

“Weather” or Not, You Can See It All -- Right In Your Cockpit

Affordable, real-time weather information for every cockpit

By Harry Kraemer

At last, pilots can have vital, long range graphical and text weather information and more delivered to their cockpits automatically, in real time, including most of what is available from a FAA Flight Service Station or in their operations departments.

Introduction

Aviation has always been a show place for applying new technology to solve critical safety issues and operational challenges. Unveiled at the EAA's annual convention in Oshkosh, July 2001, SATELLINK Technologies of Dulles, VA has done just that with Merlin™, a satellite-based system that delivers current weather and other flight-critical information directly to aircraft virtually everywhere, on the ground and in the air. Weather is a causal or contributing factor in a majority of aviation accidents and there has long been an unmet need to provide pilots with the information to make better decisions to improve flight safety and increase operational efficiency. Merlin provides pilots with unlimited real-time access to nationwide weather information – NEXRAD, satellite imagery, weather pattern animations, terminal weather radar, surface analyses, PIREPS, METARs, TAFs, NOTAMs, AIRMETs, SIGMETs, IFR/MVFR charts, icing forecasts, lightning forecasts, winds aloft, area forecasts, turbulence forecasts, and traffic information – all received and updated autonomously without any action required by the pilots. In a radical departure from earlier approaches to delivering weather information to pilots, Merlin provides all this information for a single low monthly cost, which provides an unprecedented and exceptionally compelling value-to-cost ratio.

The Technology

Merlin's works much like Satellite TV. With Satellite TV, all channels are broadcast continuously from geostationary satellites, which allows subscribers to view as many of the channels included in their subscription package as much as they'd like. Merlin is based on this same principle. All of the weather information for the entire satellite

broadcast area is continuously updated and broadcast. The use of geostationary satellites makes possible very high bandwidth transmissions that can send huge volumes of digital data, whether hundreds of TV channels or full-color high resolution graphical weather products. The information is stored and continually updated on-board, enabling Merlin subscribers instant access to any of the weather information at any time. The current weather delivery options available to pilots operate using relatively low-bandwidth links, most of which were originally developed for airborne telephone service. With these older generation systems pilots must transmit a request for some specific weather data, which is then prepared by a ground processing system and transmitted to the aircraft. Also, these older services use ground networks (which require hundreds of expensive dedicated transmission towers and cannot guarantee coverage below an altitude of 5,000 feet or less) or on Low Earth Orbit (LEO) satellite constellations that often introduce significant delays in delivering the requested information. Because each request is handled independently, capacity limits can further reduce the response times of old generation networks. .

Initial equipment costs for Merlin are exceptionally low and can easily be cost-justified by all pilots. Since Merlin requires only a small lightweight receiver and a low cost omnidirectional antenna, the equipment costs thousands of dollars less than competing older generation systems. In addition, unlike many competing systems that have expensive and heavy dedicated, proprietary display devices, Merlin's weather information can be viewed on some existing moving map displays. SATELLINK is currently working with the other major cockpit display manufacturers to allow Merlin weather and other Merlin graphical information to be displayed on their moving map and flight tracking systems. Just as obstructions and restricted airspace areas appear as overlays on these systems, Merlin weather graphics can be displayed relative to the aircraft's current location or planned track. In addition to local weather conditions, distant weather and weather trends including animations can be viewed at any time to allow consideration of alternative routings or to evaluate diversion options well in advance.

Merlin receivers are available in two configurations; a portable unit and one designed to be permanently installed. The portable Merlin receiver weighs less than one pound and is small enough to easily fit in any flight bag. The receiver supports a wide range of portable display devices, such as EFBs (electronic flight bags), tablet PCs, and even PocketPC® PDAs. The permanently installed receiver is fully certified for permanent installation and is designed to interface with a large selection of popular panel mounted Multi-Function Displays (MFDs).

Enhanced Safety

Weather is a major contributing factor in fatal aviation accidents. For years the U.S. government and major aviation associations have recognized the need to provide up-to-date, full color weather graphics and text information to pilots throughout flight. Using Merlin, pilots can see actual weather conditions and forecasts far ahead of their aircraft, which will allow them to make flight decisions well in advance, long before they encounter hazardous weather. Merlin stores historical images and thus makes it possible to create animations that show the movement of NEXRAD and other weather imagery. This provides pilots with unprecedented and easy to understand trend analysis capabilities. Merlin completes the weather picture for strategic decision-making far beyond that which is available using on-board radar and lightning detection equipment.

Additional Critical Information

Merlin's high bandwidth enables the delivery of more than just weather information. SATELLINK has teamed with Flight Explorer, the premier internet provider of aircraft tracking services, to provide real-time air traffic information, including the location and other information about every other aircraft being flown in the ATC system under radar control. This information allows pilots to rapidly and easily understand the air traffic situation hundreds of miles ahead. With this information pilots can identify potential ATC delays in time to request re-routings or to select alternate destinations well before it is too late to avoid delays.

Other flight critical information that will be delivered by Merlin includes rapidly changing NOTAMs, security alerts, specialized airport facility information, and the very latest TFR (Temporary Flight Restriction) depictions.

Cost

Merlin is the lowest cost way to deliver the most comprehensive set of weather data products for pilots of any system available today. Merlin subscribers pay a simple fixed monthly fee for access to all weather products delivered 24 hours a day, seven days a week. Most alternative weather delivery options provide limited weather products and charge for every image delivered, often for as much as \$2 an image or more. With Merlin there are never any additional charges. .

The Complete Flight Deck

The GPS and moving map displays that are available in many aircraft today have brought an unprecedented level of position-oriented situational awareness to cockpits. These innovations have saved hundreds of lives. With GPS, aircraft position, altitude, speed, direction, and other flight information are more accurate than ever before. In some aircraft Traffic Collision Avoidance Systems are available that can warn pilots of impending traffic conflicts. For aircraft that have them, on-board weather radar and lightning detection equipment provide information about the weather situation near the aircraft. However, even with the widespread adoption of these technologies, the full situational picture is incomplete. The weather affects every aircraft and yet to-date there is no means to provide pilots with a comprehensive weather picture. The method currently used, that of radioing FAA flight service station or ATC, has not changed in 50 years and requires pilots to visualize the verbal summaries they are provided from the ground. Weather delivery methods that have been proposed or that have recently been placed in service are expensive, have limited coverage areas, and provide limited data. What is needed is a means of delivering a wide variety of weather information in a timely manner and then displaying it in familiar formats on existing multifunction displays. Merlin meets this need. In conjunction with the other navigation and situational awareness systems on the aircraft, Merlin provides a complete situational awareness presentation.

Merlin's ability to provide instant access virtually everywhere to an enormous variety of weather information sets the system apart from all of the current aviation weather delivery systems. Merlin is the best tool for getting full color weather information to pilots. By joining together the capabilities of digital direct broadcast satellites and recent refinements in computing and receiver technologies with the finest weather and ATC information sources, SATELLINK is delivering real-time information into the cockpit everywhere – continuously, autonomously, efficiently.