Advanced Communications Technology Satellite Now Operating in an Inclined Orbit

The Advanced Communications Technology Satellite (ACTS) system has been modified to support operation in an inclined orbit that is virtually transparent to users, and plans are to continue this final phase of its operation through September 2000. The next 2 years of ACTS will provide a new opportunity for using the technologies that this system brought online over 5 years ago and that are still being used to resolve the technical issues that face NASA and the satellite industry in the area of seamless networking and interoperability with terrestrial systems.

New goals for ACTS have been defined that align the program with recent changes in NASA and industry. ACTS will be used as a testbed to

1. Show how NASA and other Government agencies can use commercial systems for future support of their operations

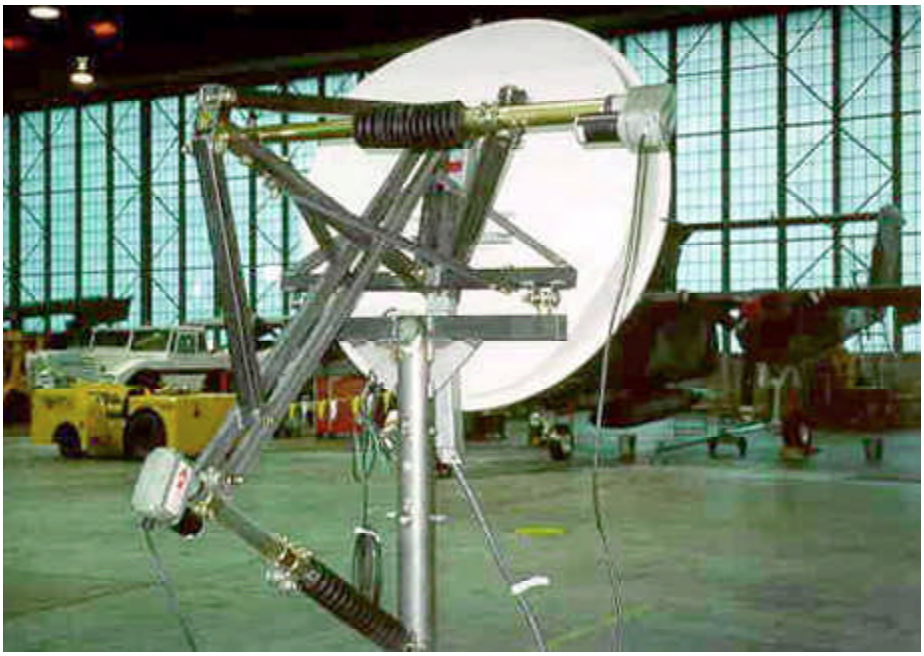
2. Test, characterize, and resolve technical issues in using advanced communications protocols such as asynchronous transfer mode (ATM) and transmission control protocol/Internet protocol (TCP/IP) over long latency links as found when interoperating satellites with terrestrial systems

3. Evaluate narrow-spot-beam Ka-band satellite operation in an inclined orbit

4. Verify Ka-band satellite technologies since no other Ka-band system is yet available in the United States

On July 9, 1998, the final north/south stationkeeping was performed on ACTS. Inclined-orbit operations technically began when the spacecraft left its original north/south limits of ±0.05° on August 8, 1998. The spacecraft will be maintained at 100± W longitude throughout the remaining life of the program. At the program's completion, a final sequence of burns will superorbit the satellite into a higher orbit where the payload and spacecraft will be shut down.

Preparation for inclined-orbit operations involved reviewing all aspects of the communications link that could be affected by the spacecraft no longer being stationary. Changes were made to onboard software and operations procedures to maintain the pointing accuracy of the narrow 0.3± spot beams so that the coverage pattern would not change. With the spacecraft increasing in north/south drift by 0.78± per year, inclined-orbit operations will be limited to about 2.5 years, or 30 months.



Tracking modifications to a 1.2-m T1VSAT.

The ground segment was modified in-house at the NASA Lewis Research Center to track the satellite. The four major components modified with tracking hardware were the T1VSAT's,[a] Gigabit Earth Stations, USAT's,[b] and the Link Evaluation Terminal. The Master Ground Station at Lewis was originally designed with a tracking system for its 5.5-m antenna, so no further modifications were needed.

Inclined-orbit operations offer the ACTS program a final opportunity to affect the design of the next generation of communications satellites. To encourage new experiments and announce the ongoing opportunity to use ACTS, Lewis released an experiment opportunity guide in March 1998.

A set of in-house technical experiments is planned as the core set of experiments for operations. Other experiments hosted by Lewis' Space Communications Program include "High Data Rate Interoperability," "Internet Protocol Performance and Coding Effects," "Hybrid Networking Using Digital Imaging and Communications in Medicine (DICOM)/Telemammography," and "Advanced Air Transportation Technology." Experiments are currently planned by the Air Force Research Laboratory (Rome Labs), Carnegie Mellon University, Lockheed Martin Western Development Laboratory, Savannah State University, and Intelsat. Over 20 organizations have expressed interest in using ACTS during inclined-orbit operations, including the Boeing Company, Southwest Research Institute, Texas Medical Center, and the Naval Research Laboratory. The next 2 years hold promise for new experiment plans as ACTS continues to be an important resource for resolving issues in satellite communications.

Find out more about this research http://acts.grc.nasa.gov/.

Lewis contact: Robert A. Bauer, (216) 433-3431, Robert.A.Bauer@grc.nasa.gov

Authors: Robert A. Bauer
Headquarters program office: OSF
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[a]T1 Very Small Aperture Terminal--an Earth station that operates at the telephony standard data rate of T1 or 1.544 Mbps and uses a 1.2-m-diameter reflector.
[b]Ultra Small Aperture Terminal--a small Earth station that uses a 0.6-m-diameter reflector and supports data rates of up to T1 for transmissions while receiving at up to 40 Mbps.