SPACE

# Are Any Astronauts Experienced?

by Jonathan Eberhart

Thanks to special handrails, tethers, sticky handgrips and gold-plated footholds, Gemini 12 astronaut Edwin Aldrin came up with a successful spacewalk and the Gemini program was able to go out in a blaze of glory

His 5½ hours of spacewalks and space stands last week almost doubled the total time of astronauts exposed to space.

Yet his experience may have been all too short. According to a former Mercury consultant, in fact, all 16 Gemini astronauts would have made better candidates for moon landings if they had been fewer in number and longer on space experience.

"Astronauts can relay their experiences to each other, but that cannot substitute for the actual experience," said Dr. Lawrence Lamb, a pioneering space cardiologist now at Baylor University College of Medicine, Houston.

Dr. Lamb's analysis is in direct contrast to the official National Aeronautics and Space Administration policy.

Astronaut Edwin (Buzz) Aldrin's first space stand was all the practice he needed for his subsequent spacewalk, says a NASA manned spaceflight official who declined to be named.

"The next time he stood up," said the official, "he was an experienced astronaut."

Dr. Lamb, whom the NASA manned space flight official calls a "first rate cardiologist," disagrees.

"It's like going off a diving board," he said. The first time it is difficult, but experience makes it easier and makes the diver better.

No astronaut has been in space more than twice. Only the pilots of Geminis 9, 10, 11 and 12 (Thomas Stafford, John Young, Charles Conrad and James Lovell) had previously been in space aboard Gemini spacecraft. Three others (Virgil "Gus' Grissom, Gordon Cooper and Walter Schirra) had one Mercury flight each.

The number of three-man Apollo practice flights leading up to the moon landing has not been decided yet, but NASA has declared that "a minimum of nine astronauts will take part in the first three."

There has been some recent crew and schedule shuffling in the Apollo office, but of the six men now in the prime and backup crews of the first manned flight, three have had no space experience whatsoever. The two pilots (Grissom and Schirra) will be the first men to face a third stint in space, but both date from Mercury days and Schirra, at 43, is the oldest astronaut in service. The sixth man, Edward White, has 66 orbits and a 21-minute spacewalk from Gemini 4.

"Of course, there are trade-offs," says NASA. This means that instead of a few astronauts with many space flights behind them, NASA would rather have as many crewmen available as possible, even if only with limited experience.

Some of the Soviet Union's experience tends to support NASA's preference.

Aerospace physicians around the world were "very concerned" when the second Soviet cosmonaut, Gherman Titov, showed strong symptoms of disorientation and loss of balance, said Dr. William Helvey, manager of biotechlology for Lockheed Missiles and Space Co. As a result, later cosmonauts were selected with particular attention paid to vestibular problems related to balance.

The long lapse since the last Soviet manned cosmonaut went into space may indicate that the Russian manned space program was slowed down by biomedical problems related to "the Titov lesson," said Dr. Helvey. Yet there have been enough U.S. astronauts in the Mercury and Gemini programs to indicate that Titov's problems probably were not general ones.

Indications are that disorientation in space is an easy thing for trained pilots to get used to, Dr. Helvey added, but it does definitely improve with experience.

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# Lunar Facts Still Scant

Three rangers, a Surveyor and two Orbiters have all been sent from the U.S. in 27 months to peer at the moon. But the theories still fly thick and fast (see SN, 11/12/66, p. 420). Each new photo or piece of data is cited by several scientists as "proving" their opposing theories.

Has nothing actually been learned? Yes, says NASA lunar specialist Dr. John O'Keefe. In fact, a great deal.

In the first place, though it has long been known that the moon is porous, it took the pictures from Surveyor 1 to show that it was granular, rather than pumice-like. It is "a network of space with grains in it, rather than a network of rock with space in it," Dr. O'Keefe said.

