

Gathered from briefings on the upcoming Apollo 14 mission

SAFETY

Buddy life-support systems

If all goes well, Alan B. Shepard, commander of Apollo 14, and Edgar D. Mitchell, the lunar module pilot, will land near the moon's Fra Mauro crater the morning of Feb. 5. During their thirty-three and one-half hours on the surface, they will spend up to 10 hours outside the LM home. They will walk more than 2.5 miles.

Each astronaut has a life-support system to supply him with breathing and suit-pressurizing oxygen and water for the liquid-cooled garment. For added safety, the secondary system has been improved for the Apollo 14 mission.

Should the primary system fail, emergency oxygen would be supplied by a small tank atop the suit. Before the secondary system was changed, the emergency tank was required to furnish not only suit pressure and breathing oxygen, but also cooling through a high oxygen flow rate.

The new system, called the Buddy System, adds a pair of 8.5-foot-long hoses that feed cooling water from one astronaut's backpack system to the space suit worn by the other. The hoses will be carried during the second traverse outside the lunar module when the men will walk over a mile to Cone crater. The new system stretches the emergency oxygen time from 40 to 75 minutes.

LUNAR SCIENCE

An area of antiquity

The Fra Mauro region of the moon, the target for Apollo 13 and now for Apollo 14 (SN: 4/4, p. 353), is of great interest geochemically and geophysically to lunar scientists. The hilly region is believed to be formed in part by debris that may be from as deep as 100 miles below the surface, scattered when Mare Imbrium was created early in the moon's history.

The debris forming the ridges extending out from the Imbrium basin has since been pocked with many smaller impact craters. Cone crater is one, about one mile from the intended landing site. Samples and rocks the astronauts hope to bring back from around the rim and the base of the crater could be very old material—some speculate as old as 4.5 billion years.

Astronaut Edgar D. Mitchell will deploy an active seismic experiment. While the men are on the moon they will set off 21 small explosions and arm a mortar that will launch four grenades after they leave. Measurements of the resulting vibrations of the moon, radioed back to earth, will give scientists new information on the shape, structure and thickness of the lunar crust in this hilly area.

ENGINEERING

Zero-gravity experiments

The unique condition of zero gravity in space can be used for certain manufacturing and materials processes. Although large-scale operations will not be feasible

until space stations become available, the Apollo 14 astronauts will activate four simple experiments on their return trip to earth. These are to help establish guidelines for later design requirements.

One experiment involves electrophoresis, in which suspended particles move through a fluid under the action of an electromotive force. Weightlessness alleviates the problems of sedimentation and sample mixing by convection, resulting in a pure sample. Mixtures of red and blue organic dyes, human hemoglobin and DNA from salmon sperm will be used.

Another demonstration will include four tests on heat transfer in weightless liquids and gases, with samples of pure water, sugar solution, carbon dioxide gas and oil containing a suspension of fine aluminum flakes.

The third test will show the benefits of using tank baffling in the storage and transfer of liquids in zero gravity. (A baffling is a device to regulate flow.) Two sets of simulated tanks will be used: one with the baffling and one without.

The fourth test will demonstrate the effect of zero gravity on the preparation of cast metals, fiber-strengthened materials and single crystals. These test specimens will be processed in a small heating chamber in flight for examination after return to earth.

MOON CART

Wheeled worktable

A two-wheeled lunar cart, called in space language the Mobile Equipment Transporter (SN: 5/16, p. 478), will make its moon debut on Apollo 14 next month.

The 20-pound aluminum MET is capable of carrying 70 pounds of equipment in addition to selected lunar rocks and samples. It will be used to tote cameras, films, soil and rock sample bags, core tubes, special sample pouches, scoops, trenching tools and hammer and tongs during the two geological traverses. The cart will also carry two experiments, an active seismometer and a portable magnetometer, and serve as a worktable.

The rickshaw itself will be a predecessor to the lunar rover, a powered vehicle to be used on Apollo 15 next summer (SN: 9/12, p. 215).

RENDEZVOUS

Only one lunar orbit

Among the changes made in the Apollo 14 schedule to insure crew safety are some to get the crew back to earth earlier. One is a tricky rendezvous maneuver during the first lunar revolution.

This maneuver involves docking the lunar module Antares with the command module Kitty Hawk about halfway through the first revolution after lift-off from the moon. In previous Apollo flights, rendezvous and docking have occurred in a two- or three-step fashion after one-and-a-half revolutions of the lunar module. The single-revolution maneuver takes more delicate timing and navigation ability, but it would save about two hours in getting Command Module Pilot Stuart A. Roosa reunited with Mitchell and Shepard. If for some reason the crews are unable to complete the maneuver, there are alternatives.