



WEATHER INFORMATION SYSTEM

Weather is a critical factor in aircraft operations. It is the largest single contributor to flight delays and a major cause of aircraft accidents.

A study conducted for NASA by Ohio State University reported that the principal difficulties in making proper flight decisions are the timeliness and clarity of weather data dissemination. Properly equipped aircraft can get printed weather reports, but the most common means of getting weather information is by voice communication with ground sources. Word of mouth reporting over congested radio channels is at best inefficient and at times extremely difficult — for example, in critical weather when a large number of airmen are working the radio.

To advance the technology of in-flight weather reporting, Langley Research Center developed — in the early 1990s — a cockpit weather information system known as CWIN (Cockpit Weather Information). The system draws on several commercial data sensors to create radar maps of storms and lightning, together with reports of surface observations.



Shown above is a CWIN display in the simulation cockpit of Langley's Transport Systems Research Vehicle (TSRV), a modified jetliner used to test advanced technologies. The CWIN display is the lower right screen among the four center panel screens; in this instance it shows color-coded categorical weather at airports throughout the U.S. By pushing a button, the pilot may select from a menu of several displays, such as a ceiling/visibility map, radar storm map, or lightning strike map (**right above**).

In simulation tests during 1993, pilots from several airlines and aerospace manufacturing companies flew the CWIN-equipped TSRV. A consensus indicated that CWIN offered improved safety, better weather monitoring and substantial fuel savings, due to fewer miles detouring

around storms. Principal CWIN developer Charles H. Scanlon, Langley aerospace technologist, estimated that a typical U.S. airline could cut its operating costs by \$5.9 million annually with a system like CWIN.

This NASA technology has been adapted to commercial use by ARNAV Systems, Inc., Puyallup, Washington. Now in service aboard general aviation aircraft is the company's System 6, a key feature of which is a weather datalink known as WxLink™. ARNAV's WxLink employs several CWIN features, among them are the lightning graphics and ground-based radar summaries.

WxLink is an aviation weather system based on advanced airborne sensors, precise positioning available from the satellite-based Global Positioning System (GPS), cockpit graphics and a low-



cost datalink. It is a two-way system that uplinks weather information to the aircraft and downlinks automatic pilot reports of weather conditions aloft.

PanAm Weather Services, Minneapolis, Minnesota, which operates 312 Weather-Mation sites in 38 states, provides the weather data input, regularly updated, for the uplink from ground to cockpit. ARNAV airborne equipment transmits PIREPS weather reports via satellite back into the National Weather System for dissemination to other users.

ARNAV's System 6 is not one product but a family of products designed for integration into a complete application. The cockpit display includes, in addition to the weather information, moving map navigation, engine and environment monitoring, a checklist library, condition alerts and digital messaging. The key unit is the MFD Multi-Function Display (MFD 5000 in monochrome, MFD 5100 in color), which packs the performance of several systems into a single display.

At right, the MFD 5100 is shown on the instrument panel of a demonstrator light twin; below is a closeup of the weather and other informational displays available to the pilot. The MFD performs health checks on 70 onboard systems and alerts the crew to difficulties; it is



fully integrated to deliver crew advisories on navigation, fuel management, environment, air data, engine and airframe condition; and it watches for off-altitude and altitude clearance situations.

TMWxLink is a trademark of ARNAV Systems, Inc.



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