SPACE

# Strange Air in Space

➤ SOME PEOPLE just don't care what they breathe—and if they happen to be astronauts, it is a good thing they feel that way.

Earth's normal atmosphere is about 20% oxygen and 80% nitrogen. But two volunteers at Brooks Air Force Base, Texas, recently spent five days breathing the two gases in a 50-50 mixture.

Yet even stranger things are in the air. A second group of four men, also at Brooks AFB, emerged from a month-long stay in a sealed "space cabin," where they lived in an atmosphere that was more than half helium. In addition, pressure was reduced to equal a simulated altitude of 18,000 feet.

Both groups of subjects ate exactly measured liquid diets, while Air Force doctors counted calories as carefully as the most avid health faddist.

The helium chamber was kept at a slightly higher temperature than the nitrogen one, since helium is a more efficient conductor of heat. Rest-work cycles were designed to duplicate approximately the conditions on board a manned space vehicle.

Neither group apparently showed any ill effects. However, it will take some time before the masses of data on blood pressure, circulation, metabolism and brain activity can be analyzed.

Both studies will continue this year with test periods lasting as long as 60 days.

The experiments are part of continuing studies to help Air Force scientists plan for manned space flights. The National Aeronautics and Space Administration is doing similar research for its Gemini and Apollo programs.

The most immediate USAF manned space project is the Manned Orbital Laboratory (MOL), scheduled for some time between 1967 and 1969. In the MOL two men will spend 30 days in orbit around the earth, studying both outer space and each other's reactions to it.

Before MOL, however, comes NASA's Gemini, whose three-orbit first flight is due early this year. Future Gemini flights, lasting up to two weeks, are just practice for Apollo, which will actually take men to the moon.

In space vehicles, low atmospheric pressure is vitally important. With the vacuum of space on the outside, normal pressure of 14.7 pounds per square inch would require heavy, reinforced structural members.

Space suits, in which freedom of movement is critical, are particularly susceptible to pressure differential. Therefore, suit pressure in the Mercury capsules was kept at one-third normal, or about five p.s.i. The Gemini and Apollo spacecraft will also have five pounds of suit pressure, but if a leak should develop in the cabin, the suits will automatically depressurize themselves to 3.5 p.s.i.

The most noticeable effect of breathing large amounts of helium (of which the atmosphere has only 0.1 percent) is that the voice goes up in pitch about seven-tenths of an octave. The condition is quite tolerable, however, and not permanent.

This occurs because helium molecules vibrate faster than normal air in response to human speech mechanisms, making the voice higher.

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# Apollo Passes Test

➤ A DEVICE designed to ensure that U.S. astronauts do not lose their lives at launching has passed a major test.

It is a 33-foot tower full of engines and parachutes called the launch escape system, which will be perched on the very top of the huge Saturn-Apollo moon vehicle when it blasts off from Cape Kennedy around 1970. The tower's job is to blast the Apollo capsule with the three astronauts away from the rest of the "package," in case the rocket goes off course or needs to be destroyed for some other reason.

For the unmanned test, however, the escape system was mounted on a Little Joe II rocket, together with lifesize boilerplate models of the Apollo command and service modules, launched from White Sands Missile Range, N.M. The system has been tested before, but this time the simulated abort, or failure, took place at the altitude where Apollo gets its worst buffeting from the atmosphere, about 31,000 feet above White Sands, which is 4,532 feet above sea level.

About 37 seconds after liftoff, a radio signal from the ground caused the command module, where the crew would ride in a manned flight, and the escape tower to separate from the rest of the package. At the same time, a small solid-fuel rocket tilted the tower over at an angle, and four rockets in the nose of the tower propelled tower and capsule up and away from the Little Joe booster. The escape system climbed to about 46,000 feet above the range before starting to fall.

At about 21,000 feet, the tower, the heat shield and a special cover that protected Apollo during launch were jettisoned.

Two seconds later a pair of drogue, or guide, parachutes were released from the capsule. These remained closed for six seconds, then opened to slow the descent until, at 8,000 feet, the main parachute opened to bring the package safely to the ground.

If everything about the actual moon shot goes as scheduled, the launch escape system will never be needed. In that case, the tower will blast itself away from the rest of Apollo, and will land in the ocean off Cape Kennedy.

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# Atlas-Centaur Redeems Itself—Somewhat

➤ ATLAS-CENTAUR, the most troublesome rocket in America's space fleet, redeemed itself to a large extent Dec. 11 by orbiting a 2,100-pound test model of the Surveyor moon-exploring spacecraft, although Centaur, always the culprit in past attempts, still refused to cooperate.

If the AC-4 had actually been going to the moon, a NASA official said, the mission would have been successful. However, difficulties with Centaur's control system caused the second-stage rocket to start tumbling in space, making it unable to restart its engines as scheduled.

The restart, attempted for the first time on this flight, is not necessary to get Surveyor to the moon.

Surveyor spacecraft will serve as robot explorers, providing television pictures and other information about possible landing sites for Apollo astronauts.

Centaur has been in the rather unenviable position of having to both prove itself for the Surveyor mission and "clear its name" from trouble-filled early years. The AC-1 caused a Congressional investigation when it exploded 56 seconds after launching, following 16 months of delays and three blow-ups on the test stand.

Prime contractor General Dynamics made good on the AC-2, which went smoothly into orbit after a 24-hour delay.

However, AC-3 showed the old form when it accumulated almost three months of delays before failing to go into orbit on June 30th, 1964, due to a faulty hydraulic pump in the Centaur (second) stage.

The AC-4 had to do its job without the aid of the preset timers that have controlled the engines and guidance systems in all of the previous flights. AC-4 was the first in the series to be flown "closed-loop," which means that all control decisions were made during the flight by the inertial guidance system on board.

The Atlas (first) stage carried the package to an altitude of about 72 miles. A few seconds later Centaur ignited, putting itself and the Surveyor mock-up into an elliptical orbit ranging from 101 to 107 miles above the earth.

Originally, the flight plan called for the Centaur/Surveyor package to remain in the initial orbit for only 25 minutes. Then, at a point over South Africa, Centaur would have restarted itself, putting booster and payload into a greatly elongated orbit of about 100 miles perigee and 5,000 miles apogee.

This maneuver, however, is not part of the Surveyor program.

Eleven more Atlas-Centaurs will be used in the Surveyor program. The first actual moon-bound Surveyor will be aboard number 7, expected to be launched some time in the second half of next year.

With such a large, important mission assigned to it, scientists are fervently hoping that Centaur will maintain its performance record.

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