

datalink

XM and Sirius target aviation with low-cost satellite services

by Stephen Pope

XM Satellite Radio has Oprah and the Opie & Anthony Show. Sirius Satellite Radio has Martha Stewart and Howard Stern. Now each is diving headlong into the market for aviation weather datalink services, and pilots couldn't be happier. XM was first on the

scene with its "always on" weather service for aviation, available over much of North America for monthly subscription prices starting at about \$30. The XM WX service offers a comprehensive menu of weather data products, which are broadcast continuously—in five- or 12-minute bursts—and can be received in flight by a host of panel-mount and handheld avionics.

Rival Sirius announced its service in February, saying it plans to link up with aviation weather specialist WSI to bring a suite of hardware and data products to market under WSI's InFlight banner. And while XM's weather service has been live for about two years, Sirius plans to catch up fast by activating its rival service later this year, after a full-out marketing blitz by WSI at EAA's AirVenture fly-in and airshow in Oshkosh, Wis., this July.

At least initially, the Sirius service will be available only to buyers of WSI's InFlight data hardware. This puts it at a slight disadvantage to the XM offering, which besides arriving first can also be accessed using a broader range of receiver equipment, multifunction displays and handheld devices. Also a potential impediment to the Sirius service, current WSI InFlight customers must migrate from their present hardware to the new Sirius-enabled boxes, putting WSI in the uncomfortable position of having to convince subscribers to pay extra for something they already have in their airplanes.

"We are absolutely concerned that we will lose customers in the transition," said Jim Menard, general manager for transportation at WSI. "Obviously we want 100 percent of our current customers to come over, but we know we won't get 100 percent." Menard said WSI is being proactive with subscribers by sending out letters and creating special promotional offers to entice InFlight users to stay with WSI.

On the plus side, switching from the current satellite that broadcasts WSI InFlight data to U.S. customers to the Sirius satellites will expand the service coverage area and allow WSI to move ahead with plans to roll out additional services in the near future.

What else WSI has going for it is, well—it's WSI. Apart from the cachet of being a sister company of The Weather Channel and counting among its clients CNN, Fox News, NBC, American Airlines, Delta and FedEx, WSI's Pilotbrief weather kiosks are a fixture at FBOs, well known to corporate pilots across the country. With the rollout more recently of the Pilotbrief Online service, WSI has made a strong push into the dispatch and flight-planning offices at many top corporate aviation departments as well,

special report

weather

firmly establishing the company as a top player—if not the top player—in the industry.

The move by Sirius into the weather arena had as much to do with its burning need to keep up with XM on all conceivable technology fronts as it did with WSI's desire to find a better satellite platform on which to host its service. WSI currently uses the MSat II satellite, launched and maintained by a company called MSU, to broadcast its InFlight products. Besides being a better "pipeline" for data, the Sirius satellites have highly elliptical orbits that allow them to reach farther into Canada and deeper into the Caribbean.

A factor that could play into InFlight subscribers' decision about whether to migrate to the Sirius-based service or consider other options is the current mix of products WSI offers to datalink weather customers. Co-developed with NASA, the graphical maps available to pilots include WSI's NOWrad mosaic, which uses sophisticated computer algorithms and "on-the-fly" decisions by WSI meteorologists before the images are transmitted, ensuring that the graphics received in the cockpit are as accurate and "clutter free" as possible, according to the company.

Additional InFlight weather products include graphical Metars and TAFs, graphical sigmets and airmets, continuously updated pilot reports, winds and temperatures aloft with hourly updates, lightning strikes and graphical depictions of the latest TFRs. WSI offers a number of InFlight service plans, with the mid-level Aviator package costing about \$50 a month, and the full suite of products under the Corporate package priced at \$999 a year. The Aviator package includes everything the Corporate plan does, with the exception of TFRs, pireps and winds and temperatures aloft, although the TFRs and pireps can be added *a la carte* for about \$8 a month extra.

Pricing for InFlight services after the transition to Sirius has yet to be announced, Menard said, but subscriptions are likely to run about the same after the switch. Hardware needed to receive the Sirius weather feed also should be in line with current pricing, which runs about \$5,000 for the InFlight receiver and antenna. WSI plans to broadcast weather data over the MSat II satellite until May 1 next year. Current AV100/AV200 InFlight systems will be deactivated on that date. Rebates on new AV300/AV350 hardware will be offered to buyers turning in old equipment.

For many the logical alternative to the WSI/Sirius service is XM's weather offering. The team at XM linked up with WxWorx in 2003 to make the service a reality. Robert Baron, president of WxWorx and an avid pilot, said a good deal of the credit for transforming



Datalink Nexrad weather graphics are compatible with a wide variety of cockpit displays, including MFDs from Chelton Flight Systems, Garmin and Avidyne, pictured above. One of the most popular datalink weather services, XM WX, starts at about \$30 a month.

the satellite radio company into a niche provider of satellite weather data belongs to XM president and CEO Hugh Panero and chief programming officer Lee Abrams (who owns and flies a Cirrus), who saw the benefit of XM's unallocated satellite bandwidth being put to another revenue-producing use.

