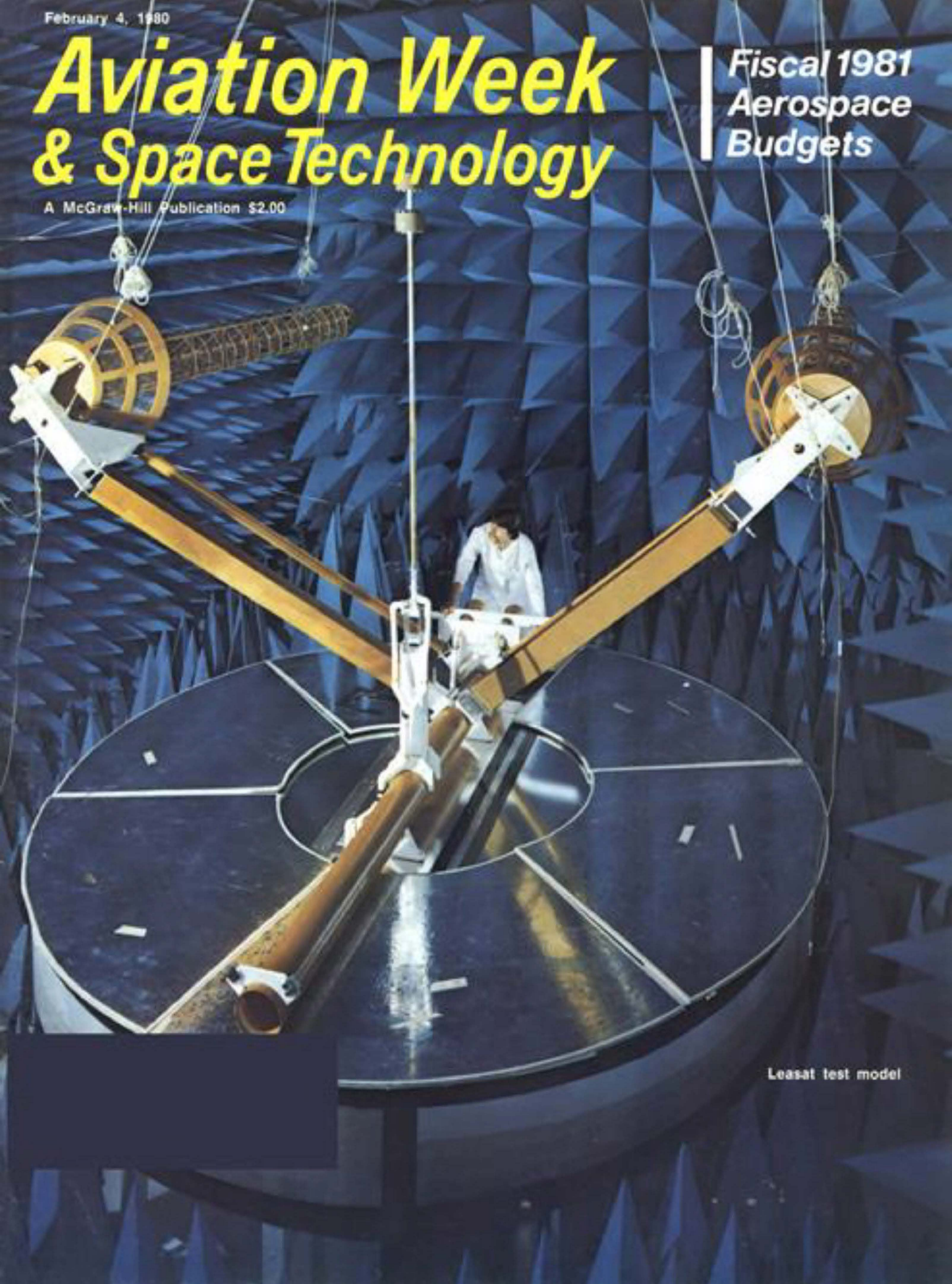
February 4, 1980

Aviation Week & Space Technology

A McGraw-Hill Publication $2.00

Fiscal 1981 Aerospace Budgets



Leasat test model

aircraft climbs to a cruising height. Between 25,000-27,000 ft., the oxygen reaches 100%. From 35,000-38,000 ft., pressure is added to assist the normal partial pressure in pushing oxygen into the mask.

Capt. Gene Williams, aeromedical adviser for the Crew Systems Div. of the Naval Air Systems Command, explained: "With the 95% oxygen [in the new system], we would readjust the schedule to maintain partial pressure of oxygen need versus altitude. It would start shutting off the air earlier and start the pressure breathing earlier."

The idea of breathing pure oxygen has been based on a safety margin. Williams cited studies that showed how consciousness could be lost rapidly if an aircraft at 40,000 ft., with 8,000-ft. ambient cockpit pressure, were to depressurize suddenly because of a missile or bullet hole. "To prevent that loss of consciousness; it was found that breathing some percentage of oxygen [more than ambient air] ahead of time does help, if breathing through the mask continues," he said.

It was also learned, however, that 100% oxygen could have a potentially dangerous side effect in certain circumstances. "One problem," Williams said, "is aeroatelectasis, or lung collapse. Under 3-6g, in an anti-g-force suit, the lower segment of the lung could collapse, and coughing would result."

"The reason is that oxygen and carbon dioxide absorb rapidly into the tissue of the lung, and suddenly the potential space disappears where the gas would have been," he added.

