The following two-part article appeared in the December 2016 and February 2017 editions of CESSNA OWNER magazine, the official publication of the Cessna Owner Organization.

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Flying is all about avoiding something: the ground, obstacles, the occasional flock of birds, controlled airspace (unauthorized), TFRs, drones, ridicule from fellow pilots in the airport lounge because of that not-so-good landing and, of course, other aircraft and “mean” weather.

Any one of these can ruin your day (or worse!), but ADS-B has put the emphasis on the latter – weather (WX) and traffic.

Some pilots, especially those on a budget, moan about the expense of adding ADS-B to their aircraft to meet the pending ADS-B requirement. The fact, however, is that many owners who could never afford the benefits of traffic or WX in their cockpit will now have it. Moreover, they’ll have it at a price point that is considerably less than previous options, and that, in my opinion, is a good thing.

As you probably know, when I’m not writing articles I’m usually offering avionics advice to aircraft owners. I get about two requests per month from owners seeking my independent advice prior to making an avionics purchase. As a result, they walk into their local avionics shop with their eyes wide-open – and their wallets protected – simply because they’ve become educated buyers. This is essentially the same thing I try to do in my articles.

Recently, the owner of a well-equipped, late-model Piper Saratoga came to me for advice on how to address ADS-B “Out.” The aircraft already had just about everything he would need (except for WAAS), but it also had both active WX and traffic avoidance installed.

Since his plan is to upgrade to a turbine aircraft in a year or two, my advice was to be very conservative. Nevertheless, I took the opportunity to point out the significant advantages that he already had in his aircraft with regard to WX and traffic. In fact, I actually showed him some features in his existing “avoidance” equipment that he was unaware of.

Ultimately, this got me thinking about “active avoidance.” While ADS-B will provide pilots with a more affordable way to avoid WX and traffic, I had to ask myself the following question: “Is it really the best way?”

Let’s take a look.
ADS-B is one element of the FAA’s NextGen upgrade to the country’s aging air traffic control system, a system currently based on ground-based radar. NextGen will move us towards satellite-based technology, hence less dependence on the air traffic controller on the ground.

Simply stated, ADS-B will allow aircraft to communicate their position, altitude and velocity to other aircraft, thus making us safer, while at the same time, allowing for less separation between aircraft. Of course, it’s important to note that while we all want to be safer in the air, allowing more aircraft in a given airspace is a much bigger deal for the commercial aviation market where time is money and delays are costly.

It is been suggested that this decision to use two frequencies is based on a concern about frequency congestion. There’s no question that there is more aviation activity in the U.S. than abroad, but this creates an interesting problem nonetheless.

Since we want aircraft to “talk” to each other, how does a commercial aircraft flying below 18K and/or in terminal operations communicate with a Cessna 172 or Piper Archer operating on 978 when the former is operating in 1090 only?

The answer: from an ATC rebroadcast sent from an ADS-B tower on the ground.

**HOW IT WORKS**

**ADS-B Traffic**

ADS-B is or will be a worldwide event, but while the rest of the world has settled on 1090 MHz as their assigned ADS-B frequency for all aircraft and transponders, the FAA has chosen to separate commercial traffic (or any aircraft flying above 18,000 feet) to 1090 MHz for ADS-B/transponders.

As for aircraft flying below 18,000 feet, they will be encouraged to use Universal Access Transceivers (UATs) operating on 978 MHz with their transponders still on 1090 as present. Note: Your mode C transponder will still be required and will serve as a backup to ADS-B. The new Mode S transponders still maintain mode A and C capability.

We are told this rebroadcast will happen within seconds of the initial broadcast by either aircraft. Still, you can probably see how this can create a potential problem, as terrain (line of sight) or other factors could affect that rebroadcast. Note: If you’ll spend all your time below 18K, you fly in a busy traffic area, and you are still contemplating your investment into ADS-B, you might want to consider one of the more expensive “dual frequency” UATs out there. You’ll know you’re getting the complete traffic picture and you’ll get it a little faster. A dual frequency UAT broadcasts on 978 MHz but receives on both 978 and 1090 MHz.

As of this writing, less than 20% of the GA fleet is equipped for ADS-B “Out,” yet many pilots are flying around with portable non-certified ADS-B “In” receivers and trying to take advantage of the free traffic and WX provided. There’s a good chance you are one of them. If so, this is a good time to remind you of the downside of depending on ADS-B “In” for traffic without providing an ADS-B “Out” signal.

Unlike the free WX (FIS-B) that is constantly broadcasted to an aircraft that has an ADS-B receiver and is within range of a ground station, ADS-B traffic is a custom report that is only sent to aircraft with ADS-B “Out.”
This “report” is triggered by your ADS-B “Out” signal. If you happen to be in range of that aircraft (and the ADS-B Tower) and don’t have ADS-B “Out,” you may receive that traffic report. If, however, your aircraft is not in range of that ADS-B “Out” equipped aircraft, then there’s a chance you won’t be warned of traffic in your area. This includes all of those other aircraft with ADS-B “In” receivers but no ADS-B “Out” capability.

