SPACE SCIENCES

A year in space on a shoestring

A barebones framework of aluminum girders, forming a cylinder 14 feet in diameter and up to 30 feet long, is being developed at NASA's Langley Research Center in Hampton, Va., as an inexpensive way to send as many as 80 individual payloads into space simultaneously for as long as two years. On about July 14, the space agency will send out some 10,000 announcements of the chance to suggest payloads for the device, which will carry them in separate, isolated boxes aboard the space shuttle.

The boxes will simply be sent to the selected experimenters, who will mount their hardware inside and return them to NASA for installation in the framework, known as the Long Duration Exposure Facility, or LDEF. The first LDEF is tentatively planned for the third shuttle flight, late in 1979, according to experiment manager John Di Battista. It will be carried into orbit, removed from the shuttle's cargo bay and left there for about nine months.

The payloads could be almost anything—solar cells being tested for degradation resistance; high-energy cosmic-ray monitors; self-contained crystal-growth tanks, thermal coatings, etc. The first flight will also require that they use no telemetry, transmit no data and employ no external power supply, although centralized power and telemetry facilities may be provided later. Each box—NASA calls them trays—will measure about 4 by 5 feet, with a variety of possible depths up to the full 14-foot diameter of the cylinder.

The LDEF, says Di Battista, should open the way for the small user, "the man who hasn't done space experiments before." It is not inconceivable, he says, that small private organizations, perhaps even high school classes or single individuals, would be able to send experiments, particularly since it would be possible to use a small portion of a single box. For more information write to: LDEF Project Office, Mail Stop 158-B, NASA Langley Research Center, Hampton, Va. 23665.

Oblique-wing test flight set

A bizarre-looking aircraft with one wing swept back and the other forward is scheduled to make its first instrumented test flight—but without a pilot—on about July 23. Called an oblique-wing aircraft, it will take off with its wings perpendicular to the fuselage, like a conventional plane then slowly swing the single rigid wing structure so that one wing angles forward as the other moves back.

The test plane, an unmanned craft flown by remote control from a TV-equipped cockpit on the ground, has a 14-foot fuselage and a 22-foot wingspan. The oblique-wing idea has been developed over many years by Robert T. Jones of the NASA Ames Research Center in California. There is a slight asymmetry in lift and in control-surface efficiency between the two wings, says Rodney Bailey, project manager, but this is compensated for by differences in wing stiffness and leading-edge shape.

Skylab revisit to sink it or save it

A return visit to the Skylab orbiting workshop, which has been empty since its third crew vacated it in February 1974, may take place as early as the fifth flight of the space shuttle set for early 1980. The major question is whether the visiting astronauts will be sent to preserve the costly facility for later study by raising its orbit or to set it on a controlled entry that will destroy it without raining debris on inhabited areas. Engineers at NASA estimate that an early visit is important, since they believe the 37-ton laboratory's orbit might decay naturally that year.

BIOLOGY

Mutant algae for better rice

Rice farmers may someday inoculate their fields with mutant algae to get better yields, if all goes well with some current California research. Plant biochemists Raymond C. Valentine and K. T. Shanmugam of the University of California at Davis, are studying ways to step up nitrogen fixation in bacteria and algae. They have developed certain bacterial mutants that fix greater than normal amounts of atmospheric nitrogen into ammonium, then release the excess into the surrounding environment. If these mutants could be persuaded to grow in plant root nodules or free in the soil, they might provide more ammonium for incorporation into plant proteins.

The team is currently selecting blue-green algae mutants that make and release extra amounts of fixed nitrogen. Algae thus modified could release ammonium into rice-paddy water and increase the protein content of rice. Blue-green algae grow in symbiosis with certain ferns, as well, and the team hopes the mutants will grow and release ammonium from the fern leaves. These symbionts could then be grown in or near rice paddies.

First marine plant hybrid grown

For the first time, scientists have successfully grown a hybrid of two marine plant genera. They accomplished this using two physically different types of kelp, which are thought to be, nevertheless, genetically similar, *Pelagophycus* and *Macrocystis*. The former plant, called the "elk" kelp, is single-bulbed and grows in deep water, while the latter is multi-bulbed and thrives in the shallower waters near the sea coast. The investigators were stimulated into their research when, in 1957, they found three naturally occurring specimens of the hybrid which they have just now reproduced successfully at the Marine Science Institute of the University of California at Santa Barbara.

Michael Neushul of UCSB and Yoshiaki Sanbonsuga, who is visiting from the Hokkaido Regional Fisheries Research Laboratory, believe it likely that their hybrid is sterile. This quality is desirable, they say, in order to eliminate the danger of its uncontrolled proliferation when introduced into the delicate balance of an existing marine community. So far, the experimenters have raised several full-sized hybrids only in tanks at the lab but believe the plant will grow in waters of a depth-range greater than can either of its parents. Kelp has a variety of commercial uses in food, fertilizer and chemicals.

Acid rain wreaks havoc on plants

In 1974, scientists completed an 11-year study of the northeastern United States which revealed that the rainfall there was significantly acidic (SN: 6/15/74, p. 383). They measured the precipitation at pH 4 on a scale from pH 0 (strongly acidic) to pH 7 (neutral, distilled water). Now a study reported in a recent issue of the AMERICAN JOURNAL OF BOTANY (63:283) indicates specific adverse effects of simulated acid rain on a variety of the kidney bean plant, *Phaseolus vulgaris*. Plants sprayed with acid solutions of pH 2.5 or below, grow shorter and bushier than the control plants. The individual leaf is not only smaller and more wrinkled with rolled-under edges, but large portions of it begin to die at pH 2. At this same acid level, the full-grown leaves of the treated plants begin to fall off prematurely and those newly formed often abscise before fully expanding.

Roger W. Ferenbaugh of the University of Montana, also measured a reduction in the total mass of a typical treated plant compared to a normal one, especially in the root growth. He also noted an increase in the rate of photosynthesis with acidity.