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... THE MANNED SPACE FLIGHT NETWORK

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GODDARD SPACE FLIGHT CENTER

0-GRAVITY DEMONSTRATIONS MAY BE SHOWN ON LIVE TV

Four inflight demonstrations of equipment and processes designed to illustrate the use of the unique condition of zero-gravity in space will be flown on the Apollo 14 lunar-landing mission this month, and may be shown on live television from the spacecraft on the return flight from the Moon.

Each demonstration is stowed in the Apollo 14 command module. The tests are planned during the relatively inactive return to Earth phase of the mission and are to be performed at the option of the crew. Data will be obtained by crew observations and photography during the mission and laboratory tests following the mission. The four technical demonstrations planned for Apollo 14 are:

Electrophoretic Separation - Most organic molecules pick up small electric charges when they are placed in slightly acid or alkaline water solution and will move through such a solution if an electric field is applied to it; this effect is known as electrophoresis. Since different molecules move at different speeds, the faster molecules in a mixture that starts moving from one end of a tube of solution will outrun the slower ones as they move toward the other end.

This characteristic of electrophoresis can be exploited to prepare pure organic materials for applications in medicine and biological research if problems due to sample sedimentation and sample mixing by convection can be overcome.

The electrophoretic separation demonstration is designed to test an engineering approach to performing the separation process in space, where the weightlessness of the solutions and sample mixtures should suppress both convection and sedimentation. A small, especially designed electrophoretic

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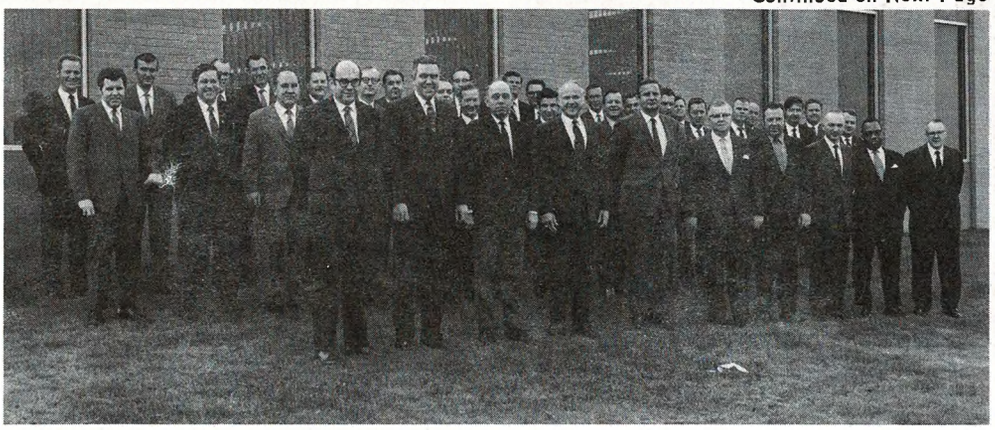
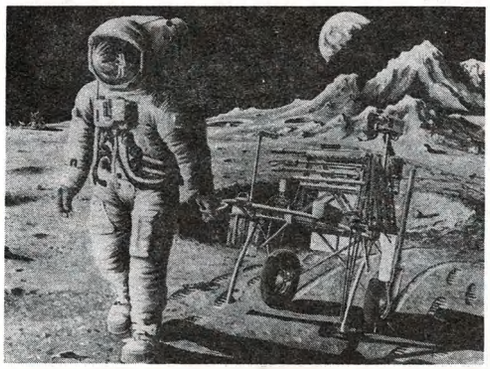


MSFN M&O Supervisors held their annual conference at Columbia, Md. (see story on page 2).

MET To Be Used By Apollo 14 Astronauts

Astronauts Alan Shepard and Edgar Mitchell will be using the Modular Equipment Transporter (MET) for the first time on the lunar surface. The MET has been nicknamed the "Rickshaw" because of its appearance and method of propulsion. It will be of great value during EVA-1 and -2, and will be capable of serving as a portable workbench with a place for a great deal of equipment. The MET will carry lunar handtools, three cameras, two sample container bags, a Special Environmental Sample Container, spare film, and a surface penetrometer.



The "Rickshaw"

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BSLSS WILL BE TRIED ON EVA-2

A Buddy Secondary Life Support System (BSLSS) will be used for the first time during the Apollo 14 EVA's. The name and idea have been drawn from a standard emergency procedure used by

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Commander Alan Shepard Fulfills Ten-Year Goal

In May 1969, following the correction of an inner ear disorder, Alan Shepard Jr. was restored to full flight status as an astronaut in America's space program. He holds the distinction of being the first American to journey into space, and was one of the Mercury astronauts picked in April 1959 (photo page 2).

On May 5, 1961, in the Freedom 7 spacecraft, Shepard was launched by a Redstone vehicle on a ballistic trajectory suborbital flight - a flight which carried him to an altitude of 116 statute miles and to a landing point 302 statute miles down the Atlantic Missile Range.

By being restored to full flight status, Shepard has fulfilled his goal to return to the program as an astronaut.

APOLLO 14 S-II-9 MODIFIED

An "accumulator" device designed to suppress oscillation buildup during flight has been installed on the second stage of the Apollo 14 launch vehicle at Kennedy Space Center.

Space agency officials made the decision to modify the liquid oxygen feed system after unusually high oscillations - sometimes called the "Pogo" effect - were recorded during the Apollo 13 flight. Technicians have placed the accumulator in the liquid oxygen line of the center engine of the Saturn V's second (S-II-9) stage.