Rock and Roll and a Bolt of Lightning

Like the proposed Sirius service, XM WX operates by transmitting data over the satellites that carry the satellite radio content. XM's satellites (one in the East called "Rock" and another in the West named "Roll") provide redundant signal transmission in the S-band wavelength, which is impervious to weather. XM WX data is broadcast continuously and can be received anywhere over the continental U.S. and coastal waters.

XM offers two service tiers for pilots, Aviator and Aviator LT. The full Aviator package costs \$49.99 a month and includes Nexrad graphics, Metars and TAFs, airmets and sigmets, freezing levels, cloud echo tops, storm tracks, surface analysis charts, winds aloft, lightning strikes, satellite mosaics and TFRs. For \$29.99 a month, the Aviator LT plan provides Nexrad images, Metars, TAFs and TFRs.

A variety of receivers and antennas are approved to operate with the XM weather service. The Rockwell Collins Pro Line 21 integrated avionics system on the high end of the spectrum uses a Heads Up Technologies XMD100 receiver and Comant antenna to display the weather graphics on an MFD. Avidyne also uses a Heads Up Technologies receiver and Comant antenna for displaying the graphics on its Flightmax displays and Entegra cockpit, while Garmin has developed a receiver and antenna of its own. XM weather can also be received by Garmin's GPSMap 396 handheld navigator and a variety of electronic flight bag (EFB) tablet computers and even PDAs.

The Sirius/WSI service, meanwhile, will be accessible on panel displays from Chelton Flight Systems, Garmin, L-3 Avionics Systems, Sandel Avionics and Universal Avionics, as well as on a number of portable EFBs.

Recent demonstrations of XM WX on a Garmin GPSMap 396 and in Piper's Meridian turboprop with the Avidyne Entegra cockpit illustrate why the service has proved so popular so far with pilots. While competing products in the category of Bendix/King's FIS (flight information services) ground-station datalink weather offering

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Garmin's GPSmap 396 handheld navigator features an integrated XM antenna and receiver.

► *Continued from preceding page* or the Orbcomm satellite service through Echo Flight provide adequate and affordable options, XM's and WSI's services are in another class altogether.

During the recent flight in the Meridian, a lone storm cell near the route of flight (in eastern Pennsylvania near Wilkes-Barre) managed to sprout despite an area-wide high-pressure system that was otherwise keeping the broken cumulus in check. On the Entegra MFD, the cell appeared precisely where it should have on the moving map, 20 or so nm east of the Meridian's magenta course line. What's even more impressive, however, is that this tiny storm cell would have been visible on the flight display 50 nm away, 250 nm away or clear across the country.

The Coolest XMWX Receiver on the Planet

An option for datalink weather that completely tips the scale for its coolness factor alone is the PDA-based Anywhere-WX system pioneered by a company called Control Vision. And while weather data on a Pocket PC might seem out of place in the button-down world of business aviation, Control Vision's AnywhereWX and Anywhere Map suites of products are absolutely worth a second look depending on an operator's needs and budget. The reasons are the data delivery method (XM WX), the system's wireless receiver technology (Bluetooth) and the display options (everything from PDAs to tablet EFBs).

Oh, and then there's the price. On the low end of the hardware spectrum, for about \$1,700 buyers get a complete AnywhereWX system, including the satellite receiver, antenna and PDA, all wirelessly connected using cockpit-safe (according to chip maker Intel) Bluetooth technology. On the high end, Control Vision offers Anywhere Map Pro EFBs, ranging in price from about \$2,900 to \$4,300, including the wireless GPS and XM antenna/receivers. The AnywhereWX

Weather images can also be shown on many EFB computers.



package can be bundled with Anywhere Map software and "Pocket Plates" electronic charts, which satisfy Part 91 requirements for operating paperlessly.

Sure, XM and AnywhereWX are cool, but the real point worth considering is that the combination is usable in everyday operations. Where the Bendix/King FIS and Echo Flight Orbcomm network's graphics appear as blocky, poorly defined pictures on a cockpit display, the XM graphics (as well as WSI's InFlight service) are smooth contours providing a highly precise picture of where the weather is—or, more accurately, where the weather was 10 or 15 minutes ago when the government Nexrad radar site took its snapshot.

This last point is an important one to consider. Unlike the live views provided by airborne weather radar systems and lightning strike finders, datalink weather information received in the cockpit is always "old" information, with the age of the data dependent on how long it took for the information to go from the radar site on the ground to the National Weather Service's main computer network and then out to the content provider. By the time the content provider turns around the data, it will be at least five minutes old and often five to 10 minutes older than that.

