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IFR

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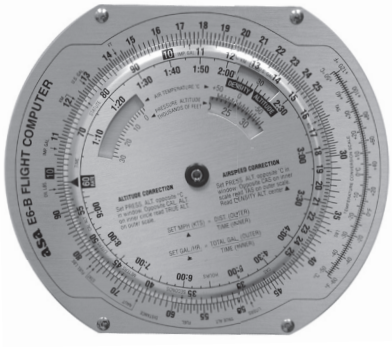

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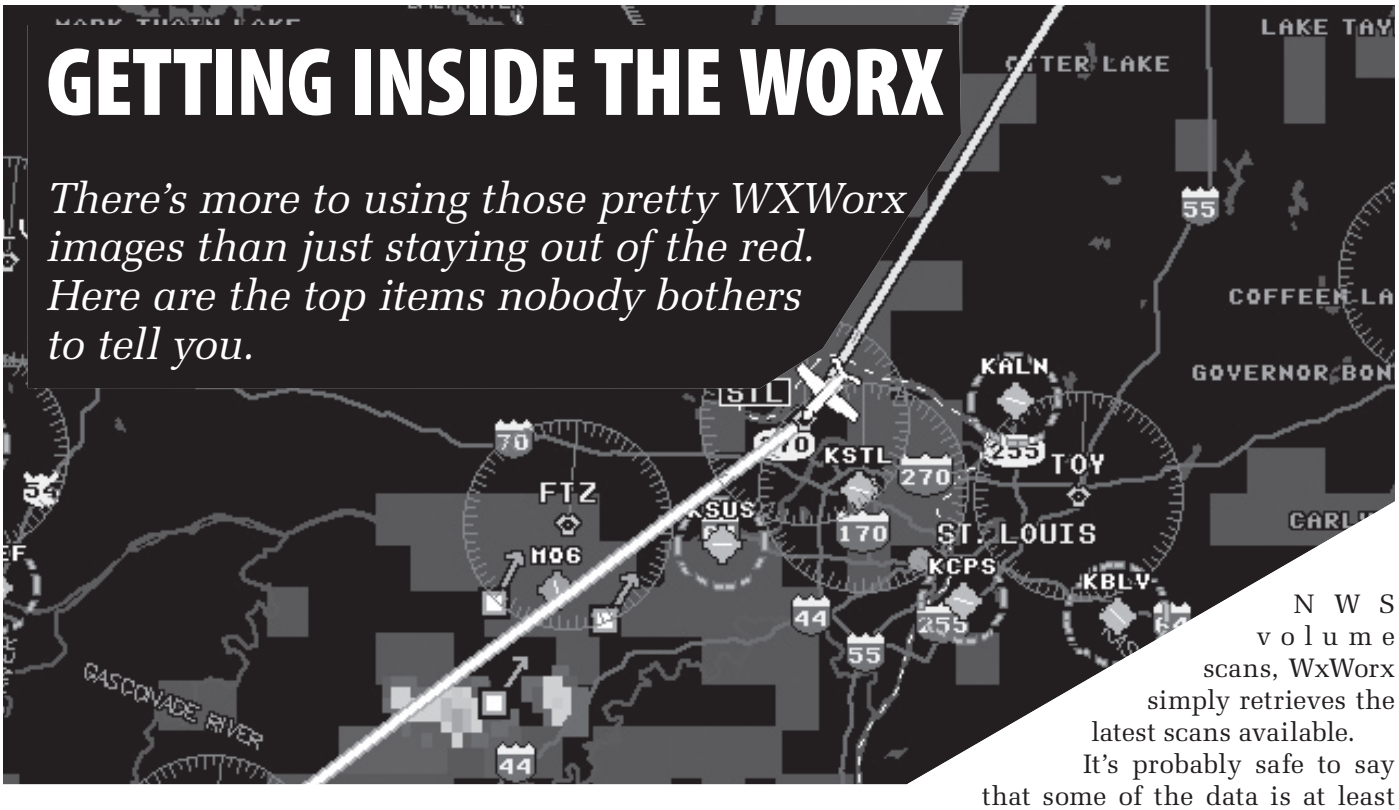
GETTING INSIDE THE WORX

There's more to using those pretty WXWorx images than just staying out of the red. Here are the top items nobody bothers to tell you.



by Scott C. Dennstaedt

Did you do the 10-day training course that came with your satellite-based weather system? No, you read the manual for about 15 minutes, activated your subscription, and departed into the wild blue yonder.

