

## 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.

The rescue ship would be equipped with five seats—two for the rescue astronauts and three for the stranded Skylab 2 astronauts.

This traumatic exercise was followed by another problem—again a leak, but this time in the system that cools all the electronic gear on Skylab. At the current leakage rate, the system will last for 18 to 25 days at which time the secondary cooling system will be activated. Another problem—a short in the solar telescope array—knocked out one of two television systems used by the astronauts.

The crew had a short respite from their problems Sunday when they participated in one of the biggest fishing expeditions in recent times. They turned the Skylab earth resources cameras on the Gulf of Mexico and 131 fishing vessels. The goal of the project, sponsored by the National Oceanic and Atmospheric Administration (NOAA), is to see if the good fishing areas can be identified from space or high altitudes by use of a variety of remote sensing equipment.

To the delight of the astronauts, Arabella, the space spider, seemed to be functioning normally. Arabella's first attempt to "do her thing" had resulted in an inefficient web. "She's got a very unusual web spun around all four corners of the box, with some stringers even from corner to corner," Garriott reported. "She had to do a lot of improvising, but she got her net out anyway and she is currently standing by waiting for some prey to float by."

On her next try, she did better. "She's a very fast learner indeed," Garriott said of Arabella's rapid adaptation to weightlessness. She had spun a web radial to all sides of the box, converging on the center "just like you would find on the ground." □

## A cavalcade to Mars: Mars 6 joins the train

In 16 days, the Soviet Union has launched three spacecraft to Mars. The latest in the cavalcade is Mars 6, lofted this week. The new spacecraft is carrying a joint French-Soviet experiment designed for the study of radio and cosmic-ray emissions from the sun as well as solar plasma.

Tass says Mars 6 differs in its design from Mars 4 and 5 (SN: 8/4/73, p. 69). "It is envisaged that Mars 6 can carry out a part of the scientific exploration with the use of equipment of Mars 4 station." No one knows for sure what this means, but one speculation is that Mars 6 may land on the Martian surface while Mars 4 and maybe also Mars 5 orbit the planet. No other details have been given. Mars 6 will reach Mars in early March. □

## Tracks of the Pterosaur: Probable oldest evidence

Fossil footprints called probably the world's oldest evidence of Pterosaurs—ancient flying reptiles—have been found in a slab of sandstone in the scenic desert country of southeastern Utah.

William Lee Stokes, a University of Utah geologist and paleontologist, says the footprints "are probably the oldest evidences of Pterosaurs in the world." He estimates them to be between 150 million and 200 million years old. The general absence of fossils in Navajo Sandstone, the formation bearing the Pterosaur prints, makes the prints difficult to date more accurately. The formation lies well below the quarry at the Dinosaur National Monument and therefore is considerably older.

"Skeletons from England are almost this old," says Stokes. "But the exact relative dating cannot be sure. In any event they are among the oldest in the world and certainly the oldest traces known in North America." In 1952, Stokes made the only other known discovery of Pterosaur prints, in Arizona. He has verified the new findings in conjunction with several other scientists, including Samuel P. Welles, a University of California paleontologist.

The prints were discovered by Lin Ottinger, a Moab, Utah, backcountry guide and rock shop owner. There are two sites. One is a few miles northeast of Moab. There the tracks are better preserved than at the second site, near the conjunction of the Dolores and Colorado Rivers. The exact location of the sites is being kept secret to protect

*Ottinger and Stokes  
with some of the  
Pterosaur tracks. Closeup  
(below) of several inch-  
and-a-half-long prints.  
University of Utah*



## TO OUR READERS

The Aug. 18 SCIENCE NEWS will be combined with the Aug. 25 issue to make a double-sized issue that will include a special report on research in astronomy. It will be mailed on Aug. 24.

—The Editor

them from possible vandalism until funds can be raised to transport the huge sandstone slabs to the University of Utah campus for study and preservation.

Welles describes the tracks as "highly irregular," and says they should provide valuable information about the actions of the reptiles on the ground.

Pterosaurs ranged from the size of sparrows to giants with wingspans of 30 feet. They ate insects and fish. Their leathery wings were used primarily for gliding, paleontologists believe.

Flying reptiles became extinct about 135 million years ago, apparently losing out to birds in the competition for food.

The great number of tracks at the newly discovered sites indicates that Pterosaurs may have abounded in the area, says Stokes. The Moab prints are not confined to the flying reptiles. About 10 different animals are represented. The paleontologists are puzzled by the multitude of fossil tracks in a sandstone formation which, as widespread as it is in Utah, has yielded few fossils in the past. "They do suggest that here and there were well-watered spots like modern-day oases . . . where communities of plants and animals could take up temporary existence," concludes Stokes. □

