of living and working in space with the U.S. crew, and the astronauts, off on a scientific research program of their own, were looking back on a rendezvous envisioned as the first major step in easing an international rivalry that has lasted nearly 18 years in space—and on the ground.

It didn't go without a hitch—no space flight ever does. But the "glitches" were minor, and in all its major aspects, the Apollo-Soyuz Test Project (SN: 7/5/75, p. 10) went as well as the space officials, diplomats, engineers, public relations types and flight crews who planned it could have wanted. The major technical item on the flight, a tunnel-like adapter that would couple the two dissimilar spacecraft together by their hatches, turned out to provide the smoothest docking ever, according to Stafford, who should know: In 1966 he was commanding Gemini 9 when a stuck shroud prevented docking with an unmanned practice target, and three years later docked Apollo 10 with a lunar module, an exercise which, while eminently successful, was hardly the flowing encounter of last week's mission.

(One docking that Stafford could not evaluate was that of a Soyuz vehicle and a Soviet Salyut space station, a task that has ranged from difficult to impossible on several occasions. One successful example, however, was that of Soyuz 18 and Salyut 4 on May 25, still in orbit last week and setting new Soviet space records every day, including a contribution to the record number of men in orbit, described by Salyut cosmonaut Pyotr Klimuk as "the Magnificent Seven.")

But the importance of the Apollo-Soyuz mission must be calculated on several different levels. "Without a doubt," says flight director Don Puddy, "it's an exercise in two-way communications." And indeed, one of the most complex and trying aspects of the whole operation was the melding of two launch sites, two control centers, two spacecraft (with several communications posts in each), numerous tracking stations, alternative transmission frequencies (one of which kept picking up interference from air traffic controllers on the earth below)—and two languages. When conversing with one another, astronauts spoke Russian and cosmonauts,

The first step: Kubasov, Leonov, Stafford and Slayton meet in orbit as Brand stands watch in the Apollo command module.



NASA

English. Key flight officials in both countries had translators at their elbows. Yet in the main, it all seemed to work.

From the standpoint of developing cooperation, in fact, the years of exhaustive preparation for such complexities were perhaps more important than the actual mission. "I think the greatest part of our learning," said Slayton, "has been in our training which preceded this flight." Personnel exchanges, joint training sessions, policy meetings and technical conferences began as early as two years before the

flight was officially agreed to in 1972. Some observers, in fact, have argued that NASA is "giving away technology" to the less sophisticated Soviet program.

The U.S. space agency, however, understandably takes a different view. "Our program is so open," says one ASTP official, "that the Russians could get information through a number of other ways." Yet there have undeniably been some gains. "I think that some of our operational flexibility is rubbing off on them,"

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Clustering globularly around a black hole

Black holes are all around us, it seems. Some theorists would pepper the entire universe with a dust of miniature black holes even into the inner reaches of the solar system. Black holes of a more stellar size appear to be associated with certain X-ray sources found in binary star systems. (There is even a somewhat way-out theory that a black hole fell on Siberia, the Tunguska event of 1905.) Now, in the July 3 *NATURE*, two prominent astrophysical theorists, John N. Bahcall of the Institute for Advanced Study and Jeremiah P. Ostriker of Princeton University Observatory, propose that the X-ray sources recently discovered in some of the globular star clusters that form a kind of halo around our galaxy are associated with black holes.

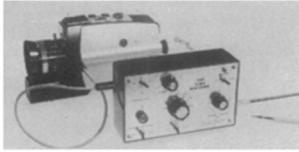
The globular clusters contain the oldest stars associated with the galaxy. At 10 billion years or so they represent some of the earliest forms of organized matter in the evolution of the universe. It seems theoretically possible that the cores of the globular clusters could evolve, by col-

lapses and collisions of stars, into extremely massive black holes (several hundred times the mass of the sun).

Such is what has happened, Bahcall and Ostriker suggest, to the four clusters known to be X-ray sources, NGC1851, NGC6441, NGC6624 and M15. The X-rays would be produced by hot gas falling into the black hole. The gas could be matter ejected during evolution of stars in the cluster or it could be pulled from stars that passed too near by the black hole's gravity.

The theory makes two "unambiguous" predictions. First, the X-ray emission should look as if it comes from a point at the center of the cluster. It should show no fluctuations due to eclipses or orbital or spin periods of large bodies. (There could be some periodicities caused by small particles orbiting the black hole in some circumstances, but these could be distinguished because the theory tells what their periods ought to be.) It seems like a clear-cut program to place before observers. □

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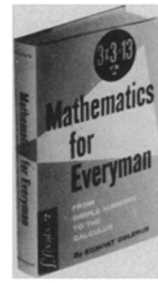
. . . Apollo-Soyuz

says Neil Hutchinson, another flight director. When TV cameras aboard the Soyuz began balking, for example, Soviet ground controllers consulted with the cosmonauts, who went in with hand tools and improvised some wiring to bypass the guilty switch, rather than, as in past times, simply doing without the troublesome component. "I think that's great," says Hutchinson. "That can't do anything but, in my opinion, help them to do a better job of things." One American Soviet affairs expert attending the mission went so far as to suggest that even if there is some give-away going on, it may have some positive effect by helping to relieve a "technological paranoia" that can only work against expanded cooperation in the future.

There was also much exchanging of symbolic memorabilia, of course, and finally some time for science. It was certainly not the primary goal of the flight (and it got correspondingly short shrift in the press), but the scientists involved made it abundantly clear that they felt the experiments conducted aboard to be far more than mere add-ons. "There's lots of good science on this program, as there was on the Apollo lunar program," said Thomas M. Donahue of the University of Michigan.

Donahue's own experiment, in fact, was described by flight director Pete Frank as "one of the most difficult things that's ever been accomplished in a spacecraft." Shortly after undocking on July 19, 51-year-old "rookie" Deke Slayton piloted Apollo out of the plane of its orbit (a demanding and fuel-consuming procedure) to shine an ultraviolet beam at reflectors on the Soyuz to measure neutral oxygen and nitrogen in the upper atmosphere. An experiment to survey the extreme ultraviolet sky (a task thought to be pointless until recent data suggested possible inhomogeneities in the absorptive interstellar medium) holds unique promise for the University of California's C. Stuart Bowyer: "We will have shown," he says, "that a field that was thought to be impossible to do can, in fact, be done." A vast earth-observation program coordinated by Farouk El-Baz of the Smithsonian involves a dozen co-investigators and 24 teams of land, sea and air observers from nine countries. The astronauts were a vital element, said El-Baz, because of the fine color distinctions possible by the human eye. The roster of such unilateral experiments was well under way aboard Apollo when Soyuz landed safely July 21, leaving the astronauts three more days in space.

But the major question was that of a possible second joint mission. "There's a general feeling on both sides that there will be flights in the future," said U.S. ASTP technical director Glynn Lunney. But, Lunney says, probably not until the U.S. space shuttle flies in the 1980's. □



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