Volcanic activity was also found to have played an early part in the life of the moon. This was faintly indicated by the Ranger 7 and Ranger 8 photos, but on Ranger 9 it "came through loud and clear." Further information from Lunar Orbiter 1 helped prove that this was true for a "major portion" of the moon's surface and was not just a spot occurrence.

A particular joy was the discovery, courtesy of Surveyor, that the bearing strength of the surface was about five pounds per square inch, reassuring proof that astronauts landing there will not fall through. "We couldn't have had it better," said Dr. O'Keefe happily. "It was just about the softness you would have chosen if you'd had your 'druthers'—about like a pole-vault pit."

Other information from the U.S. space armada was less clear-cut—depending upon whose side you are on.

"I would say that Lunar Orbiter definitely strengthened the case for acid volcanism," declared Dr. O'Keefe; "but," he added resignedly, "that's very controversial." A number of scientists are on his side, but there is opposition including, among others, Nobel Prize-winner Dr. Harold Urey.

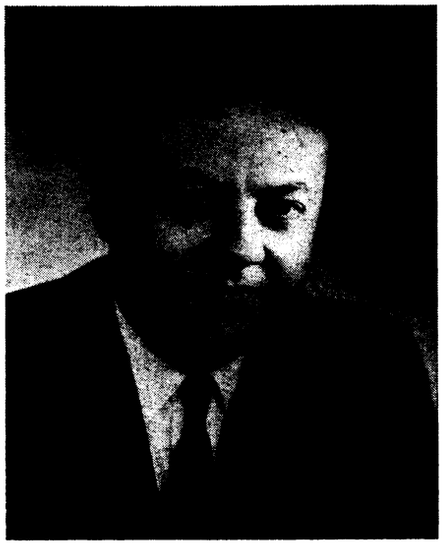
Acid volcanism essentially means a volcano-less volcano. "Most poeple think that a volcano is a nice little mountain with a hole in the top," Dr. O'Keefe said. Acid volcanism has no mountain at all, just a hot, very thick liquid oozing through a crack in the ground, often piling up to form huge domes before it hardens.

Another idea somewhat damaged by Lunar Orbiter was that the lunar surface was "spongy." "Poor Tom Gold's idea" was practically disposed of, said Dr. O'Keefe, referring to the noted Cornell expert who has theorized that the moon is covered with a thick layer of dust loosely formed into airy "fairy castles." However, Dr. Gold has since conceded that the dust is probably packed down by now anyway.

In looking over the 30,000-odd photos from the various spacecraft, a number of scientists have shown "a tendency to see lunar ash flows" in the maria, or seas, Dr. O'Keefe said. But the maria seem too flat for that. What the pictures may actually show, he says, is "fluidized dust," a peculiar phenomenon in which dust is floated around and leveled out by gases escaping from cooling volcanic rock beneath. Though the moon dust has long since settled, its ripples and movements when heated would have appeared almost fluid-like (see Lunar: What's to Come, p. 444).

TECHNOLOGY

# Inventors Win an Ally



J. H. Hollomon

Inventors, often popularly thought of as crack-pots working in home-made laboratories, actually make up a vital part of the country's expanding technology. Now they have a new champion in the government.

The research chief of the Department of Commerce says that while the process of research and development is very nice, it can take 10 or 20 years for one company's good idea to spread out to all the others.

Inventors, he says, not researchers, are the thing.

"There are 300 companies doing 90 percent of the research and development in the U.S. . . . they do not have 90 percent of the new ideas," said Dr. J. Herbert Hollomon, Assistant Secretary of Commerce for Science and Technology.

Though the country spends more on R & D each year than the entire cost of the U.S. moon program, Dr. Hollomon noted that R & D "do not create anything in themselves, or solve any problems." Those, he said, are the jobs of invention: "putting what is already known to work."

### Project Hindsight

He cited a Government study called Project Hindsight, which revealed that 95 percent of recent technical advances studied came from scientific ideas that were already known before World War II. The useful results came not from basic research, which for years has been touted by the government almost as an end in itself, but from invention inspired by necessity, he said.