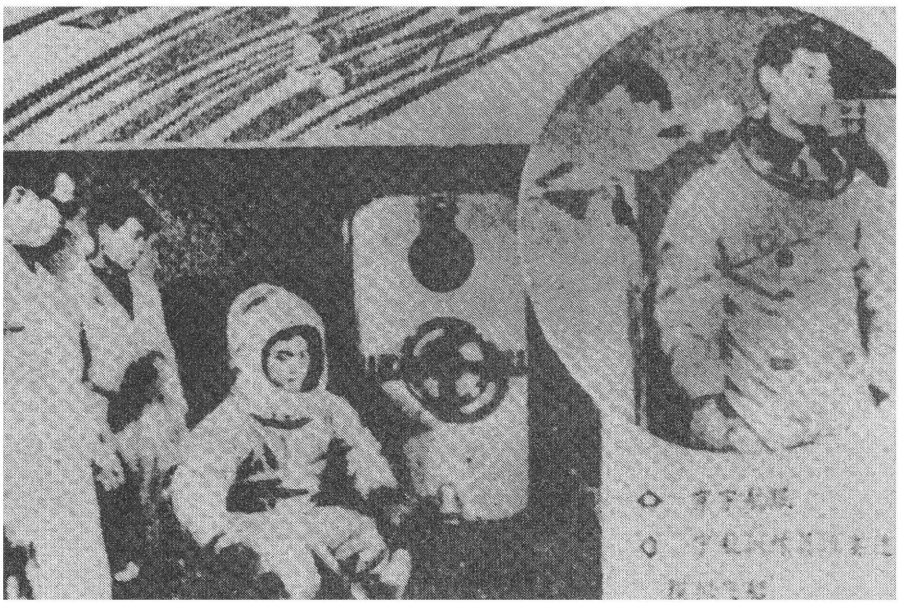
He added that the Air Force has advocated an air/oxygen mixture to prevent aeroatelectasis because a certain amount of nitrogen tends to prevent that condition. Preliminary Navy work has shown that argon, the physiologically inert gas in the final product of the molecular sieve, also will inhibit the condition because it is not absorbed into the tissue as fast as oxygen.

The prototype has a volume of less than one cubic foot and will fit into the current liquid oxygen converter compartment. The molecular sieve will necessitate increased power to provide thermal control during low-temperature operations.

It will be equipped with an oxygen sensor for cockpit display to give visual and aural warnings of low supply. The system also will fit into the space of the current apparatus that provides an alternate oxygen supply at 1,800 psi. in the ejection seat.

The Navy started funding the molecular sieve in 1974 and has spent about $1 million so far.

Operational evaluation with the fleet will take place in July on six Harriers. After the first Bendix production run of about 60 units for the AV-8A, competition will be opened for other Navy tactical aircraft.



Space suit development is part of the Chinese manned space program. Chinese characters describe the picture at left as "a man in training preparing for a trip to outer space." Characters for picture above read "man wearing space outfit." UPI photo.

Space Technology

Astronaut Candidates Training In China for Future Missions

Washington—Astronaut candidates for a future Chinese manned space flight program are undergoing zero-g, centrifuge and physiological stress tests at a Chinese space facility.

The Chinese had said in early January such training was under way (AW&ST Jan: 21, p. 16), confirming an earlier AVIATION WEEK & SPACE TECHNOLOGY report that China was in the earliest stages of developing a manned flight capability (AW&ST May 28, 1979, p. 26).

Physical conditioning is the major part of Chinese astronaut training. Most of those participating in the program are young pilots drawn from the Chinese air force. Some of those in training are not considered space flight candidates but are being trained as future astronaut instructors. Specific facilities and tests being performed by the trainees include:

- **Vibration tests**—Chair that provides its occupant with violent vibratory loads is designed to accustom the candidate to launch stresses.
- **Spinning gondola**—Gondola hung from the ceiling is swung back and forth and then spun violently, providing its occupant with a simulation of launch stresses.
- **Centrifuge**—It is being used to simulate launch and reentry g-force loads.
- **Zero-g training**—Parabolic flights in fighter aircraft are being used to provide about 30 sec. of zero-g at a time during which various tasks such as eating are being performed.
- **Spacecraft simulator**—Simulated spacecraft cabin is under use, primarily for habitability exercises. The simulator has an internal space of about 10 sq. meters and is capable of altitude chamber type operations for breathing under reduced pressures like those to be used in future Chinese spacecraft. Windows provide views of simulated earth and star fields. The Chinese want their trainees to be thoroughly familiar with the stars for space navigation purposes. A small exercycle also is in the mockup.
- **Impact trainer**—Chinese observers described the system as "a thrilling impact test." One said: "We were brought to an iron tower that was tens of meters in height and called an impact tower. A young man under training was strapped tightly to a chair, which was upholstered with plastic foam. The chair was hoisted slowly up the tower. Suddenly the slide valve in the pulley was released to make the trainee plummet to the ground with a big bang." The test is to simulate a spacecraft ground landing.

The Chinese said they also are working on space foods, including "moon cakes" wrapped in a membrane to prevent crumbs from floating away in zero-g. Space suits are also under test and include provisions for squeezing food into the mouth when in a pressurized condition.

The Chinese have not discussed their manned effort at length with foreign visitors except to say that the space applications effort has a higher priority.