It's not your fault. The training program doesn't exist. This new cockpit instrument bestows super-pilot powers, but even Superman needs to watch out for Kryptonite. There are some fine points of datalink weather that every 21st-century super pilot needs to know.

Tweaking the Numbers

Knowing how the weather data is processed is key to using it well. WxWorx or "Weather Works" is the heartbeat of the XM weather operation. Headquartered in Huntsville, Ala., WxWorx collects and processes the data from the NWS and other commercial vendors before it is broadcast across the XM Satellite Radio data link.

Hearing about the latency in the NEXRAD image is now as ubiquitous as instrument instructors telling you not to chase the needles. What many people misunderstand is that there's no real way to know the actual age. The time or age you see on your display is based on the time that it is broadcast or received. That's not the actual age of the product.

In fact, there is no single "age." It's a composite of data taken over time. The NWS WSR-88D Doppler ground-based radars supply the data you see in the cockpit. Each of the 141 radars operates independently and, potentially, use scanning modes that take different amounts of time. WxWorx schedules a broadcast of NEXRAD every five minutes. Since this broadcast isn't synchronized to the NWS volume scans, WxWorx simply retrieves the latest scans available.

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It's probably safe to say that some of the data is at least two minutes old with the potential of it being nearly seven minutes old at the point it's broadcast. If you stare at this image until the next broadcast five minutes later, assuming you actually get the broadcast, you could have a total latency of 10 minutes. For a storm that is moving at 30 miles an hour, that's a five-mile difference.

Storm Cell Identification and Tracking (SCIT) is WXWork's automated algorithm that's about as secret as Coca Cola's formula. In fact, this is where Bob Baron, president of WxWorx and Baron's Services got his start by providing neighborhood-to-neighborhood tracking and warning of storms exhibiting severe characteristics. Bob is a pilot and television meteorologist.

SCITs are typically represented by lines or arrows that indicate the direction and speed of a cell exhibiting severe characteristics (wind shear, hail, or heavy rain rate). Due to their automated nature, SCITs tend to come and go. One may pop up and three datalink update cycles later, it's gone. Two updates later, it's back again. They have the highest refresh frequency of all the weather

products at one minute and 25 seconds.

