aerospace

AERONAUTICS

Supercritical wing

The National Aeronautics and Space Administration has developed a new wing for jet transports that would allow highly efficient cruise flight near the speed of sound (about 660 miles per hour) with no increase in fuel usage. This advantage could be converted to increased range or greater payload capability.

The supercritical wing, as it is called, was developed at NASA's Langley Research Center in Virginia, under the direction of Dr. Richard T. Whitcomb. It was delivered last week to NASA's Flight Research Center at Edwards, Calif., where it will be installed on a modified F-8 for flight tests.

At current jet transport speeds, about 530 miles per hour, air flowing over the upper surface reaches supersonic speeds. This generates local shock waves and increases the aerodynamic drag and buffeting. Aircraft designs in the past have used swept wings to reduce the drag. This, however, increases structural weight and makes it difficult to fly at low speeds.

With the supercritical wing, the upper surface is flattened—a design that delays the air from reaching supersonic speeds until the airplane itself is traveling at a higher speed. To compensate for the subsequent loss of lift, the rear portion of the bottom edge is shaped in a concave curve.

MATERIALS

Detecting stress

Engineers at North American Rockwell's Space Division in Downey, Calif., are developing ultrasensitive, nondestruction techniques for spotting potential airplane structural problems before the breaking point occurs.

One example is a listening device that can detect metal stress sounds inaudible to the human ear. Columbium and titanium metals for possible use in the space shuttle or in advanced aircraft are being stress-tested to establish patterns of intensity for these trouble sounds.

Other techniques include electronic devices such as tiny glass fibers used to conduct images of inaccessible areas on the craft.

Such instruments aboard a craft could detect deterioration before any structural failure occurs, says Bastian Hello, space division vice president.

MILLIMETER WAVES

Communications revolution

Preliminary results from a communications experiment aboard the ATS 5 satellite using millimeter wavelengths indicate that the space agency might be able to open up the extremely overcrowded microwave band to frequencies above 10,000 megahertz. Such an action would virtually revolutionize earth communications systems.

Millimeter wave frequencies not only offer better gain-to-antenna characteristics and extremely wide bandwidths but also allow reduction in size and weight of components. They could also offer more than 10 times the usable frequency spectrum than has previously been available.

Such potential would, for example, permit all of the television stations in the New York metropolitan area to be put on one single carrier wave and still leave room for more than 15,000 telephone channels.

Results from ATS 5 indicate that only very heavy rainfall will affect reliable communications. Additional tests will determine how far apart receiver stations must be placed so that a single major storm does not block communications to both stations.

HYPERSONIC CRAFT

A new approach

A hypersonic transport that would launch vertically, use nuclear propulsion to go into orbit, then glide to the destination airport has been proposed for study by Maxwell W. Hunter of the Lockheed Missiles and Space Co., Sunnyvale, Calif.

Instead of using air-breathing engines, the craft would use hydrogen/oxygen engines at launch and switch to nuclear power at an altitude of 10,000 feet. It could reach any point on the earth within an hour. A gaseous nuclear rocket that retains fission products on board in a shielded container is promising because of low propellant costs. Environmental contamination would be avoided by use of the hydrogen/oxygen rockets, which emit only pure water as exhaust. Sonic-boom problems would be greatly lessened because of the steep ascent.

"The hypersonic," says Hunter, "goes faster than the supersonic," and, he claims, "has none of the unsaleable features of the SST."

POLICY

Reorganization plans

Reorganization studies are under way at the National Aeronautics and Space Administration as a result of budget and personnel cuts.

The plans make realignments within the three major offices—Advanced Research and Technology, Space Science and Applications and Manned Space Flight.

The Office of Manned Space Flight, for example, is studying a matrix structure which would shift emphasis from single to multiple projects. Hitherto, a program such as Skylab was staffed with all the required personnel to do the job. The new structure would emphasize disciplines instead of project offices. Administrative or support personnel now working solely on Skylab would also work on the space shuttle and station as well.

The President's Science Advisory Committee and the National Academy of Sciences have for years recommended a reorganization of the space biology, biomedicine and biotechnology efforts, which are currently divided among the three offices. Overlapping jurisdictions may be remedied by the creation of a single office. Exobiology (the study of life on other planets) is one area which would not be included.

Organizational changes already accomplished within the Office of Advanced Research and Technology place more emphasis on aeronautical and spacecraft research. Some NASA departments will be eliminated; others, such as the Offices of Industry Affairs and Technology Utilization, have been combined.