



### Weight-Saving Technology

The helicopter pictured is the twin-turbine S-76, produced by Sikorsky Aircraft division of United Technologies, Stratford, Connecticut. It is the first transport helicopter ever designed purely as a commercial vehicle rather than an adaptation of a military design. Being built in large numbers for customers in 16 countries, the S-76 is intended for offshore oil rig support, executive transportation and general utility service. The craft carries 12 passengers plus a crew of two and has a range of more than 450 miles—yet it weighs less than 10,000 pounds. Significant weight reduction was achieved by use of composite materials, which are generally lighter but stronger than conventional aircraft materials.

NASA composite technology played a part in development of the S-76. Under contract with NASA's Langley Research Center, Sikorsky Aircraft designed and flight-tested a helicopter airframe of advanced composite materials. The materials and the experience gained in the NASA project

were subsequently incorporated in the design of the S-76. By using composites instead of traditional materials in such components as the horizontal stabilizer, tail rotor, doors, pylons, fairings, cockpit canopy and floors, Sikorsky was able to save about 30 percent in the weight of these components. The weight-saving contributed to a substantial increase in the helicopter's performance. Sikorsky's NASA work also led to use of composites in the company's Army Black Hawk combat support helicopter and the Navy/Marine Corps CH-53 transport helicopter, both being produced in quantity.

### Aircraft Design Analysis

The airplane shown below is the Beech Super King Air, an executive transport built by Beech Aircraft Corporation, Wichita, Kansas. Its development was aided by the NASA computer program known as NASTRAN® (NASA Structural Analysis), which electronically analyzes a computerized design and predicts how it will react to many different conditions of stress and strain. In this instance

the program was employed in analysis of the airplane's structure and engine mounts.

NASTRAN was similarly used in development of other Beech planes, such as the T-34C military trainer and the new single-engine Skipper light-plane, which is making its debut this year. At its Boulder, Colorado facility, Beech has used NASTRAN in analysis of fuel tanks for space vehicles. The company reports it has achieved cost savings and improved its design/analysis capabilities through use of the NASA program. NASTRAN and other government-generated computer programs are made available to industry through NASA's Computer Software Management and Information Center (COSMIC)® at the University of Georgia.

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