TIS-B traffic (Traffic Information Service) information can also be affected by this. In my opinion, TIS-B traffic has always had its flaws. It was touted as a cheap traffic solution when manufacturers introduced the first generation of enhanced Mode S transponders, like the GTX-330. This should concern you.

If you’re not aware of this situation and want to know more, here’s a link: http://bit.ly/2dJYEXL. (Thanks, by the way, to Sporty’s iPad Pilot News for their very in-depth coverage of issues regarding the use of iPads and portable ADS-B “In” equipment. If you’re considering adding an iPad or similar smart device to your cockpit, Sporty’s is the information source!)

**ADS-B Weather**

For many, this is the big deal with ADS-B – weather without the expense of a subscription!

FIS-B (Flight Information Service) weather is essentially datalink WX and is available to any aircraft that has an ADS-B receiver (either portable or certified) and is in range of an ADS-B tower. However, unlike all the datalink WX providers in the country that provide this information via satellite, ADS-B WX is transmitted from a ground station so you must be in range and have line of sight. As an old British playwright would say, “There’s the rub.”

You may be denied this information if you’re too low in terrain (not a great idea) or too far away. Same goes if you’re about to take off in bad weather and hope to see the WX picture prior to actually taking off – it may not be there.

Don’t get me wrong; ADS-B is a good thing for aviation, especially for the “have-nots.” Who are the have-nots? They are pilots who don’t have the benefits of active traffic and WX in their aircraft. Unfortunately, this is often a budgetary thing.

While it would not be entirely accurate to call ADS-B WX and traffic “passive,” there is an inherent dependence on others (and other equipment) that can get between you, the traffic and the weather. Conversely, having an “active” system lets you eliminate the middleman so to speak.

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**ACTIVE AVOIDANCE OF TRAFFIC AND “MEAN” WEATHER**

### Active Traffic

Onboard Traffic Avoidance Systems have been around for a long time and run the gamut from cheap, portable, dash-board-mounted units to the very expensive Class A TCAS systems installed in commercial aircraft.

The portables tell you where some of the traffic is and, in my opinion, this can lead to a false sense of security. I believe this is true of any system that cannot show you the whole traffic picture. You’d better keep your head out of the cockpit!

The commercial TCAS systems found on larger charter aircraft and “heavy metal” not only tell you where the traffic is, but they tell you how to avoid it when seconds count. These systems easily exceed a $150,000 investment, but that’s not what we are talking about here. Many of the early traffic systems for GA were passive and required ATC to activate transponders in your area. Obviously, this fell short of the goal of having an onboard, reliable traffic system.

### How an Active Traffic System works

An active traffic system for GA aircraft uses the same radar beacon technology that we have used for years to separate traffic. However, instead of being interrogated by ATC, the active system in your aircraft operates independently from ATC and “pings” aircraft in your vicinity by sending out its own signal.

Transponder-equipped aircraft within range respond and the resulting response is displayed in real-time, either on a self-contained traffic device’s display or with remote traffic systems on an MFD (Garmin, Aspen or Avidyne, etc.) or GPS navigator (like the Garmin, Avidyne or Bendix King units).

Aircraft that are not equipped with transponders will always represent another issue, but the looming ADS-B requirement will severely limit where these aircraft will be in 2020. (Too bad, I guess; low and slow is still some of the best kind of flying!)

Regardless, this raises another important point about active traffic systems: they work everywhere. Remember, there are some places where ATC has no coverage and where ADS-B will have limited or no coverage. Even in these places, an active traffic system will still work.

### Traffic Avoidance Equipment

A number of manufacturers make active traffic systems (TAS or Traffic Advisory Systems) for GA aircraft. For example, BF Goodrich (now L3 Communications) introduced their SkyWatch system in 1996 and it has remained one of the most popular systems.
The original SkyWatch system utilized its own 3 1/8 display (much like a stormscope), but the advent of MFDs and large format navigators (like the GNS-530) eventually allowed traffic data to be displayed on the big screen and overlaid on the map, certainly a significant improvement in traffic awareness.

The SkyWatch was a pretty expensive add-on to your panel at the time. Ryan International introduced a less expensive, albeit passive option in 1998. Dr. Paul Ryan, not to be confused with our current “Speaker of the House,” (No politics here. You don’t want to get me started!) had invented the first stormscope and was then entering the traffic arena.

The Ryan 8800 and 9900 TAS units were passive in that they required ATC to trigger the transponder-equipped aircraft in your area to respond. The Ryan TAS units would then receive and display the information on either a separate three-inch ATI display (the size of a GPS annunciator) in the case of the 9900 or on the face of the unit itself in the case of the lower priced 8800. While these units were significantly less expensive than the SkyWatch product, they were passive and, therefore, not as reliable. (I guess you know how I feel about that by now!)

