Satellite Broadcast of Graphical Weather Data Flight Tested

NASA Glenn Research Center at Lewis Field's aviation Weather Information Communications (WINCOMM) and NASA Langley Research Center's Aviation Weather Information (AWIN) programs collaborated in a flight test and evaluation of a worldwide weather data-link capability using satellites. This successful flight testing moves NASA closer to its goal of developing advanced communications and information technologies to enable high-quality and timely dissemination of aviation weather information to all relevant users on the aviation information network.

Recognized as a major contributing factor in aviation accidents and incidents, weather contributes directly or indirectly to nearly 80 percent of fatal general aviation (small private aircraft) accidents. In 1997, the Aeronautics Safety Investment Strategy Team's weather team produced a prioritized list of investment areas under weather accident prevention. Weather data dissemination is the most critical and highest ranked priority on the list. NASA's Aviation Safety Program founded the Aviation Weather Information initiative to focus efforts on significantly reducing the number of weather-related aviation fatalities. Access to accurate and timely weather data could contribute to a major reduction of weather-related incidents and accidents. However, a cost-effective solution has eluded most general aviation pilots because of the high cost of onboard weather radar equipment.

Rockwell Collins, through a contract with NASA and in cooperation with WorldSpace Corporation, successfully completed ground and flight testing of a receiver and antenna in Johannesburg, South Africa. This NASA/Rockwell Collins project is an evaluation of worldwide weather data-link capability using transmissions from the Satellite Digital Audio Radio Services (S–DARS) AfriStar satellite. Owned and operated by WorldSpace, AfriStar is a geostationary satellite that broadcasts commercial digital audio services to stationary and mobile platforms. S–DARS satellites are the most powerful communications satellites produced to date, allowing users to receive signals using simple, low-cost patch antennas instead of more expensive, beam-steered antenna arrays.

Engineers connected an inexpensive, commercially available radio receiver to a laptop computer and an antenna designed and built by Rockwell Collins, enabling them to receive WorldSpace signals from the AfriStar satellite during flight tests. WorldSpace broadcast their composite color graphical weather data files, which were multiplexed with normal audio streams, to the flat patch antenna mounted on a single-engine aircraft. The aircraft was equipped with a modified commercial S–DARS receiver, a Global Positioning Satellite (GPS) receiver, and a laptop computer with color display. Continuous data reception occurred during normal aircraft maneuvers performed throughout takeoff, cruise, and landing operations. In addition, engineers monitored receiver power levels during steep turns and banks. In most instances, the receiver was able to maintain acceptable power levels during all phases of flight and to obtain weather data with little or

no error.

Rockwell Collins patch antenna mounted on the fuselage of a Cessna-172 aircraft.

With the successful completion of ground and flight testing of a receiver and antenna in Johannesburg, South Africa, the team has started to prepare for experiments using high-speed aircraft in areas of the world with limited access to timely weather data. NASA plans to provide a more advanced antenna design and consultation support. This successful test of real-time aviation-related weather data is a positive step toward solving communications-specific issues associated with the dissemination of weather data directly to the cockpit.

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