

Advanced Communications Technology Satellite (ACTS) Used for Inclined Orbit Operations

The Advanced Communications Technology Satellite (ACTS) is operated by the NASA Glenn Research Center at Lewis Field 24 hours a day, 7 days a week. ACTS, which was launched in September 1993, is in its 7th year of operations, far exceeding the system's planned 2 years of operations and 4 years of designed mission life. After 5 successful years of operating as a geostationary satellite, the spacecraft's North-South stationkeeping was discontinued in August 1998. The system is now operating in an inclined orbit that increases at a rate of $0.8^\circ/\text{yr}$. With only scarce fuel remaining, operating in this mode extends the usage of the still totally functional payload. Although tracking systems are now needed on the experimenter Earth stations, experiment operations have continued with very little disruption. This is the only known geosynchronous Ka-band (30/20 GHz) spot-beam satellite operating in an inclined orbit.

The project began its transition from geostationary operations to inclined operations in August 1998. This did not interrupt operations and was transparent to the experimenters on the system. For the space segment, new daily procedures were implemented to maintain the pointing of the system's narrow 0.3° spot beams while the spacecraft drifts in the North-South direction. For the ground segment, modifications were designed, developed, and fielded for the three classes of experimenter Earth stations.

With the next generation of commercial satellite systems still being developed, ACTS remains the only operational testbed for Ka-band geosynchronous satellite communications over the Western hemisphere. Since inclined orbit operations began, the ACTS experiments program has supported 43 investigations by industry, Government, and academic organizations, as well as four demonstrations. The project's goals for inclined-orbit operations now reflect a narrower focus in the types of experiments that will be done. In these days of "faster, better, cheaper," NASA is seeking to gain greater relevance to the agency's mission from these experiments. One area that is of much interest both to NASA and the commercial world is the investigation of protocol issues related to the interoperability of satellites with terrestrial networks, such as Transmission Control Protocol/Internet Protocol (TCP/IP) and Asynchronous Transfer Mode (ATM) over wideband satellites. Other experiment areas of interest are supporting the U.S. Government and NASA as they begin using commercial space assets to meet their communications needs, evaluating issues related to operating a spot-beam satellite in inclined orbit, and evaluating new Ka-band hardware that requires a satellite link. ACTS is now in its last year of operations. Operations are planned through June 2000, when after 81 months of operations, this very successful spacecraft will be superorbited and made inert.

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