First of four Soviet craft flies past Mars; second orbits it

In a 20-day span during the summer of 1973, the Soviet Union sent four unmanned space probes in close succession toward the planet Mars. The first two have now arrived.

The first-launched of the series, Mars 4, began its journey last July 21, and last week flew past Mars at an undisclosed distance. Soviet officials have stated that the four probes would variously orbit, land on and fly by the planet (SN: 9/29/73, p. 199). But Mars 4 is believed to have been an intended orbiter that flew by because its retro-rockets fired too briefly to slow the craft down enough to be captured by Mars' gravity. Following the July 25 launch of its companion, Mars 5, the Soviet news agency, Tass, reported that "simultaneous scientific research by the two stations will make it possible to obtain full data about the planet. . . ." Mars 5 successfully went into orbit around Mars last week, suggesting that Mars 4, similar in design, was to have done so also.

If the probes take similar lengths of time for their interplanetary journeys, Mars 6 and 7, launched Aug. 6 and 9 respectively, should reach their destination in the latter part of next week. Tass has said that Mars 6 would "carry out a part of the scientific exploration with the use of equipment of Mars 4 station." This could suggest that plans called for such studies as broad and close examinations of the same area.

Another interpretation, however, is that Mars 4 was intended as an orbiting communications relay for a probe on the surface. This would save considerable weight on the landing craft by allowing it to use a much smaller transmitter. In addition, the relay would enable the surface probe to stay in contact with earth a much larger percentage of the time.

Since Mars 4 and 5 are similar, if not identical, it is possible that Mars 5 could assume the relay duties. But its orbit around the planet is an extremely stretched ellipse, ranging from 1,760 to 32,500 kilometers above the surface, which could mean that ease of communications might vary depending on the surface craft's location relative to the orbiter's point of closest approach.

Mars 6 is not necessarily a lander. Its announced joint research with Mars 4 could have referred, for example, to simultaneous studies from orbit of the day and night sides of the planet. But reading between the lines suggests that such a mission would more likely have been a job for numbers 4 and 5. Furthermore, Roald Sagdeyev, head of Moscow's Space Research Institute, announced after all four probes had been launched that one of them would definitely try to land. The likeliest candidates seem to be the latter pair, which have yet to arrive.

There has been no indication that the landers will be searching for signs of life. Some U.S. observers feel that Soviet instrumentation is not yet up to the task. Sagdeyev did say, however, that the lander is designed to analyze the properties of Martian soil and rock, as well as to study the atmosphere and magnetic and gravitational fields. It is also equipped to take television pictures and transmit them to earth.

Life detection is not the only area in which Soviet space instrumentation seems to be lacking. Recent reports have pointed out the comparatively primitive state of guidance and control equipment aboard the manned Soyuz spacecraft. This also shows up in such basic areas as telemetry, the basic monitoring of critical conditions aboard a spacecraft. The Mars probes appear to be a case in point.

During the ground testing of the Mars probes, in which a computer runs the spacecraft through a simulated flight while engineers monitor them just as though they were in space, a defect showed up in the triggering system that would fire the probe toward Mars from an orbit around the earth. "To be sure," wrote Yuri Markov, one of the test engineers, in Pravda, "if the entrances and exits of each unit were telemetrically monitored, it would not be difficult to detect the defective unit. But the fact is that such telemetric monitoring is an inadmissible luxury for each unit: The lion's share of the channels is devoted to scientific, 'useful' instrumentation, and there is a minimum number of service channels."

In referring to "each unit," Markov cited the spacecraft's digital computer as an example, so he apparently was not simply describing the obvious impossibility of monitoring each individual transitor and microcircuit chip. Instead, the suggestion is that there is a shortage of telemetry to watch over what U.S. engineers would refer to as entire subsystems. This could make it difficult for Soviet spaceflight controllers to analyze on-board malfunctions precisely enough to work around them.

Despite this difficulty, the Soviet Mars 3 probe is the only spacecraft ever to have landed intact on the Martian surface (which it did in 1971), even though it transmitted data only for 20 seconds. In the earliest days of March, Mars 6 and/or Mars 7 may repeat the feat. □

Japanese satellite: Where they wanted it

They've finally done it. After numerous attempts to put a satellite into orbit, followed by four satellites that ended up in orbits hopelessly far from where they were intended to be, Japanese space researchers have at last put one where they want it.

The 124-pound probe was launched Feb. 16 from Japan's Uchinoura site at the southern tip of Kyushu, southernmost of the major Japanese islands. Its initial orbit ranged from 156 to 1,925 miles above the earth, compared with a planned orbit of 151.2 by 2,160 miles.

This is not exactly pinpoint shooting, compared with many U.S. launches, but past Japanese attempts were all wildly off the mark. The most recent shot prior to Saturday's firing, for example, entered a 3,942-by-144-mile orbit, far higher at apogee and lower at perigee than the 1,566-by-424.8-mile orbit that was intended.

The key to the new probe's success was its launching rocket, a three-stage version of the formerly four-stage Mu booster, equipped for the first time with a "thrust vector control system" using bursts of Freon gas to keep the vehicle on course. In addition, jets of hydrogen peroxide controlled the rocket's roll, pitch and yaw.

The satellite was launched by the University of Tokyo's Institute of Space and Aeronautical Sciences, which has accounted for all five of the country's satellites despite the fact that it receives only a tiny fraction of Japan's small space budget. The bulk of the funding goes to the National Space Development Agency, a semi-autonomous government body that is working on a larger booster, in the U.S. Thor-Delta class, capable of putting large, commerical communications and weather satellites in orbit. The agency has yet to try even a test launch, but may do so by 1975 or 1976.

Past Japanese satellites have carried simple instrumentation for basic studies of the upper atmosphere, but their skewed orbits have minimized the usefulness of the resulting data. The success of the thrust vector system should be a major shot in the arm, certainly for science and possibly for the space budget allocations of the University of Tokyo. □