aerospace

Gathered at the annual meeting of the American Institute of Aeronautics and Astronautics last week in Houston

SPACE STATION

Looking for flexibility

A year before the shuttle passed the space station in priority at the National Aeronautics and Space Administration, there were two basic designs for the station. Both used four-deck cores 56 feet long and 33 feet in diameter, to which other modules could be added. Now finance restrictions require development of the reusable space transportation system (the shuttle) first, and the space station is taking on a new look.

A current NASA in-house study involves a more flexible design. It is still modular, but instead of a large core there is a cluster of smaller modules, each carried to orbit in the 15-by-60-foot shuttle bay. The cluster—which could include bioscience, astronomy and earth resources laboratories—would be assembled in space using manipulator arms to attach the module onto a multiple docking adapter.

In addition, says Charles W. Mathews, director of the Space Station Task Force at NASA headquarters in Washington, the new concept is oriented toward users. Universities, industries and governments would develop their own programs, go up to the labs for work and return to develop data. A Space Program Advisory Council would work with NASA and the user community to consolidate ideas and develop policies and guidelines.

SPACE SCIENCE

Free-flying experiment modules

With the shifting priorities at NASA, there is also a growing emphasis on so-called free-flying experiment modules. These are proposed space satellites that could be carried into orbit inside the bay of a space shuttle and operate over long periods of time. This would be accomplished by having their experiments updated and their systems serviced in orbit by astronauts.

Most applicable to such a concept would be instruments like orbiting telescopes that need to be separated from the space station cluster to avoid contamination of their optical surfaces and degradation of equipment from power sources.

J. M. Macdonald of the Convair Division of General Dynamics and J. R. Olivier of NASA's Marshall Space Flight Center are thinking of the free-flying modules operating in conjunction with a space station, but it seems feasible that such modules could be also placed into orbit and serviced by the shuttle without the existence of the space station.

AEROSPACE ECONOMICS

More for the money

A major problem confronting the aerospace industry today is that its products have become too expensive; customers are no longer able or willing to pay the cost, says I. G. Hedrick, vice president for technical operations of the Grumman Aerospace Corp.

While costs have gone up over the past 25 years there has been no sufficient reduction in structure weight, no trend toward lighter wings and no breakthrough in new materials. He says costs can be reduced through development and use of new materials, improvement of manufacturing methods and simplifying maintenance.

Hedrick believes no major breakthrough is likely in aluminum alloys. Instead, he urges industry to concentrate on titanium alloys, boron and graphite fibers and fiber-organic matrix composites.

Among his suggested savings: Manufacturing cost could be cut by casting the air-frame structure. Metal-removal costs could be reduced by using gasjet laser cutting, which is estimated to be 30 times faster than friction sawing. Maintenance costs could be cut by use of new materials that are more durable and cheaper to repair, such as fiber composites.

NOISE CONTROL

Thermal reduction of sonic boom

Unless the noise due to the sonic boom can be reduced to a level acceptable to the American public, it is probable that the SST will not be permitted to fly supersonically over the United States. F. B. Batdorf of Aerospace Corp., San Bernardino, Calif., suggests a new way of eliminating sonic boom. Lengthening the body of the aircraft to create the desired pressure disturbance seems impractical. But the use of heat (SN: 1/13/68, p. 43) to simulate a long body might be the answer.

In a recent study, he says, rough calculations indicate that the heat needed to eliminate the sonic boom is prohibitively large if it is derived from the output power of the aircraft. But if it is obtained by direct combustion of cheap fuel such as JP-4, the requirement does not appear to be prohibitive.

The basic concept of using heating instead of lengthening the body to produce the needed pressure disturbance will be checked experimentally during fiscal year 1971 in a wind tunnel investigation at NASA's Langley Research Center at Hampton, Va. If the wind tunnel experiments validate the underlying theory, the usefulness of the approach will depend primarily on the practical engineering aspects of deploying the heat.

ADVANCED DESIGN

Wingless hypersonic craft

Using a computer analysis program, engineers Thomas J. Gregory, Mark D. Ardema and Mark H. Waters of Moffett Field, Calif., have performed an analysis of a wingless hypersonic cruise aircraft.

The all-body concept has a number of advantages over a winged shape: elimination of the heavy high-temperature wing structure and use of the vehicle's surfaces to perform part of the function of the propulsion system inlet and exhaust nozzle. One significant disadvantage, however, is the high transonic drag.

Although constraints on the noise produced by sonic boom severely reduced the payload, the analysis showed that rocket assist at transonic altitude could help relieve that problem.