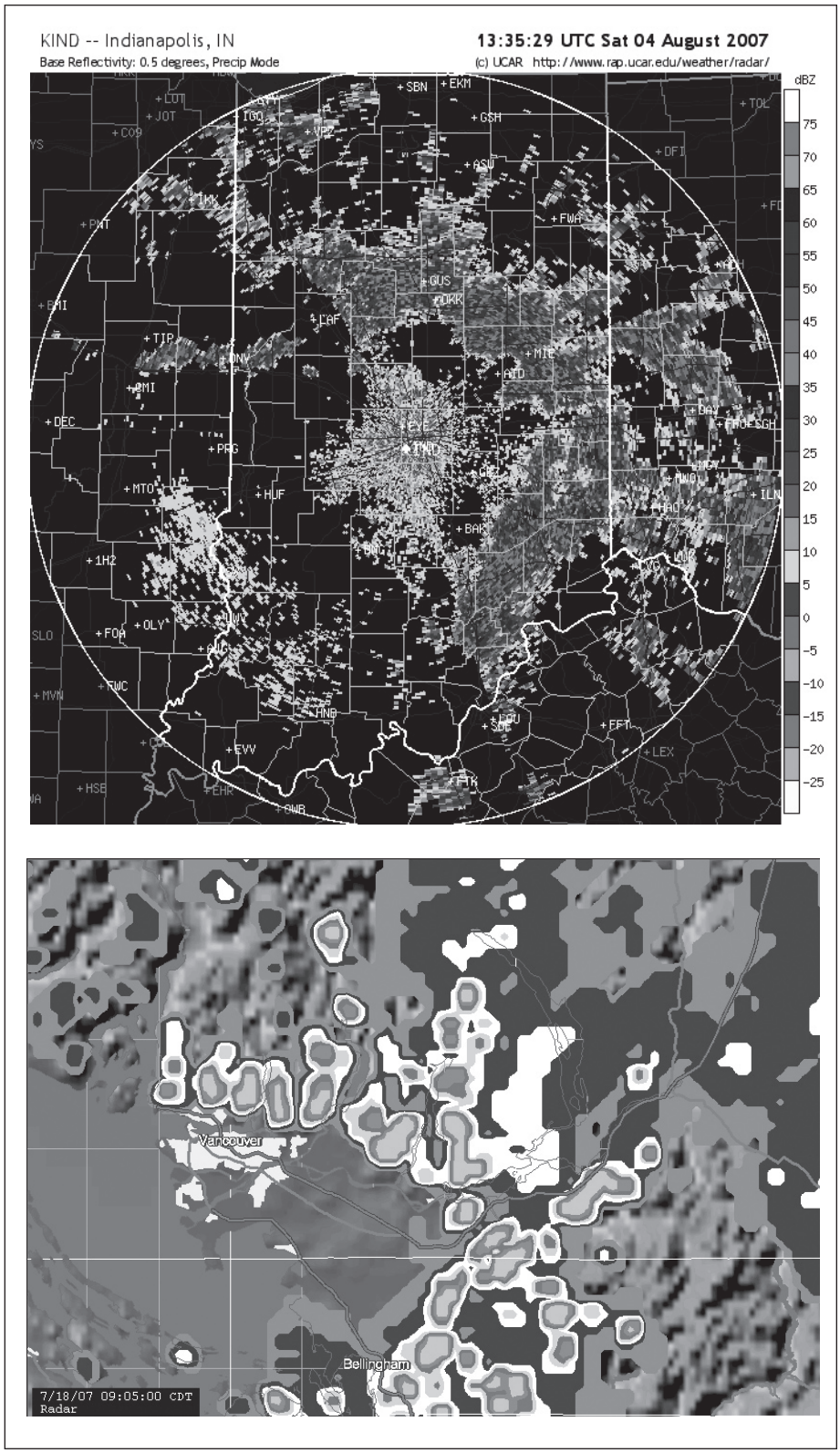
I've sometimes seen strange SCIT behavior, especially during the initial stages of development or when the cells are moving slowly. It's common to see two SCITs right next to each other pointing in the opposite direction. That's probably not accurate. Relying on this information for the direction of a specific cell isn't wise, especially if you see a lot of discrepancy. This happens frequently enough that I generally discount it for estimating the motion of thunderstorms.

The SCIT identifies the individual movement of the cell, which can be different than the movement of a line of thunderstorms. Thunderstorms generally have two motion vectors. Individual cells generally move with the direction of the upper air flow. The line of cells moves with the air mass. It's common for the individual cells to move northeast while the line of cells moves southeast. I like to use a looping feature, if it's available, to determine the actual direction of movement of all precipitation, not just precipitation associated with strong thunderstorms.

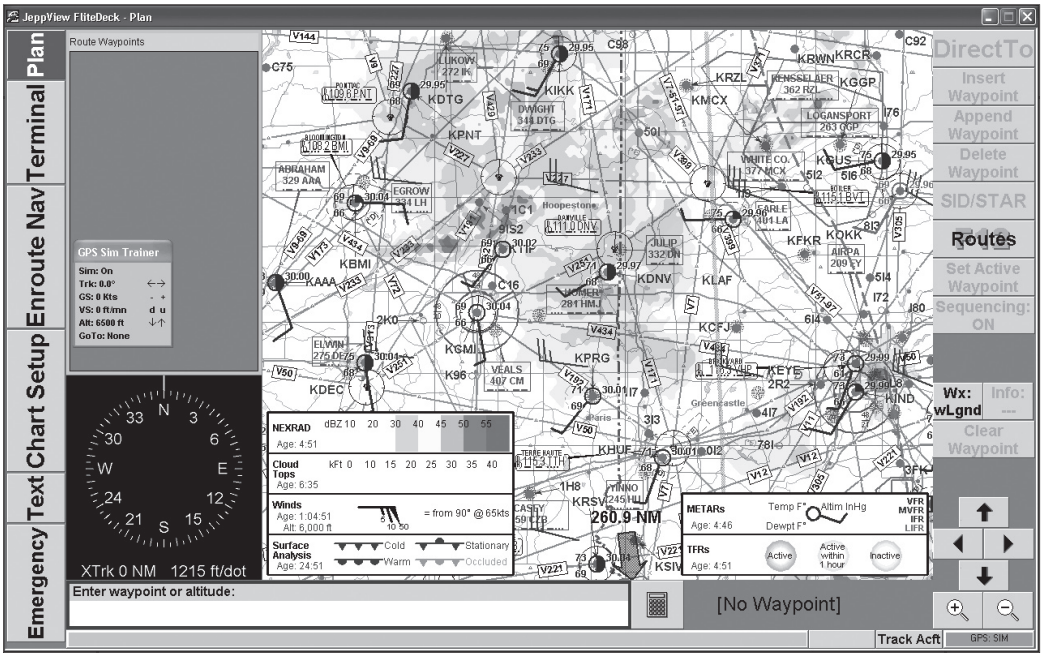
WxWorx NEXRAD images look much cleaner that what you see on the NWS Nexrad radar web site. That's because they filter out non-precipitation returns. Whenever the radar beam strikes an object that isn't rain, drizzle, snow, ice pellets, or hail it creates residual ground clutter. Most of the clutter is close to the radar site and is not too hard to distinguish from real precipitation, but is nevertheless annoying.

