

Weather Information in the Cockpit

Don't Leave Home Without It

BY DALE SMITH

The National Transportation Safety Board recently issued a safety alert regarding thunderstorm encounters, highlighting the need for pilots on IFR flights to actively maintain awareness of any severe weather along their route.

According to the NTSB's safety alert, a number of recent fatal accidents appear to have been caused by in-flight encounters with severe weather. The critical point is, these flights were operating under instrument flight rules and the pilots were in contact with ATC at the time of the accidents. The NTSB safety alert can be downloaded at www.ntsb.gov/alerts/SA_011.pdf.

The bottom line is, each pilot needs to understand that avoiding severe, or any other weather, is his or her responsibility. Controllers can only do so much to help; their primary responsibility is to keep IFR aircraft separated.

Besides, with all the different weather display options available in the cockpit today, the information available to pilots might be better than what a controller can give them.

Weather Avoidance: Tools of the Trade

With weather available on TVs, laptops, iPhones and various cockpit

displays, there's no reason not to know what weather's waiting along your flight path and how to avoid it. Remember, however, these tools are for avoiding severe weather; they are never to be used to penetrate storms. That's a mistake too many pilots make only once.

Weather-avoidance tools come in two types: strategic and tactical. Airborne radar and lighting-strike finders are tactical because they give up-to-the-minute information about weather in the aircraft's immediate vicinity. Up-linked weather, such as what you see on TV, your computer or a data-link receiver is strategic because the information it displays is at least 5 minutes old.

"People who fly with a Stormscope or, better yet, a radar system under-

stand the differences of each system," said Mike LaConto, avionics manager for Epps Aviation in Atlanta, Ga. "But the part they seem to like about the data-link weather is it can see past a row of thunderstorms and help them strategically plan 300 or 400 miles down their route.

"I think data-link is definitely a complement to an on-board system — not a replacement. The ideal situation is to use all three systems in combination to get a more accurate presentation of the weather," he said. "Sometimes, amongst the users, there can be an over-reliance on the data-link weather. That's one thing we



L-3's Stormscope WX-500

try to caution against. The data-link information can be anywhere from 5 to 15 minutes old. It's a strategic planning device, but it's not meant for trying to penetrate a line of thunderstorms or maneuver in adverse weather."

LaConto thinks it is important for pilots to fully understand the capabilities of the system they are purchasing. "Each has its strengths and weaknesses," he said. "There can be several considerations in selecting the right system: A is their budget; B is the type of flying they do. We try to determine what best fits their needs and aircraft type."

While LaConto believes having all three systems is the best solution, budgets and aircraft configurations often put radar out of the picture. Next in line would be a combination of a strike finder and a data-link receiver.

Of course, with money being tight, the majority of Epps' customers simply are buying some kind of data-link receiver. It's better than nothing, but LaConto cautions against relying too heavily on what it's showing.

"I know people try to use data-link as their all-inclusive system and have gotten themselves in trouble because the picture they were seeing was not, in fact, what was the reality in their situation," he said. "Especially here in the Southeast and Florida, summertime thunderstorms move fast. It's a completely different picture in a matter of minutes."

This lack of understanding highlights the need to make sure pilots know how to properly use their new weather avoidance tools — or, at the very least, understands what the unit cannot do.

"Of the three systems, data-link is probably the easiest to use — it's the most intuitive," LaConto said. "It's just like watching 'The Weather Channel.'



Avidyne's TWX670 tactical weather detection system



They're familiar with METARS, SIGMETS, AIRMETS — things like that — and they generally walk their way through the information.

"When it comes to using radar and Stormscopes, I find there's a large gap in their knowledge and their ability to use the system well. It's generally because they have not taken the time to get the proper training on how to use their system," he said. "We're not in the training business, but we explain the basics and can help them find training if they want it."

Airborne Weather Radar

While upstart data-link weather has put airborne radar in the proverbial back seat, there's no denying, when it comes to real-time weather information, nothing is better than on-board radar. It's too bad the need for a large antenna means radar can't be installed in today's new piston singles.

However, if you're flying a single that can handle an antenna pod or a mid-size or larger piston twin, radar is an invaluable tool, as pilots familiar with Honeywell's RDR 2000 or Garmin's GWX 68 will attest.

Today's digital radar has much more to offer than the old analog monochromatic units. These systems

feature more powerful, more reliable magnetrons, which give incredibly accurate displays, and they enable features, such as attenuation compensation, to show the "storm behind the storm."

Another advantage is they display rainfall rates in four colors, so it's easy to see where the really bad weather is located. The multiple-color indications also make it easy to spot areas of strong rainfall rate variations. The more dramatic the variation, the better chance a pilot will encounter significant turbulence in those areas.

Both Avidyne and Garmin glass displays interface with many popular radar systems to deliver real-time weather on the MFD. When you get into the really high-end radar systems, you also can take advantage of Doppler turbulence and predictive wind-shear detection capabilities.

To reduce pilot workload and improve the accuracy of displays, many systems also feature antenna stabilization and automatic antenna tilt control to help eliminate false ground returns.

