Ambitious Soviet planetary plans presented at U.S. meeting

The two Soviet spacecraft now on their way toward encounters next March with Comet Halley represent a marked increase in sophistication over past Soviet planetary missions — higher data transmission rates, charge-coupled-device cameras, instruments mounted on movable "scan platforms" and other advances. In addition, they will reach their goal via the first Soviet use of a "gravity slingshot," swinging around Venus this June to be redirected toward the comet. And as they pass the cloud-shrouded planet, each will deploy a landing craft that, on its way down, releases a balloon to study the atmosphere.

Such details of Soviet planetary missions officially used to be kept secret (the earliest missions sometimes were not even announced until they had reached their destinations), although individual U.S. and Soviet scientists have long provided one another with occasional data that might aid the other side's scientific goals. Such exchanges, though limited, date back to even before the 1972 bilateral agreement on the peaceful uses of outer space. Lunar photos taken by the Soviet Zond 8 craft and by the vehicles of the U.S. lunar orbiter program were exchanged, for example, and U.S. researchers provided maps for the Soviet Lunakhod moon-rover missions. In the early 1970s, data on the Martian atmosphere and possible landing sites were provided from the U.S. Mariner 9 probe, and reports from the atmospheric entry of the Soviet Mars 4 and 5 missions that followed later aided U.S. designers planning the parachutes for the Viking landers. Although President Reagan allowed the bilateral agreement to lapse in 1982, blocking government-to-government exchanges, several U.S. scientists are participating as individuals in the Soviet Venus-Halley missions, and NASA will provide tracking data about the craft as a navigation aid to the European Space Agency, whose Giotto probe is also Halley-bound. (NASA will also be tracking the balloons released into the Venus atmosphere, with those data being passed on to the balloons' developer, the French space agency.)

Even so, U.S. researchers attending the annual Lunar and Planetary Science Conference at NASA's Johnson Space Center in Houston last week were surprised when Valeriy Barsukov, director of the Vernadsky Institute of Geochemistry and Analytical Chemistry in Moscow, provided unusually detailed descriptions of several Soviet planetary missions to come. Soviet successes at Venus in recent years have apparently provided confidence leading to a more open approach, but Barsukov included not only general mission descriptions but also lists of instruments to be carried, and even described in considerable detail a joint Soviet-French mission that is not due for a firm decision until October.

It has been understood for some time that the next mission on the Soviet timetable was to be a 1988 flight to Mars and the larger of its two tiny moons, Phobos. What Barsukov described, however, is no mere orbiter or pair of them (Soviet planetary spacecraft are usually sent in twos), or even combinations of orbiters and conventional landing capsules. Instead, he said, two orbiters will be placed in elliptical paths around Mars whose most distant points (apoapses) are about 6,000 kilometers above the surface. This is roughly the distance from Mars to Phobos. The first orbiter's path will then be circularized so that it is matching speeds with Phobos, providing the opportunity for long-term observations (a mode that NASA calls a "rendezvous"). The plan is that the craft will be able to essentially "hover" within as little as 50 *meters* of the surface of Phobos, taking television images of details as small as a few *centimeters*.

In addition, the orbiter is to deploy a landing capsule. This is a touchy maneuver because of Phobos's minuscule gravity, so weak that from certain points on this oddly shaped moon's surface, a human being with strong legs might be capable of jumping free into space. The lander is to be equipped with a springlike device that, when triggered, will cause it to "hop" across the surface, allowing it to study a different location. (A similar jump was carried out by the unmanned U.S. Surveyor 3 craft on earth's moon in 1967, though not with a spring. Mission controllers on earth refired its rocket engines by radio command, whereupon Surveyor 3 jumped about 3 meters up, landed a little more than 2 meters away, and continued its observations.) Also among the Phobos lander's instruments will be a "laser mass spectrometer," designed to zap portions of the surface with a laser beam and analyze the resulting vapor.

If the Phobos portion of the mission is successful, said Barsukov, the second orbiter/lander may be sent to repeat the feat on Deimos, the other Martian moon. Otherwise, it will be available as a backup probe for Phobos.

Due to reach Mars in 1988, the dual mission will be arriving about two years ahead of the next U.S. planetary project, a single orbiter called the Mars Observer. U.S. and Soviet researchers would like to find a way of coordinating the two missions, particularly if their operating lifetimes overlap. But there are no such plans as yet, and the lapse of the bilateral space cooperation agreement in 1982 may continue to make the necessary exchanges and interactions difficult.

Next on the list, said Barsukov, is a polar-orbiting satellite of earth's moon, equipped with a camera, X-ray and gamma-ray spectroscopes and other instruments, in a path about 100 kilometers above the lunar surface. The pole-crossing orbit means that the moon's whole surface will pass beneath the satellite, in comparison with the narrow streaks of data recorded by such devices as the "subsatellites" deployed from the manned Apollo 15 and 16 missions in 1971 and 1972.

A Lunar Polar Orbiter (LPO) was brought up three times and rejected in NASA budgets of the 1970s, but one has been proposed by the NASA Solar System Exploration Committee and is now under consideration. The Soviet version as described by Barsukov is to carry a strikingly similar batch of instruments, however, and some U.S. scientists at last week's meeting were wondering what its effect will be on U.S. plans.

Interest in an LPO has also been expressed by the European Space Agency and by Japan. Meanwhile, some researchers envision such a mission as a potential candidate for two satellites, perhaps carrying complementary payloads or relaying communications to earth when one or the other craft is on the moon's far side. But again, the climate for U.S.-Soviet cooperation in space is less than balmy.

Due for a decision in October, said Barsukov, is a cooperative Soviet-French mission called Vesta, named for the brightest known asteroid as seen from earth — and intended to visit it, along with two others. On the way past Venus, two Soviet descent modules would be deployed that would photograph the planet's surface on their way down, thereby progressing from wide-angle views of the terrain (invisible from above the clouds except with radar) to near-surface close-ups. In addition, each descent vehicle would in turn deploy a "kite" with a package of instruments at the end of its long "string," to measure the speed and direction of Venus's winds. The French contribution, according to Barsukov, would be the multi-asteroid flyby — again a mission that has been advocated by numerous U.S. space advisory groups and is in the "core program" recommended as essential by the Solar System Exploration Committee.

Earlier on the evening of Barsukov's talk, Geoffrey Briggs of NASA described the status of forthcoming U.S. planetary missions, such as the Galileo orbiter-and-probe of Jupiter, a Venus Radar Mapper and the Mars Observer. The budgetary climate, however, has troubled many U.S. planetary researchers, even though NASA's proposed budget for fiscal 1986 includes an unusual, though small, boost in funds for planetary research and analysis (see p. 190). Speaking of the increase—the first requested by NASA in that category in four years — Briggs said, "I somehow doubt that that's going to be a major factor this year." — *J. Eberhart*