A special form of ground clutter called anomalous propagation (AP) can also produce non-precipitation echoes. A classic example of AP occurs when a strong, nocturnal temperature inversion forms. This inversion "bends" the radar beam toward the earth. AP typically shows up at distances far exceeding the normal ground clutter and tends to look like real precipitation.

Currently, ground clutter is re-



Above: *Nexrad images from the NWS (top) can show aomalous propagation (AP), which can look like real weather to even the trained eye. WxWorx filters out these false returns. Canadian weather radar (bottom) can be even worse. Most of these returns are false, caused by the radar beam striking the mountain ranges. Canadian radars don't supply the velocity data to filter out these false echoes. When WxWorx begins its new hybrid process, this will improve the Canadian radar display tremendously.*



Abave: *You can display XM weather data using Jeppesen's FliteDeck. You can see your current position on the IFR en route chart with NEXRAD transparently drawn on top. Imagine that when you hear, "Ten degree left deviation approved. Report re-established on Victor 434."*

moved by an automated process at WxWorx. Returns that aren't showing much motion and are low and close-in are cut. Reflectivity values below 10 dBZ are also removed. This works, but it also eliminates features such as gust fronts and outflow boundaries, which are no fun for the pilot. Clutter suppression does not always work perfectly and it will at times let some clutter through and will filter out returns that may have significance.

Canadian weather radar has just become available and is updated on a 10-minute frequency. It doesn't remove ground clutter. There will be times where you'll see precipitation echoes that are due to the beam striking a mountain range. These echoes look frighteningly real, but tend to remain stationary and follow the mountain range. Canadian users are learning to adapt and recognize what's real and what's not.

WxWorx will be placing a human forecaster in the loop. This extra quality control step is simple and won't delay the delivery. A forecaster at WxWorx will create a rudimentary map based on the current weather. This map will conservatively identify regions that are impossible to contain precipitation and mask out any returns that are truly false. The automated process will then kick in as usual. This should alleviate some of the clutter in the Canadian radar product and improve the U.S. one.

Over The Top

There seems to be a lot of confusion about using echo tops to identify cloud tops during the winter. Meteorologists use echo tops when finding more significant thunderstorms by locating the highest tops. Higher echo tops equate to severe weather potential including wind shear, heavy rainfall, frequent lightning, tornadoes, and hail.

"What they are really looking at is the 'precipitation top,' rather than cloud top," says icing researcher Ben Bernstein. "In thunderstorms, these may be reasonably synonymous, but for most non-convective icing events, there may not be much of a connection. Most icing is in the form of small drops that radars don't see well enough to give a decently strong return. The echo-tops algorithm uses a minimum reflectivity of 18 dBZ, which is much higher than the reflectivity in most non-convective (stratus) icing situations ... they'll tend to be at less than -20 dBZ."

The point here from a pilot's perspective is that you shouldn't count on clear, ice-free air just because your altitude along your route will be over the echo tops.