Lightning Detection Systems

At first glance, some of you might be surprised to see lightning detec-

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tion or “strike finders” listed with weather-avoidance products. True, there are times when there can be torrential rainfall and no lighting, but there just as easily can be rapidly building storm cells with significant electrical activity well before the precipitation begins to fall.

Using the principle of sferics — a term relating to an atmospheric electrical discharge, such as lightning — sensors pick up the sferics data, create a 3-D energy plot and display the relative bearing and range to these “strikes” on the aircraft’s display.

Some data-linked weather packages offer lightning displays, but you should be careful. The lightning strikes are picked up from ground-based sensors, so data-link lightning has the same 5 to 15 minute latency issue as the weather.

High-end lightning detection systems, such as L-3’s Stormscope — the product synonymous with lightning detection — not only shows the strikes, but it can also be used to help spot areas of building storm activity. Stormscope’s “strike rate indicator” displays the approximate

number of strikes per minute. An increasing number would signify a building storm, while a decreasing number would indicate the likelihood of the storm’s dissipation.

Avidyne recently kicked lightning detection up a notch with the introduction of its TWX670 with color-lighting display. The unit uses varying colors to show the “shape and intensity of the storm.” In its TWxCell mode, color-filled hexagons highlight the most intense regions of thunderstorm activity.

Data-Linked Weather

Here’s how data-linked weather works: NEXRAD radar storm images, along with other types of related data, are collected from a variety of government and private sources. Then, this information is compiled by the service provider and up-linked to a satellite. The final step is transmitting the data to the aircraft.

All totaled, the process takes anywhere from 5 to 15 minutes from the time the information is collected at the NEXRAD site until it is displayed in the cockpit. Because of this information latency, it’s important for pilots to keep a safe distance between their aircraft and any en route weather indications.

When pilots do call ATC for weather updates, the controller is working with past data, which is another good reason to have all the information possible in the cockpit.

Data-linked weather is delivered to your cockpit by a subscription service, such as XM WxWorx on Wing or WSI InFlight/Sirrius. Which service is right for your customers? Both services have their own unique features, services and capabilities. But it pretty much starts with what equipment they have installed or want to buy.

As fast as technology is changing, by the time you read this, some OEMs might well have software patches allowing either hardware to work with either satellite system. This is especially true now that XM and Sirius are part of the same company.

No matter how you dice it, both XM and Sirius offer a host of great capabilities for pilots, but at a cost. And it’s a good idea to research that cost and relate it to how much flying you’re really going to do before you invest in a satellite weather system.

But with the ability to deliver excellent weather information on a seemingly endless array of displays — everything from an iPhone to a panel-mounted MFD — data-linked weather

Fly Weather Smart

Here are some tips from the NTSB to help keep you safe when flying in the vicinity of severe weather:

- Severe weather avoidance is the pilot’s responsibility.
- The primary job of ATC is to keep IFR aircraft separated.
- Depending on the type of equipment available, the precipitation detection and display capabilities of ATC facilities varies from poor to excellent.
- Approach-control radar systems provide near-real-time weather, while en route centers receive weather radar information from the National Weather Service, which can be up to 5 minutes old.

- Make sure your ATC weather advisory includes the location, extent and intensity of radar-observed participation.
- If you have any uncertainty about whether or not a course change will keep you clear of convective weather, ask the controller for verification.
- Actively give pilot reports. Controllers use them to confirm their weather radar depictions.
- Pay attention to SIGMETs and Weather Center advisories, and obtain further details from HIWAS of Flight Watch if the advisory is anywhere along or near your route. □

has earned its place alongside TCAS, TAWS and GPS as a key to improving flight safety.

In fact, aside from the signal-latency issue, the only real drawback to data-link weather has been its geographical boundaries. While there are territorial differences in the providers, the packages are available in the continental U.S., Canada and some areas of the Caribbean — the same areas covered by the XM and Sirius satellite systems providing the services.

The good news is the data-link business is changing as fast as the weather. Avidyne recently made data-linked weather a global tool by introducing its MLX770 data-link transceiver. The system uses the global Iridium satellite network to deliver WSI aviation weather to Entegra-equipped aircraft operating throughout the world.

The More Weather the Better

Even with Epps' overall avionics business being down, LaConto said cockpit weather equipment, especially data-link, is still selling well.

"I would say it's 80 percent data-link, 10 to 12 percent weather radar, and the rest Stormscopes," he said. "A lot of aircraft are already equipped with radar and Stormscopes.

"Besides, I think a lot of people are reading about data-link, so the demand is still high. And, like I said, pilots are buying (data-link) to complement their existing (radar or strike finder) systems."

And this is the solution LaConto believes is the best of all. "If you're going to fly in weather, you need the best picture you can have to make the best decisions you can make," he said. □

Weather Mapping & Radar

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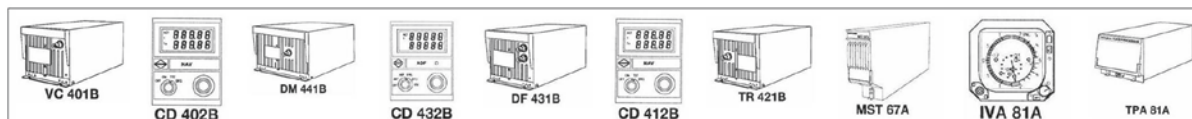
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