Ryan would go on to introduce the 9900BX, a fully active system. Then, in 2005, Avidyne purchased Ryan International and the 9900BX design and it became the foundation for their very popular TAS series.

To me, the TAS600 was a vast improvement and one of the most significant features was its audio output. While other systems simply reported traffic in your headset, thus requiring you to look at the screen to see where the traffic was, the TAS600 (and all its bigger brothers since) actually say “Traffic, One O’clock High,” thus telling you where to look for the traffic without having to visit the display first.

Even with this feature, the Avidyne TAS600 unit was significantly lower in price than the SkyWatch, so L3 responded by adding this audio feature to their SkyWatch system. Not to be outdone, Garmin introduced their active traffic system, the GTS800, in 2009, and they have since expanded their line. We’ll visit all available active traffic options – new and used – in the next installment.
Active Weather Avoidance

Certainly, onboard radar is an active weather avoidance tool, but its limited applications in GA aircraft today (twins only) has me moving on to lightning detection. Why you ask?

As pilots, what are you trying to avoid when flying in weather? Where is the real danger?

Precipitation you say? You don’t need equipment in your airplane to tell you that there’s a blizzard outside and it’s not a good day to fly!

So what about rain? While hard rain might be an issue for your plane’s new paint job, it’s not really a safety concern, unless, of course, the rain is accompanied by lightning. But even then, rogue lightning strikes away from a cell aren’t as much of an issue as you might think. In most cases, a metal airplane can deal with a direct lightning strike with minimal damage. Although I have to admit that it’s not good for your blood pressure! Composite airframes, on the other hand, can be much more vulnerable to a lightning strike.

How about wind? Wind in flight is more of an issue when you talk about arrival times or, more specifically, fuel consumption. Wind near the ground can also be a challenge on landing and takeoff, but it’s not something that can be measured effectively in an airplane, nor is it likely to be helpful at the time. Wind shear is another story entirely, but we have Doppler radar systems and (hopefully) a voice on the ground to help us through those situations.

Actually, the biggest weather-related risk we face in the air is a lightning storm cell. Sure, radar will tell you there’s an area of very heavy rain ahead, but it will not tell you if there’s an imbedded cell in the middle of it. The tremendous turbulence in the center of a lightning storm cell, along with the possibility of hail, should scare the hell out of you!

I’ve told this story before but I’ll tell it again for those of you who haven’t heard it. In 1974, I owned a Stinson Voyager and flew out of Marshfield, Mass. One of the tenants at the airport was famed attorney, F. Lee Bailey. Though Baily had a Beech Duke and was an active aircraft and helicopter pilot himself, he would frequently use the services of a professional pilot.

One day, I got to talking with his pilot a few days after they had returned from a flight. (At the time, I was a fledgling pilot and a sponge for this kind of stuff!) Anyway, Baily’s pilot told me that on that particular flight – and with the “help” of ATC – they found themselves in the middle of a thunderstorm cell.

One minute the Duke was at idle and climbing at 2,000 feet per minute and in the next minute they were descending at the same rate and at full throttle. The Duke, a fairly powerful aircraft, was entirely at the mercy of the weather. Fortunately, there was no hail present. You can only imagine the outcome of such a situation should you lose your windshield!

In my opinion, that’s the real danger that you are trying to avoid when flying in weather, and that’s the exact role of a lightning detection system – to point you exactly to the location of a cell so you can avoid it. No other weather avoidance system does that.

Lightning Detection Equipment

Paul Ryan, aforementioned pilot and inventor, noticed that his automatic direction finder (ADF) would respond to lightning when he flew into an area of thunderstorm activity. With that knowledge in mind, he went on to develop the first stormscope and, in 1978, he introduced the WX7. Ryan would go on to develop many more models, each a little more accurate than the previous.

3M later bought out Ryan and continued to market the stormscope until BF Goodrich Avionics Systems bought out 3M. Using Ryan’s basic concepts, BFG developed a number of stormscope models of their own.

It’s important to note that all early stormscopes suffered from a common problem known as “radial spread.” In short, this meant that the intensity of a storm would interfere with the device’s ability to determine range. For example, a weak storm would show itself farther away, while a strong storm would appear closer than it actually was on the display.

Obviously, this was a serious issue for pilots who wanted to “thread the needle” in areas of active thunderstorm activity. Fortunately, BFG Avionics’ designers figured out how to solve this problem and the stormscope became a reliable tool for lightning detection.

As mentioned, L3 Communications (www.L3com.com) subsequently bought out the BF Goodrich Avionics Division in 2003 and have marketed the products ever since. Today, L3’s WX-500 remote unit is very popular. It is a remote unit that displays real-time lightning information on virtually all of today’s certified navigators and MFDs.