The accumulator is a compartment or cavity located in the liquid oxygen line feeding the center engine. The compartment is filled with helium gas which acts as a cushion to the pressures of the fluid flowing through the line.

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APOLLO 14 S-II-9 MODIFIED

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This dampening effect will cause that column of fluid to oscillate at a frequency different from that of the thrust structure and engines, and will in effect "de-couple" the propulsion system from the structural system.

The J-2 engine propellant utilization valve in the S-II stage has been redesigned. The valve controls the propellant mixture ratio to the engine to provide high thrust when it is needed during the early burn period with higher stage weight, and lower thrust for more efficient operation during the later burn period. The redesigned, pneumatically actuated valve replaces a motor driven valve and by-passes considerable onboard stage electronic circuitry. Its actuation command now comes directly from the vehicle instrument unit. The change was made to simplify the propellant utilization system and to enhance the stage's reliability.

Commander Alan Shepard Jr. with LM Pilot Edgar Mitchell and CM Pilot Stuart Roosa.

MET To Be Used

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The MET was built at MSC and is a rubber-tired, aluminum equipment cart; it weighs about 90 pounds (fully loaded) on earth. On the moon, approximately 1 pound of tractive effort will be required to move the MET; it is expected that the astronauts will be able to use it on slopes as steep as 20 degrees.

Apart from its practical value, the MET will also provide valuable data on how wheeled vehicles perform on the rough surface of the moon, and may have some influence on the final design of the self-powered lunar rover being developed for the Apollo 15 mission.

Conference

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The MSFN M&O Supervisors held a busy annual conference in the Bendix Field Engineering Headquarters at Columbia, Md. during the week of Nov 30 - Dec 4.

Highlights of the week included: an address by BFEC's President E. Grogan Shelor and other chief Bendix managers, a tour of Columbia, a topic presentation program, a presentation and discussion of selected subjects by each M&O supervisor, a management seminar, a tour of MSFN facilities at GSFC, and a speaking program made up of key NASA personnel.

The M&O supervisors who attended were: Lynch Berry, MIL; George Cantrell, CYI; John Clouse, ASC, Jim Farrell, GBM; John Gale, NTTF; Dave Ginavan, CYM; Ted Helm, MIL; Keith Hill, BDA; Don Stewart, GDS; Bell Way, (Assistant M&O) BDA; Tom White, GWM; and Jack Zaratzian, MAD.

BSLSS

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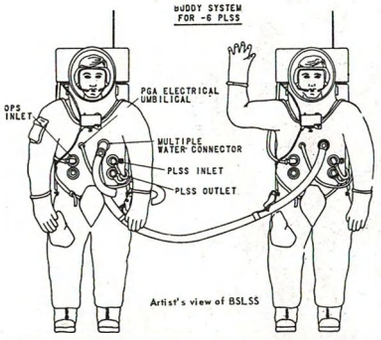
scuba divers: share the air remaining in a good tank by passing the mouthpiece back and forth.



The buddy system approach has been adapted to moonwalks through the use of connecting hoses that feed cooling water from an astronaut's backpack Portable Life Support System (PLSS) to the spacesuit worn by his companion. If the cooling system of one of the backpacks fails, the connections would give the men enough time to return to the LM. The connecting hoses will be used during the second EVA and carried on the modular equipment transporter.

"On the lunar surface," Apollo 14 LM Pilot Edgar D. Mitchell explained recently, "one of the greatest problems of working is the dissipation of metabolic heat that you build up. You don't want to build it up and store it in the body; the BSLSS allows us to tie these two cooling systems together and get a greater distance from the LM than we could without it. Without the buddy system, we will have to use oxygen for cooling as well as breathing -- and that's a rather inefficient way of doing it."

DEMONSTRATION

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separation apparatus will be tested; the quality of the separations obtained will be demonstrated by trials with three sample mixtures having widely different molecular weights: a mixture of red and blue organic dyes; human hemoglobin; and, DNA (the molecules that carry the genetic code) from salmon sperm.

If successful, the demonstration will show that a more refined apparatus could be developed to prepare samples of materials on future space missions for use in medical and biological research on the ground.

Heat Flow and Connection - This demonstration is designed to perform four tests on heat transfer in weightless liquids and gases. In three of the tests, temperatures around electric heaters which will be immersed in samples of pure water, a sugar solution, and carbon dioxide gas will be mapped out by color changes produced in "liquid crystal" temperature indicators. The fourth test will observe the fluid flow induced by heating a sample of oil containing a suspension of fine aluminum flakes.

The results which will be observed and photographed by the astronauts will characterize the effects of convection and other modes of heat transfer in fluids during space flight. This information will be of value in designing future space experiments and assessing the feasibility of many processes that have been proposed for manufacturing products in space.

Liquid Transfer - This technical demonstration is designed to show the benefits of using tank baffling in the storage and transfer of liquids in zero-gravity. The tests will be conducted with two sets of simulated tanks, one set containing tank baffling and the other without any baffling. By observing and photographing the transfer of liquids in the two sets of tanks, a comparison can be made to determine the benefits obtained from the use of baffles in zero-gravity. The advantages of tanks with baffles can be important in the design of future space refueling systems.

Composite Casting - This technical demonstration is designed to 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 and testing upon return to Earth.

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