SPACE SCIENCES

Astronaut Haise to leave NASA

In April of 1966, NASA test pilot Fred W. Haise was selected as a member of the astronaut corps. Just 20 months later, when Apollo 8 was making the first manned flight around the moon, Haise was part of the crew — the backup crew, which trained for the mission but stayed behind on earth. The momentous Apollo 11 lunar landing mission in 1969 again included Haise, but again from an earthbound post, as backup pilot for the lunar module.

His chance to fly finally came the following year, as the real lunar module pilot for Apollo 13, bound for a landing in the Fra Mauro region of the moon. The flight took off on April 11, 1970. About 55 hours after liftoff, plans abruptly changed when a failure in the Apollo service module's cryogenic oxygen system required the astronauts to convert their lunar module into a lifeboat, returning to earth without ever touching the lunar surface.

Haise's last Apollo berth was the next-to-last moon mission, Apollo 16, and this time he bore the title of commander — of the backup crew.

After Apollo came the Skylab project, with slots for three three-man crews to spend weeks conducting experiments from earth orbit. Haise, however, became technical assistant to the manager of the space shuttle, still years from flight. In 1977, he actually flew the shuttle, but only for the bottom few thousand feet of its projected mission, as the craft was dropped from an airplane for approach and landing tests in the California desert.

In March of 1978, Haise was named as commander of one of the shuttle's early orbital test flights (possibly, according to NASA sources, as early as the second mission), but the shuttle schedule has dragged on and on, until space agency officials now unofficially envision the first orbital flight no sooner than March — or later — of next year.

At the end of this month, the Grumman Aerospace Corp. (which built the Apollo lunar module) of Bethpage, Long Island, N.Y., will welcome a new vice president for Space Programs. He will be a just-retired astronaut named Fred W. Haise.

ATS-6 to be turned off, kicked up

The Applications Technology Satellite ATS-6, whose lengthy and diverse list of "firsts" and other accomplishments ranges from educational programs to satellite-to-satellite communications, will be shut off by NASA on June 30, five years and one month after it was launched. It is also three years beyond its planned lifetime, but three of the satellite's four "station-keeping" thrusters (which help it maintain its desired longitude over the equator in its geosynchronous orbit) have failed, "and the lifetime of the fourth," says NASA, "is questionable." Without its thrusters, ATS-6 would drift between its present position at 140°W and about 70°W, creating a potential hazard to other satellites in the increasingly crowded geosynchronous region. Thus, on Aug. 6, controllers at the NASA Goddard Space Flight Center in Greenbelt, Md., will use the remaining thruster to boost ATS-6 to a long-lived orbit several hundred kilometers farther above the earth.

One of ATS-6's major tools has been its huge, high-gain antenna, a mesh dish nine meters in diameter, which has allowed it to transmit directly to small ground receivers instead of requiring large, centralized receiving stations with overland distribution systems. This enabled the satellite to be used in such projects as medical communications tests to remote areas of Alaska; educational broadcasts to 2,500 rural villages in India; air traffic control experiments with the Federal Aviation Administration; and multinational, two-way TV conferences.

The satellite was launched for NASA by the U.S. Air Force on May 30, 1974.

PHYSICAL SCIENCES

Dietrick E. Thomsen reports from Montreal at the 1979 IEEE International Conference on Plasma Science

Electric heating

A plasma, an ionized gas, is probably most often thought of as a raw material for thermonuclear fusion. But it has other uses, from the highly technological one of etching semiconductors to the mundane one of being what results when the filament blows in an electric bulb.

When plasmas are serving as the raw material for fusion — and that is what everyone hopes will be their main relation to future light bills — they have to be heated. Although there are already a number of ways of heating a plasma, a practical fusion reactor will probably require a combination. New ones are continually sought.

A plasma is an electrically conducting fluid, and a large group of physicists with the General Atomic Co. reason that they should be able to take advantage of that and heat the plasma with radiofrequency power. If that proves possible, it should be "an attractive alternative to neutral beams as the principal heating source for fusion reactors."

J. L. Luxon represented the group in describing experiments in which they attempted to generate radiofrequency discharges that would couple to the electrons of the plasma, inducing in them a slow wave motion that would be damped inside the plasma and heat it. The trials, done in General Atomic's Doublet IIA apparatus, found a range of wave characteristics for which the process sometimes works and sometimes doesn't. Luxon's term is "sporadic." They think they know why it's sporadic, but being certain will take more study. "This task has turned out to be difficult," he says.

Tandem mirrors

Another difficult task is confining a fusion plasma. (If you don't, it will dissipate ad infinitum.) One popular general method is to use magnetic fields to hold the plasma in a given volume. A specific application of it is the so-called magnetic mirror, a magnetic field so arranged that if plasma particles try to escape, they are bounced back toward the center of the volume.

Magnetic mirrors are not completely escape-proof. Plasma can get out along the axis of the magnetic field. So the idea of tandem mirrors has arisen: Minimize or slow the escape by lining up mirrors one after another.

Tandem mirror experiments are just beginning to operate. Two described at the meeting (Lawrence Livermore Laboratory's TMX by B. G. Logan et al., and a 10-meter-long arrangement at the University of California at Berkeley by M. Tuszewski et al.) are just in the early stages of injecting plasma and seeing what happens to it. So far these early tests and diagnostics seem to be going well.

And insulated stars

Magnetic confinement of a plasma is similar to what is called magnetic insulation: The presence of a magnetic field in a gap where electric current would normally flow, say the space between an anode and a cathode, can inhibit the current. The magnetic field may be self-induced (as by a current flowing in one of the electrodes), or it may just be there.

Richard Lovelace of Cornell University gave a review intended to show how this one phenomenon can apply from terrestrial circuit technology to astrophysics — all because it forms channels down which charged particles are forced to flow. Magnetic insulation is used in magnetrons — which are devices for generating radiofrequency power — guns for generating beams of electrons and ions, and, in his opinion, is responsible for the sharply defined geometry of double-lobed celestial radio sources that cover thousands of parsecs.