To be fair, Insight Avionics (www.insightavionics.com) actually beat Ryan to the market when they introduced their aptly-named Strike Finder lightning detection system in 1976. The Strike Finder is a self-contained unit designed to fit in a standard 3 1/8-inch instrument hole and the price is very attractive.
Avidyne (www.avidyne.com) was a late entry into lightning detection, having introduced their TWX670 Tactical Lightning Detection System in 2009. Detection is similar to other manufacturers but the display is unique. The TWX670 is a remote mounted unit designed to interface with MFDs and navigators and it displays lightning activity in colors, much like a radar screen.

Note: It was my intention to include specifics on all of the traffic and weather avoidance equipment available but there’s so much to talk about that we’ll have to cover this next time.

Summary and Conclusion

ADS-B will bring traffic and weather avoidance to aircraft owners who could not previously afford it, and once it is fully implemented (2020), most pilots will have a much better handle on their traffic situation.

But while pilots who fly in congested areas, IFR or even VFR can benefit from the added reliability provided by an active traffic system, ADS-B rebroadcasts of traffic from aircraft on alternative frequencies may be delayed by line of sight issues.

In my opinion, aircraft owners who already have active traffic on-board should think twice before removing it. Nexrad or datalink WX has become common in the GA cockpit but even the providers of datalink weather will tell you that is more of a planning tool.

This is even truer when thunderstorms are present. ADS-B WX is, in fact, datalink WX and should also be considered a planning tool. Plus, ADS-B WX is being transmitted from the ground and we already know that’s less reliable than satellite transmission.

If you’re VFR or light IFR and you stay away from “mean” weather, ADS-B FIS-B weather will serve you well. If, however, you fly medium-to-heavy IFR, you need a defensive tool to avoid WX.

Onboard radar is a good tool but, in my opinion, most pilots don’t really know how to work it correctly to interpret the weather picture they see. Radar points to rainfall; whereas a stormscope or Strike Finder or Tactical Lightning Detection system is easier to interpret because it points the pilot directly to a thunderstorm cell, and that’s the kind of WX that should be avoided.

Hey, look … another year is going by! I would like to wish you and your “Flyin’ Families” all a safe and happy Holiday Season!

Thanks for reading!

Bob Hart
www.AvionixHelp.com
In the December issue we discussed the role that ADS-B will play in providing WX and traffic information to pilots, some of whom could not previously afford it. We also looked at active traffic and WX systems installed in some aircraft and I asked the question: "Is active a better way than ADS-B?"

You may not agree, but my answer was “yes.” Actually, I’d go one step further and suggest that an aircraft that has both active avoidance and ADS-B WX and traffic avoidance onboard is best!

In this installment we will discuss active avoidance equipment – both new and used. Moreover, while it was not my intent to discuss ADS-B equipment, I realized that three manufacturers agree with my premise and have actually designed products that cater to this “both are best” philosophy. We’ll take a look at these products here.

Prior to the advent of ADS-B as a source for onboard WX and traffic information, pilots with the need (and the bucks) looked to active options that have been available for some time. On the other hand, pilots on stricter budgets chose less expensive, though in my opinion, less reliable options.

To get at least some traffic in the cockpit, many pilots chose inexpensive portable units. Zaon Flight Systems offered their PCAS (Portable Collision Alerting System) and Monroy Aerospace offered (and still offers) their “Traffic Watch” portable option. Both of these units mount on top of the dash and respond to ATC’s interrogation of aircraft transponders to give the pilot the traffic information they detect.

Not only are these units totally dependent upon ATC to trigger transponders, but their antennas are often located inside the cockpit. As such, they are not, in my opinion, a reliable source for all traffic. I sold many of...
In 2002, Garmin introduced their GTX-330 mode S transponder that not only provided normal transponder functions, but was also able to receive TIS (Traffic Information Service) broadcasts as well. If you had a way to display it, you had traffic information presented on an MFD or navigator like the GNS-430 or 530.

However, while this was certainly better than the portables, it too suffered from line of sight and range issues and was only available in certain areas. Suffice it to say, there were very few affordable options for traffic avoidance at that time.

Of course, the advent of portable, non-certified ADS-B receivers in the last five years has changed all that. However, its installation costs and limited applications for general aviation (primarily twins) suggest to me that it’s a topic best reserved for another discussion. Radar has been around for a long time, and you may be surprised to know that the technology hasn’t changed in many years. Besides, it still doesn’t show you exactly where a cell is!

Instead, I propose that a combination of Nexrad WX (from either ADS-B or a subscription service like XM) for “strategy” and an active lightning avoidance system for “defense” is the best way to achieve weather situation awareness, just as ADS-B traffic combined with an active traffic system is the best way to achieve total traffic awareness.

Now, let’s take a look at the equipment (listed alphabetically by manufacturer).