This is true for all datalink weather services, which collect, analyze and disseminate information primarily from government-operated sources. But as long as pilots understand that the weather information they are receiving is more for strategic planning rather than tactical decision-making, these tools can be invaluable.

The FAA in particular is interested in datalink weather as a way to reduce the GA fatal accident rate. A NASA study in 2001 pointed out that 85 percent of aircraft accidents from 1990 through 1996 involved light general aviation airplanes. Weather was a factor in nearly a third, equating to approximately 11 weather-related GA accidents per week, with four of the 11 involving fatalities.

The figure paints a stark picture of the need for better cockpit weather tools for aviators, especially those who fly small GA airplanes. Still, the need for strategic and tactical weather information in the cockpits of business jets and turboprops is equally important. In an era when The Weather Channel and meteorology-specific Web sites are available to passengers in the cabins of modern business airplanes, it's obvious that the pilots in the cockpit should have access to equally good information.

Global Weather Requires a Global Approach

Thankfully, satellite and VHF datalink technology has matured to the point that weather data can be streamed to the cockpit pretty much anywhere the airplane might be flying, even over the poles thanks to the Iridium satellite constellation. A name well known in corporate aviation

NASA Turns Regional Airline Turboprops into Flying Weather Stations

Notwithstanding this spring's violent (and numerous) tornadoes, forecasters in the Midwest are able to make more accurate local weather predictions thanks to an airborne sensor being tested by NASA's aviation safety program. Researchers at the agency's Langley Research Center in Hampton, Va., leading a team that has installed so-called tropospheric airborne meteorological data report (Tamdard) instruments on dozens of Mesaba Saab 340s, are turning the regional airliners into veritable flying weather stations.

The Tamdard instrument allows aircraft to sense and report atmospheric conditions automatically as they fly. A satellite transmits the airborne, real-time observations to a ground data center that processes and distributes up-to-date weather information to forecasters, controllers and pilots.

"Initial research shows the airborne sensor makes a 10- to 20-percent improvement in forecast error in numerical models, and that's just with temperature," said NASA project leader Taumi Daniels. The onboard sensor also measures humidity, pressure, wind, icing and turbulence, as well as GPS-derived location, time and altitude data.

According to Jay Ladd, the president of AirDat—which makes and supplies the airborne sensor system—regional aircraft are a desirable platform for the sensors because they typically fly below 25,000 feet and have frequent cycles each day. This application, Ladd said, dramatically increases the number of observations in

the lower atmosphere, with the Mesaba experiment contributing 800 daily atmospheric soundings. Contrast this with the data received by a mere 70 weather balloon sites in the continental U.S. that collect temperature, wind and moisture data from twice-daily atmospheric soundings and the potential benefit of Tamdard becomes clear.

Since the Mesaba fleet was fitted with the AirDat equipment in January last year, "Meteorologists at the National Weather Service have found the tropospheric airborne meteorological data [from the Mesaba aircraft] to be useful in forecasting severe thunderstorms, dense fog, the precipitation types of winter storms and low-level wind shear," said National Weather Service meteorologist Richard Mamrosch.

AirDat's goal is to expand the geographical coverage of the airborne sensor network, Ladd said. Horizon Air will soon be equipping its regional turboprops with the 6.5-pound sensor system, which includes both the sensor and a two-way satellite communication/datalink system. Regional aircraft aren't the only suitable platform for the airborne sensors, according to Ladd. He cited fractional fleet aircraft and air-taxi operations as possible candidates for the devices because such operations involve "a lot of landings and takeoffs." In fact, Ladd said he's talked with air-taxi start-up DayJet about equipping its Eclipse 500s with the AirDat airborne sensor package.

The system can also be used for real-time tracking of company aircraft, as an "ACARS-like" communication system and to downlink maintenance data. Besides adding no drag or weight penalty, the package's communications system antenna provides a double benefit since it can also be used as an antenna for satellite (XM or Sirius) graphical weather services.

Ladd added that the package is not limited to the above-mentioned uses because the AirDat system can obtain and process any data flowing over the Arinc 429 busses, in addition to data from the airborne weather sensor. This, he said, makes for a flexible system that can handle almost any data-gathering or data-processing request. —C.T.



NASA researcher Taumi Daniels checks the weather sensor installation in a Saab 340, left. Mesaba's fleet has been fitted with the devices.

circles for its trip support services, Universal Weather & Aviation has been offering in-flight weather for years through its UVdatalink service. Designed to operate over a standard ACARS or satcom link, the service was revolutionary for its time, allowing pilots to upload color weather maps to the flight deck for display on a Universal Avionics FMS CDU screen.

