A record-long spacewalk and a leaky space station

Space flight reached a new plateau in dramatic suspense late last week when a leaky rocket motor prompted NASA to put into action round-the-clock emergency preparations for a rescue ship for the three Skylab 2 astronauts. The flurry was short-lived—only to be followed by a short in the solar telescope, a leak in the cooling system, broken equipment and some frustrating moments this week during a record-breaking spacewalk of six and one-half hours.

"I have the feeling that someone doesn't like us," sighed flight director Charles R. Lewis early this week. "We have had a major problem every night. It can't be real, but it's happening."

Meanwhile, the spider Arabella, oblivious to all the fuss, spun her web—a hopeful omen that life in the space laboratory would soon settle down to a more normal routine.

The spacewalk, which had been postponed for a week due to various problems, was the longest ever. Astronauts Owen Garriott and Jack Lousma were outside the laboratory for more than four orbits of earth, traveling 17,100 miles per hour. They worked for most of that period—four hours—to unfurl a new 22-by-24-foot sun shield framed by two 55-foot poles. They solved one problem after another, always a jump ahead of astronauts on the ground working the same problem. After one such difficulty with a twisted pole, Garriott announced he had finally solved the problem. "You beat us to it again," replied Story Musgrave, capsule communicator, as he was preparing to read up a solution. "How did you solve it?" Garriott asked. After the explanation, Garriott said, "That's just how we solved it, congratulations."

To erect the shield, Lousma and Garriott had to assemble 22 five-foot poles to form a V-shaped frame or mast. The shield was then pulled up by ropes, as a sailor hoists a sail. The new shield covered most of the parasol deployed by the Skylab 1 crew. Temperatures inside the space station began to drop immediately.

During the spacewalk, the two men also looked for physical signs of two leaks that had caused much worry earlier. They also checked a distribution box on the solar telescope mount to see if an apparent short had burned through the box. They saw nothing unusual.

The most serious of Skylab's recent problems was an oxidizer leak in one of the three remaining attitude-control engines on the outside of the command module. The command module returns the astronauts to earth. Mission rules require that at least three thrusters be working. (The fourth thruster had already sprung an oxidizer leak prior to docking last week.)

The crew had been jolted from their sleep by an alarm and looked out the bathroom window to see a scene of sparkling crystals—"like a snow storm." They shut off the valves to isolate the leak and waited for eight hours for word about what would happen next. With only two dependable thrusters working, the first thought in mission control was to bring the astronauts back to earth the next day before any more leaks developed. Since both engines were leaking the same thing—nitrogen tetroxide—space officials feared the oxidizer itself might be contaminated. This would mean that all the propulsion systems on the command and service modules could be affected. After testing samples of the oxidizer at Cape Kennedy, however, engineers found nothing. "We feel fairly confident that we've got two quad rocket systems for attitude control, should we have a problem with anything else that would result in an immediate need for reentry," Christopher Kraft, director of the Johnson Space Center, told a then-jubilant crew. "Just to be prudent," he added, "we have started preparation of a vehicle at the Cape . . . so we would have a rescue vehicle . . . should that become necessary."

Does Titan have a neon and argon atmosphere?

Titan, Saturn's largest satellite, appears to be warmer than a simple equilibrium of solar heat absorbed and solar heat reradiated would account for. Carl Sagan and others have therefore suggested the existence of a heat-trapping greenhouse effect in Titan's atmosphere (SN: 1/13/73, p. 23).

The suggestion faces an immediate difficulty since the amount of hydrogen observed in the satellite's atmosphere is insufficient to trap the necessary amount of infrared radiation. It is possible that other gases present in the atmosphere could enhance the opacity of the hydrogen, and a number of candidates have been put forward including methane, the only other gas known to be in the Titan atmosphere, and nitrogen. In the Aug. 3 NATURE Robert Cess and Tobias Owen of the State University of New York at Stony Brook suggest instead the noble gases neon and argon.

The idea is attractive whether the atmosphere of Titan is original, that is, captured from the solar nebula at the time of the satellite's formation, or whether the atmosphere was produced by outgassing from the body of the satellite.

In an original atmosphere substantial amounts of neon should be present since neon has a relatively high cosmic abundance. If the original methane were gradually dissociated by the action of sunlight, neon could come to dominate the atmosphere. In an outgassed atmosphere both argon and neon should be present. Again, if most of the outgassed methane were destroyed by photodissociation, the neon-argon mixture could come to dominate.

Cess and Owen tried to determine whether in either a hydrogen-neon mixture or a hydrogen-neon-argon mixture the infrared opacity would be enhanced enough to account for the observed temperatures of Titan. Their computations indicate that the hydrogen-neon mixture seems more desirable. Conclude Cess and Owen: "The fact that a large amount of neon should be present if the atmosphere is a relic of the solar nebula is an especially attractive feature of these models, because it is hard to justify appropriate abundances of other enhancing agents." For the moment the case remains entirely theoretical; there is no way to measure the presence of the noble gases on Titan.