**NOTE:** In part one (December 2016) I discussed the emergence and evolution of traffic systems. Go back and read Part One if you missed it.

### ACTIVE TRAFFIC SYSTEMS - FACTORY NEW

**Avidyne TAS Active Series with ADS-B capability**

In 2005, Avidyne purchased Ryan International and their 9900BX design. This would go on to become the foundation for their TAS series of active traffic units. Prior to this, active traffic systems were one-size-fits-all and typically designed for faster, more expensive aircraft with a service range consistent with such aircraft. The prevailing theory: the faster the aircraft, the wider the range needed to pick up traffic that was farther out.

Frankly, high-performance aircraft owners were the dominant customers for active traffic back then, but Avidyne discovered that they could build active traffic units with less range at a lower price point, thus broadening the market to include slower, IFR-equipped aircraft. Today, they offer four models, each of which utilize a dual antenna configuration:
The TAS600 is designed for entry-level singles. It has a 7-nm range, 3,500-ft vertical coverage, and 18,500-ft altitude limit. Street price: $6,900 - $7,400, plus install.

The 605A is designed for mid-performance aircraft. It has a 13-nm range, 5,500-ft vertical coverage, and 55,000-ft altitude limit. Street price: $8,200 - $8,700, plus install.

Note the “A” stands for ADS-B capable. Recently, Avidyne added an internal ADS-B receiver to the 605, 615 and 620 models allowing them to monitor both active and ADS-B traffic. They “get it!”

The 615A is designed for high-performance aircraft and rotorcraft. It has a 17-nm range, 5,500-ft vertical coverage, and 55,000-ft altitude ceiling. This unit is also ADS-B capable. Street price: $12,000 - $13,000, plus install.

The 620A is Avidyne’s best active system with ADS-B capability. It has a 21-nm range, 10,000-ft vertical coverage, and 55,000-ft ceiling. Street price: $17,000 - $18,000, plus install.

Here’s the link to the Avidyne TAS series data: http://www.avidyne.com/products/tas-a/index.html

Another improvement that Avidyne made to the TAS series was in the audio output capability. Previous active traffic units would notify the pilot of a traffic issue by simply stating “traffic” in the headset. This required the pilot to look at the display first in order to know where to look.

Since their introduction, the Avidyne TAS units made more detailed declaration into the pilot’s ear, i.e. “Traffic-Two O’clock-High-Two miles!” Not only was this a significant improvement in safety, but it’s also the reason I recommended the TAS series to my customers who were adding an active traffic system. The original Skywatch did not offer this, but L3 responded by adding this feature to their unit a few years later.

**Garmin GTS Active Series with ADS-B**

Surprisingly, Garmin was a late entry into the active traffic market, but as you would expect, they learned from others and did it right. Garmin offers the buyer a choice between single or dual antenna configurations and, unlike the others, they offer a TCAS 1 certified system for aircraft that require it.

Like Avidyne, Garmin also listened, as all of their active traffic models notify pilots of a traffic situation with “Traffic, Two O’clock-High-Two miles,” as I believe they should. Plus, all Garmin GTS series active traffic units have ADS-B “in” receivers, so they provide active traffic and ADS-B traffic information.

Garmin offers multiple models depending on your speed and need:

The GTS800 offers a 12-nm range, 10,000-ft vertical coverage, 55,000-ft service ceiling, and built-in ADS-B “in.” Street price: $8,800 - $9,300 (single antenna), plus install.

The 825 offers a 40-nm range, 10,000-ft vertical coverage, 55,000-ft service ceiling, and ADS-B built in. Street price: $17,500 - $18,500 (single antenna), plus install.
GTS855

The 855 is Garmin’s certified TCAS 1 system for commercial aircraft that require it. The 855 has an 80-nm range, 10,000-ft vertical coverage, and 55,000-ft ceiling. Street price: $22,000 - $23,000 (single antenna), plus install.


L3 Avionics Systems - ADS-B with Active Traffic (the reverse!)

As I mentioned, it was not my plan to discuss ADS-B products in this article on active traffic, but L3 threw me a twist that I feel compelled to mention here.

BF Goodrich introduced the Skywatch active traffic system back in 1996, and it was really the only player in general aviation active traffic avoidance at that time. Ryan International came along with a passive system a few years later, but the Skywatch was dominant for years.

The Skywatch was a one-size-fits-all product that targeted high-performance aircraft owners. In fact, at the time when L3 bought Goodrich (2003), it cost more than twice what you can buy an Avidyne TAS600 for today! Still, it was reliable, effective and it kept a lot of pilots from “scratching” their airplanes. That’s why I was so surprised when I learned that L3 had sold the design and rights to the Skywatch to a Florida company called Extant Aerospace.

A call to Extant was not returned, so I have to guess a little here. In short, I don’t think Extant plans to produce the Skywatch; rather they will be the contact for repairs, exchanges and spares.