That's not to say UVdatalink is past its prime. Quite the contrary, for access to global weather information backed by

live support from trip-planning specialists and even staff meteorologists, Universal Weather & Aviation remains among the most popular sources for datalink weather and related trip-planning service for business aviation customers.

Besides the usual color weather maps, Metars and TAFs, Universal's In Flight Alerts service, launched earlier this year, allows the flight crew to keyboard free text e-mails to staff meteorologists. The pilots

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could have questions about weather at the destination airport in Italy or they might need to divert to Greece. Once an e-mail is sent, the pilots will receive an acknowledgment in three to five minutes and an answer to their question minutes later.

Another big advantage of UVdatalink is its ability to supply international weather maps using an onboard ACARS link, Inmarsat satcom link or even Iridium's low-earth-orbit satellite network. Maps are available for any region of the world. Because of the slower data rates of ACARS, full-color maps take a couple of minutes to download, but the extra time is a small price to pay for the information the worldwide charts contain. UVdatalink is compatible with Universal Avionics' UNS-series flight management systems, Teledyne Controls' TeleLink system on the Boeing Business Jet and Global Express, Rockwell Collins' Pro Line 21 cockpit or any other open-architecture ACARS unit.

Brian Allen, marketing and sales manager for Universal Weather & Aviation, said the company has an advantage over those that provide strictly weather data for its ability to provide customized information to pilots.

"Our customers are often looking for route-specific information not only relative to weather, but also for new notams, rerouting around tropical events, volcanoes or for security situations," he said. "We also monitor the airplane's departure, destination and alternates, and our meteorologists and trip-planning specialists can free-text the airplane an e-mail message if there's something the crew needs to know about."

Universal's UVdatalink services range from about \$5,000 a year on the low end to about \$13,000. For that price, depending on the service options a customer chooses, the flight department has 24/7 access to trip support, fuel orders, flight planning and other services. The price a particular customer will pay is based on a menu approach, where additional services raise the yearly price.

More than 450 airplanes are equipped with UVdatalink hardware, and about 400 of those are business jets, Allen said. The company has 60 full-time meteorologists on staff and is adding new services to its weather menu. One is a traffic flow management bulletin service that can keep the crew apprised of airport delays, which are often caused by bad weather. The company is also in the process of designing new types of weather map, one of them a vertical chart that can show multiple weather phenomena simultaneously, including winds aloft, turbulence for a given altitude and icing.

Other datalink weather services for business aviation are tailored around full-service airborne communications packages. Honeywell Global Data Center (GDC) provides AFIS and satcom flight support services, including Flight Sentinel, designed to provide business jet operators with the latest information about weather and ATC delays. Like Universal Weather, Honeywell offers multiple service plans providing air traffic services, worldwide VHF and sat-

com communications, international flight planning, graphical flight following, text and graphical weather and access to GDC staff 24 hours a day.

Subscribers to Honeywell's premium package service pay about \$100 a month for AFIS graphical weather. If the aircraft flies outside its basic VHF area, the cost is an extra \$12.50 a chart. For many subscribers, the base area includes all of North and South America, according to Honeywell.

Honeywell's datalink weather services provide a comprehensive menu of products, including historical Nexrad replay, significant weather charts, winds aloft, area forecasts, notams, pireps, Metar/TAFs and other data. With the Flight Sentinel service, GDC staff provide continuous monitoring of all customer flights, and can notify crewmembers of new TFRs and severe weather, and provide alternate routing to circumnavigate storms or turbulence.

As far as additional datalink-weather-only options are concerned, XM and WSI have really put a stranglehold on the market, so much so that the rival services that showed early promise are fading today, at least in bizav circles. The Honeywell Bendix/King FIS service uses a nation-



The datalink service broadcast by Sirius will use a WSI InFlight receiver and antenna.

wide network of FAA-maintained ground stations—which cover most populated areas in the continental U.S., but when flying beyond the range of the FIS ground stations or at lower altitudes in some areas, the coverage gaps mean having to do without data. On the plus side, as part of Honeywell's contract with the FAA text weather reports are provided free of charge. Nexrad and other maps are offered in tiers priced at \$49 and \$69 a month, based on an annual subscription.

Echo Flight, operating over the Orbcomm low-earth-orbit satellite network, provides good coverage, but unfortunately suffers from a data pipe that can shovel only 980 bytes per packet. What that means in layman's terms is that the Echo Flight data stream simply can't come close to matching XM or WSI/Sirius in terms of richness of detail.

The company, down to just four employees, is struggling to survive, but considering that Echo Flight has about 1,500 current subscribers it may be able to live on for some time. Several service plans are offered, from a \$49.99 a month subscription providing the full menu of Nexrad maps and text reports to a pay-as-you-go service, in which maps and Metar summaries cost \$1 each after subscribers pay a quarterly fee of \$29.85. □