NASA'S LATEST ACT

With the launch of a new communications satellite, the global village promises to get even smaller

By John R. Williams

When NASA launches the nation's most advanced communications satellite in June this year, the nation will get more than an orbiting telephone switchbox. Scientists and other data-dependent clients will gain a tool that promises to herald a new era of global knowledge sharing.

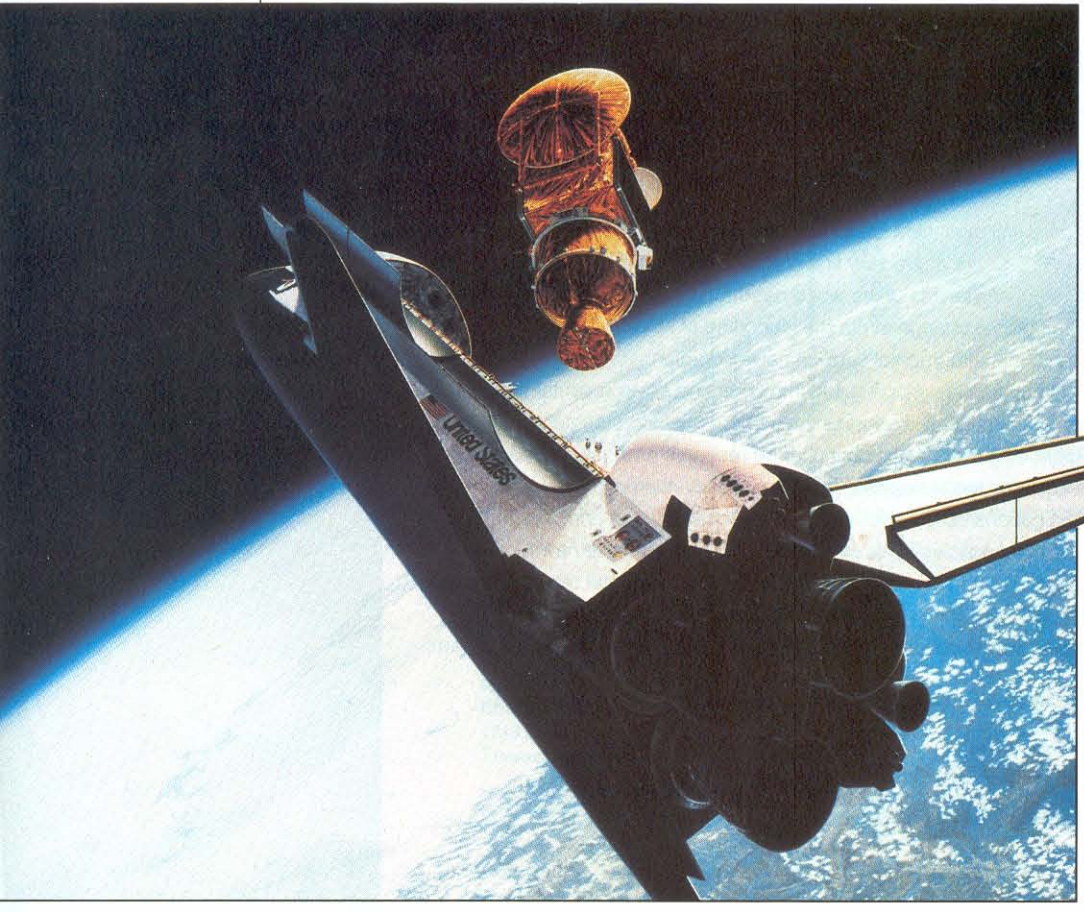
With the aid of the Advanced Communications Technology Satellite (ACTS), scientists from remote outposts in Antarctica may share data instantly with the rest of the world, doctors can resource the expertise of medical specialists thousands of miles away and financial analysts can have real-time access to the nation's markets. The $500 million program is sponsored by NASA's Office of Commercial Programs with project management provided by NASA's Lewis Research Center in Cleveland, Ohio. Weighing in at 3,250 pounds, the satellite will be released by the space shuttle Discovery and maneuvered into geosynchronous orbit 22,300 miles above the equator. Placed at a 105 degrees west longitude, ACTS will be in a perfect position to relay huge chunks of data to remote parts of the Western Hemisphere.

ACTS makes use of such advanced technologies as a baseband processor and a microwave switching matrix. These two devices act as the heart of the system. The processor acts as an onboard computer, electronically sorting and routing communications traffic. The microwave switch matrix allows the routing of traffic at much higher data rates than current satellites. This technology allows scientists and other users to communicate using supercomputers and high-definition television signals.

The real work is carried out by hopping electronic beams, which send information to a small area of the hemisphere for a few seconds before moving on to another location. The satellite can deliver so much information in one of these bursts that by the time the hopping beam returns to a particular location, no lapse can be detected. ACTS also uses steerable beams to link geographically dispersed areas, such as Alaska, Hawaii and Antarctica.

"The system acts as a facilitator—a new way of doing things," says Patrick C. Smith, an electronics engineer with the National Science Foundation's Division of Polar Programs. "The main goal of the experiment is to find out how modern communications technologies can help scientists and others do their jobs better."

Smith, along with researcher Raymond Smith of the University of California at Santa Barbara, is involved with one of 31 experiments to be carried out with ACTS. From Palmer Station, on Antarctica's Palmer Peninsula, Raymond Smith will simulate field research and use the ACTS system to relay that data back to the United States. Scientists will be able to access the satellite and be linked in real-time to other research going on around the globe, providing a huge database from which to draw conclusions or see trends that they had



In June 1993 the space shuttle Discovery will deploy ACTS, the nation's most advanced communications satellite.

not considered before leaving for the polar continent.

Another experiment is being spearheaded by the Mayo Foundation in Rochester, Minnesota. The experiment, if successful, could link country doctors with experts in larger cities, instantly transmitting visual data such as x-ray charts. The program could re-energize family practice because specialists would be able to render immediate assistance, says Mary Mitchell, chair of the technical working group overseeing the foundation's ACTS experiments.

"We want to see how we can get better health care to the rural and underserved areas," says Mitchell. "With fiber optics data transmission we have lag times—time that could be crucial for a patient."

Financial analysts also hope to gain from ACTS, using the satellite to maintain uninterrupted links to world markets. "All disaster recovery systems are terrestrial-based," says Don Flournoy of Ohio University's Institute for Telecommunications Studies. If your phone service goes out, the phone company just re-routes traffic around the trouble spot to maintain service. This becomes more problematic as the users get bigger, however. Banks and other financial institutions use larger, higher capacity T-1 cables to relay information. If an earthquake, hurricane, explosion or other disaster disabled a network, it could be an entire day before it's repaired.

Flournoy wants to simulate a disaster and see how fast the network can be re-established and how accurately and securely the data can be relayed. The link will also be tested to determine its effectiveness for normal data transfers on a day-to-day basis.

"The advantage with the whole system is that you only pay for what you use," says Fluornoy. "It's totally interactive and with this new advanced satellite we can deliver and retrieve data almost instantaneously. That's important if we want our businesses and other institutions to stay competitive." ■

Contributing editor John R. Williams wrote about repairing robotic space probes in our January/February issue.