There are 15,000+ Skywatch systems out there, so if you have one you may want to copy this link: http://extantaerospace.com/products/SkyWatch.pdf

Considering my philosophy that ADS-B and Active Traffic combined is the way to go (for many), I thought L3 was nuts to get rid of the Skywatch, so I dug a little deeper. Here’s what I found:

L3 Avionics NGT-9000+

The NGT-9000+ is an all-in-one ADS-B mode S transponder with an ADS-B “in” receiver. It also has a built-in dual display capable of displaying ADS-B TIS-B traffic on one side and ADS-B FIS-B WX on the other side. That in itself is a big deal, but the “+” is the part that I want to talk about here.

The NGT-9000+ also has the Skywatch active traffic processor built in, so when interfaced with the Skywatch’s NY164 antenna, the unit provides ADS-B traffic and NextGen Active Traffic (this is what L3 calls it now) in a single unit. They are also now adding an interface for their WX-500 Stormscope processor so you will be able to display lightning avoidance data on the NGT-9000+’s display as well.

Forgive me L3; but that’s a lot of information on a display the size of the NGT’s! Nevertheless, having active and ADS-B traffic on this unit is – in the words of the Guinness crowd – “Brilliant!” Clearly L3 gets it, too!

This means that if you currently have an L3 Skywatch, you can remove the remote processor and the 3 1/8” display (if you have one), install the NGT-9000+ and you’ll have that best-of-both-worlds scenario I’ve been talking about.

Here’s the link to the L3 NGT-“Lynx” data: http://www.l-3lynx.com/
ACTIVE TRAFFIC - THE USED MARKET

I searched all viable active traffic models on the used market and found next to nothing. I did find a used Ryan 9900BX, which was the second active system that came on the market (after the Skywatch), and the shop was asking $7,500 for an overhauled system. While this unit is still supported by Avidyne, you can buy a new TAS600 for the same price. That makes more dollars and sense.

I also searched the venerable Skywatch system and came up empty-handed. However, as aircraft owners equip for ADS-B, not all will agree with my concept of having both ADS-B and active in the cockpit. This leads me to believe that these systems will eventually begin to show up on the used market.

ACTIVE LIGHTNING AVOIDANCE SYSTEMS - FACTORY NEW

If you read part one, you already know that I believe that the best active WX avoidance tool is a lightning detection system, and when combined with ADS-B FIS-B weather, you have a great WX planning tool and an active defensive tool.

A Stormscope, Strike Finder or Tactical Lightning Detection System by any other name is a WX avoidance tool. This equipment points you directly to the dangerous WX you want to avoid, namely, the vicious center of a thunderstorm cell in which you’d encounter turbulence and hail that can take control of your aircraft, break your windshield or worse. Conversely, ADS-B Nexrad WX will tell you where it is raining and where severe WX is, but it won’t tell you exactly where the center of a cell is; that’s the job of a lightning detection system.

L3 calls them “Stormscopes” and they have been a leader in lightning detection systems for many years. Many of their discontinued products are viable and still available on the used market.

Avidyne is a late entry into lightning detection and their “Tactical Weather Detection System” offers some unique features.

Insight Avionics has been a serious player since day one (1976). Their “Strike Finder” also offers some unique features and is the most affordable of the bunch.

Garmin is absent from the lightning detection market.

Avidyne Corporation’s TWX670 “Tactical Weather Detection System”

Avidyne will tell you that the development of the Stormscope has gone through many phases since the mid-70s and the accuracy of detecting storms and features has improved significantly over the years. When Avidyne jumped into the market in 2009, they took what the others had learned and improved on it.

Like color radar, weather intensity is better identified to the pilot with color, and the TWX670 is the only color lightning detection system on the market today. Some pilots avoid WX entirely but others must fly in it, and the TWX670 shines in that critical area of weather within 25 miles of the aircraft where “threading the WX needle” is required.

Another modern feature of these third generation lightning systems is cell mode or what Avidyne calls “Twxcell mode.” All early lightning detection systems showed all lightning strikes within range on the display. Obviously, this can be confusing for a pilot.

Twxcell mode filters out random strikes and essentially shows you cells only, thus giving you a clearer picture of where the dangerous weather is located. Add color to identify intensity, and it would be easy to say that the TWX670 is the most sophisticated of the new current lightning detection systems on the market. Street price: $9,800 - $10,500, plus install.

NOTE: Stabilization is available when interfaced to a heading source like an HSI (see sidebar).

Here’s what we see in the form of new lightning detection systems on the market today (again in alphabetical order):

Stabilization is an important topic when talking about lightning detection systems, especially when discussing the Strike Finder. As you’re flying in weather, a lightning detection system shows the lightning strikes in real time and displays them in relation to the nose of the aircraft. When you make a turn, those strikes remain on the screen in the same position even though you have just turned the aircraft 90 degrees to the right.