"There's so much to-do about how much research we're doing, how much science we're doing, but these other things are important too," he said.

England and Japan represent the two opposite extremes of technological adaptability, Dr. Hollomon said. England is so bogged down and conservative that it often takes years for a new development to enter common use; Japan, however, is so attuned to new scientific techniques and ideas that it was able to launch itself into full-scale exploitation of the transistor faster than many companies in the U.S.

Two special panels of the Department of Commerce have been studying Federal laws related to invention, as well as ways to improve the "national climate for innovation." Reports are expected soon.

The National Bureau of Standards, to which Hollomon is turning to accomplish his purposes, was officially installed in new quarters last week.

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# Lunar (see p. 441)

WHAT'S TO COME?

A lot has been proven, and much more has been indicated, by the many spacecraft that have been sent to the moon. But there are at least three Lunar Orbiters and seven Surveyors left, each with a contribution to make.

One important experiment, beginning with Surveyor 5, will measure the angles at which alpha particles projected in a stream from the spacecraft bounce back from atomic nucleii on the lunar surface. These angles should indicate whether moon dust is acid, basic or neutral. From that one tidbit, scientists hope to deduce all kinds of things about the moon.

But the biggest prize of all will be the actual samples brought back by Apollo astronauts. Simple analyses should then reveal the age of the moon, what it is made of, and whether it came from the earth.

When the samples arrive, scientists around the world will be champing at the bit. A NASA-appointed committee has already made most of the decisions about which lunar laboratories will get how much of the available material.

Some lunar samples called chondritic meteorites, or chondrites, however, may already be on earth. Current opposing theories are that they may come either from the moon or from the asteroid belt that lies between the orbits of Mars and Jupiter. All it will take is a simple comparison. If the moon samples match the chondrites, "people will probably just throw the asteroid belt into the wastebasket," said NASA's Dr. John O'Keefe. Though of unknown origin, chondrites are presently almost worth their weight in gold —they're worth $30 an ounce.

ROCKETRY

# 'Coon Gun' Launcher Saves Fuel

An 80-foot-tall tube that looks like "a big ol' coon gun" two and a half feet across has been used to test rockets that eject themselves into the air automatically before switching to full power.

Hidden among the rocky crags of southern California, the Jules-Vernian launcher is only the little brother of a monster tube—10 feet in diameter—for rockets weighing more than 300,000 pounds.

Rockets fired from the big tube for testing are literally "tied to the ground" as they fly by an inch-thick nylon cord, one third of a mile long, fastened at the other end to a huge dead weight tractor. "The biggest we could find," said an official of Lockheed Propulsion Co., the technique's developer.

This bizarre tie-down system, designed for easy retrieval, was first tried in 1959, when Minuteman missiles were being test-launched from their underground silos (see cover). The recent test flights only travelled about 400 feet up and 400 feet horizontally before being snapped abruptly downwards by the cord.

Only a small amount of propellant is used in the tests—just enough to demonstrate the launch technique for the Air Force, which is supporting the development program to the tune of $775,000.

The launch tube was mounted above the ground over an engine test stand that has in the past been used to fire engines producing up to 3,000,000 pounds of thrust, almost half that of the Saturn V moon rocket.

Each test rocket was designed to burn at low pressure when first ignited, causing just enough gas pressure inside the tube to push the projectile up along a series of Teflon-coated rails lining the tube. Once out in the open, the engines automatically began developing full thrust.

The advantage of such a technique, according to Lockheed, is that by conserving its fuel during launch, the rocket has enough left to handle a bigger payload or travel farther than a conventionally-launched rocket of the same size and fuel capacity.

Since 1960, when the Minuteman tests ended, the technique has been little used, largely because it is most useful only for tube- or silo-launched rockets. A prime candidate would have been the Titan, except that it was simply too big.