Without stabilization, the pilot must manually clear all strikes and the unit will begin repainting the lightning picture on the display. All lightning detection systems have a “clear” button for this. If you do not clear the screen, the cell that you saw straight ahead still appears on the display on your nose when, in fact, it’s now off your left wing.

With a stabilized lightning detection system, the WX picture on the display moves with the aircraft as you turn, and the cell that was on your nose is now correctly displayed off your left wing.

The reason this is significant when discussing the Strike Finder is that all other lightning detection products on the market require an external HSI or heading source in order to provide this stabilization function. Some pilots actually prefer to clear the screen when they turn or from time to time because it gives them a better sense for how the weather is developing. However, you can imagine the problems that could develop if you make a turn with a non-stabilized lightning system and forget to clear the screen.
Insight Avionics “Strike Finder”

Being the first to introduce a lightning detection system (1976) is one thing. To be able to say that you still offer an improved version 40 years later and it’s the most affordable lightning detection system on the market is another discussion entirely. This is a discussion you can only have in regard to Insight Avionics.

Unlike the current Avidyne and L3 products, which are remote mounted units requiring an external, certified display, the Strike Finder is self-contained and utilizes a standard 3 1/8” display. The bright LED display is easy to read, even when mounted on the co-pilot side of the panel. Street price: $4,800 - $5,200, plus install.

You can also add optional, built-in, solid-state stabilization to a new Strike Finder unit for under $1,200 – mere pennies compared to the cost of other heading systems. NOTE: This is the lowest price option if you are motivated to add lightning detection to your aircraft. Remember, ADS-B FIS-B Nexrad weather is not a defensive tool against thunderstorms!

Here’s the link to Insight’s Strike Finder data: http://www.insightavionics.com/strikefinder.htm#top

L3 Communications

Besides Insight, the other early player in lightning detection in the mid-70s was Ryan International. Ryan later sold out to BF Goodrich who, in turn, sold out to L3 Communications. All were called Stormscopes.

Ryan produced 10 different model Stormscopes between 1976 and 1984, each a little more accurate than its predecessor with improved features. However, most of the significant improvements in the Stormscope as we know it today were developed by BF Goodrich.

Goodrich had four aviation models in 2003 when L3 bought them. L3 now offers two factory new models:

WX-500

In 1997, the ability to display lightning strikes directly over a moving map either on a MFD or large format navigator (like the GNS-530) took lightning avoidance to the next level. That’s because it allowed the pilot to more clearly see where dangerous cells were directly on the map. As a result, it’s safe to say that the WX-500 is the most popular lightning detection device today.

Stormscope WX-500 on MFD and WX-500 on NGT-9000.

The WX-500 is accurate, provides both strike mode and cell mode, and interfaces to just about any certified display you can find. The WX-500 is a two-piece, remote mounted system and can be stabilized when interfaced to a heading source.

No question, if you already have an MFD or navigator and you’re looking to add lightning detection, the WX-500 has been a very popular choice. Street price: $5,800 - $6,200, plus installation.

WX-1000+ and WX-1000E

The WX-1000 was one of the first Stormscope models developed by BF Goodrich after acquiring the rights from Ryan International, and L3 continues to market it because the E version serves a unique niche in the corporate market.

Frankly, the WX-1000+ (with stabilization capability) is not a serious consideration for a new installation in a GA airplane because it’s a more expensive three-piece system and a bit more cumbersome and expensive to install.

On the other hand, the WX-1000E is designed to interface to EFIS systems found in the corporate jet market for those operators who frequently have both radar and lightning detection on board.

Street price on the WX-1000+ (with display): $15,000-$16,000, plus install. The WX1000E (no display) is about the same, plus install.
ACTIVE LIGHTNING AVOIDANCE - THE USED MARKET

Avidyne

I did not expect to find any TWX670 Tactical Lightning Detectors on the used market, but I did find some processors only in “as-removed” condition. It’s a relatively new product compared to the others and a bit more expensive than the WX-500 from L3, so it’s a harder sell for Avidyne dealers. It will be difficult to locate a complete used TWX670 system on the used marketplace. Sorry, no used price information is available.

Insight Avionics

The Strike Finder has been around for 40 years, so I was surprised to find very few on the used marketplace. I think this means that people are holding on to them!

I talked to Brian Wrightman in the marketing department at Insight, and he gave me just that, some “insight” into buying a used Strike Finder.

The original Strike Finders had plasma displays. I have a plasma TV and the displays are great; however, Brian said that plasma displays need to be used on a regular basis. I was aware that Insight had changed their displays a number of years back, but I had assumed that the displays themselves had been an issue.

Fact is, Insight was offered a large military contract but the military had a policy regarding plasma displays. As a result, Insight converted their units to LED, got the contract, and have been using LED displays ever since. The fact that the military would pick the Strike Finder over other lighting detection models speaks to the quality and reputation of the product.

Brian suggests that if you are looking to purchase a used Strike Finder, look for a unit that is in service all the time. If you install one, put it on your avionics master switch and let it run all the time – whether there is WX or not. Also note that the units with the plasma displays can be upgraded to LED for just $1,365. Again, if you’re shopping for lightning detection on a budget, note that a new Strike Finder is the value leader.

L-3 Communications / BF Goodrich Stormscopes

Compared to the two products above, the market for used Stormscopes has a lot more to offer.

To discuss the used Stormscope market, I went to the expert. I’ve learned that companies who specialize in a specific market usually do well in the avionics market – and so do their customers!

Don Valentine of Valentine Aviation is the Stormscope specialist. If you have questions, need parts, or are in search of a used Stormscope system, Don is one of the best places to go! Learn more at https://www.stormscopes.com/home-page.html.

Here’s a listing of viable Stormscopes on the used market, a brief description and estimated street prices:

**WX-900 (from L3 or BFG)**

The WX-900 was designed to be an affordable alternative for pilots who fly slower aircraft. There are, however, two compromises in the unit when compared to higher priced systems. First, while most other systems have a 200-nm range, the WX-900 has a 100-nm range. This makes sense for slower aircraft if, in fact, it saves you money.

The other “weakness” is that it has an LCD display, which is a little harder to read, and putting it on the pilot side panel (vs. the co-pilot side) is a must. LCD displays must be read from a directly head-on perspective. If you’re more than, say 20 degrees off center, you’ll have trouble reading it. Trust me; you don’t want to have trouble reading your Stormscope in WX conditions!

The WX-900 is a two-piece system (display with internal processor and antenna). Street price on a used (SV) WX-900 system is about $1,400 - $2,400*.

**WX-950 (L3 or BFG)**

The WX-950 was the cat’s meow in self-contained stormscopes in the mid-90s before the WX500 came along. The WX-950 has a 200-nm range with both strike and cell modes. It’s a two-piece system (display with internal processor and antenna), has a nice bright display that can be seen anywhere in the panel, and has that all-important cell mode feature that pilots like. Street price for a used (SV) WX-950 system is about $3,000 - $4,000*.

**WX-1000 (L3 or BFG)**

The WX-1000 is a three-piece system and not recommended for a new installation in a GA/legacy aircraft. Street price: $3,000 and up. Install is more; features are less.

**WX-500 (L3 or BFG)**

The WX-500 has been the most popular choice in a Stormscope sensor for aircraft owners who have an MFD or large format navigator to sense and display lightning data. It’s a two-piece remote system and features strike and cell modes. It is controlled by the display. Street price for a used (SV) WX-500 system is about $3,700 - $4,500*.

*My street prices are based on purchases from a quality shop with warranty. You always want to buy used avionics that way!
CONCLUSIONS

• ADS-B WX and traffic will be great for aircraft owners who do not already have these tools in their cockpit, and while it’s an expense that many wish to avoid, it will give the aircraft owner important, potentially lifesaving information that most could not previously afford. ADS-B will not, however, provide enough reliable information for some aircraft owners, especially those who fly in more severe WX and traffic environments.

• ADS-B FIS-B weather is the same as subscription weather, but it is broadcast from the ground and suffers from line of sight and range limitations. It is not a defensive weather tool.

• Lightning data from Nexrad/ADS-B is not a defensive weather tool! Active lightning detection is more reliable, timelier and (for those who must fly in areas of weather that others would avoid) a better solution.

• ADS-B TIS-B traffic is great for pilots who have no (or limited) traffic in their cockpit now. However, some ADS-B traffic data (due to the dual frequency system in the U.S.) is rebroadcast from the ground with the same limitations of line of sight and range. Conversely, active traffic is not dependent on ATC or ADS-B broadcasts, works everywhere, and provides real-time traffic better.

• Having ADS-B onboard is good. Having active WX and traffic onboard is better. Having both ADS-B information and active avoidance is best!

Thanks for reading! Until next time, avoid trouble and have a safe and happy flight!

Bob Hart - www.AvionixHelp.com

Bob Hart purchased his first airplane in 1971 at age 21. He’s owned five others since. As a Senior Avionics Consultant at Eastern Avionics, Bob has personally sold over $20 million in Avionics. Bob now offers avionics advice through many on-line forums and through his website: www.AvionixHelp.com and is semi-retired. After living in Colombia, South America, for a few years, he is now back in sunny Florida.

Editor’s Note: Bob Hart is a regular participant on the Cessna Owner Organization’s and Piper Owner Society’s forums and is available to answer your avionics-related questions. To contact him, visit www.CessnaOwner.org or www.PiperOwner.org, click the Forums tab, and scroll down to the “Avionics” forum. COO or POS membership is required.