Lightning strikes on your datalink can be deceiving as well. Lightning data is not supplied by the NWS. Instead, lightning data is owned by a commercial vendor and isn't cheap. To keep the monthly subscription costs down, WxWorx supplies a lower resolution product in both time and space. Lightning data is updated every five minutes and has a resolution of four km.

Ground-based lightning detectors can locate a cloud-to-ground strike within 500 meters and record it within seconds of its occurrence. However, since WxWorx doesn't provide this kind of resolution, a lightning bolt symbol is placed at the closest four-kilometer grid point.

A dozen cloud-to-ground strikes near the same grid point in the last five minutes would show as only one strike symbol on the display. Zoom in on the display during serious activity and you'll see the four-km-by-four-km matrix of lightning symbols. This makes it difficult to get a sense of the magnitude of the storm and how quickly it is building or dissipating. Intracloud and cloud-to-cloud lightning strikes aren't detected either; you need a Stormscope for that. Only cloud-to-ground strikes make it into the WxWorx data stream.

That's not critical for most pilots. We like to give that weather a wide berth anyway. It does emphasize that you should never use this product for

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regarding renewing an expired certificate. Currently, 61.199(a) says that you can renew an expired certificate by passing a checkride for one of the ratings already on your certificate. No word about passing a checkride for a new instructor rating, however. The revision will say that you can pass a checkride for any instructor certificate or rating to become current again. So, instructors for life we will be, just with more endorsements in our logbooks.

Finally, there is a bone for pilot-rating checkrides. Today, 61.39 (d) and (e) state that if you start a checkride on, say, October 1, you have 60 days to pass that checkride and receive the rating. So, you must count forward from October 1, know that October has 31 days, and arrive at November 29 as D-Day. No rating by November 29? You need a new 8710. Oh, and you have to retake the entire checkride, including retaking the stuff you already passed.

The change makes it two calendar months instead of 60 days. So, if you start the instrument rating checkride on October 1, you now must finish and receive the rating by December 31.

There's your heads-up on the upcoming reshuffling of our regulatory, IFR world. Best of luck navigating both the skies and the changes.

Jeff McNamee is a CFI-I in central Florida.

GETTING INSIDE THE WORX

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tactical weather avoidance.

The winds aloft you get through the XM weather data link are superior to the official winds aloft forecast (FB Winds) you get via a DUATS or a Flight Service briefing. It is important to understand, however, that the winds aloft are not actual winds directly recorded by a sensor, but are a one-hour, or possibly two-hour, forecast from the Rapid Update Cycle (RUC) weather model.

The RUC model is run once every hour and produces an hourly forecast for the subsequent three hours. For comparison, the FB Winds are typically based on a six-hour forecast from the North American Mesoscale (NAM) model, which is run every six hours.

Similarly, the freezing level is a one- or potentially two-hour RUC forecast. It is common during the winter to have multiple freezing levels above a particular location. This is very common during a freezing rain event. The freezing level supplied by WxWorx is a forecast for the lowest freezing level. Be aware that a temperature inversion may exist and the air above the lowest freezing level might be warmer than zero degrees Celsius.

What's in the Worx?

Besides a new operations center that will rival the bridge of the Starship Enterprise, I caught a glimpse of the near future of WXWorx. I've been sworn to secrecy, but I can say my eyes got very big and I think pilots will be overjoyed with the changes — especially this winter.

QUIZ ANSWERS *(questions on page 20)*

1. **d.** Each aircraft manufacturer is free to design a system and ask for certification. A Columbia 400 has a dual-alternator system where either alternator can handle virtually all the electrical load, while a Diamond DA40 has only one battery and one alternator for the G1000 display. The DA40's backup battery only powers the standby artificial horizon.

2. **b.** Most the HSIs on the most common systems, the Garmin G1000 and the Avidyne Entegra, do not show a glideslope on the digital HSI. Instead, they show the glideslope indication to the left of the altitude tape in the upper half of the primary flight display. Mechanical HSIs do show glideslope as well as a CDI and your current heading.

3. **c.** Check out AIM Table 5-1-2. You'll see that /G means en route and terminal capable. It says nothing about approach capable. You're still legal for this per the answer to question 4.

4. **a.** Check out AIM table 1-1-6. En route and terminal GPS ops are fine with an expired database so long as you verify the data. We don't know exactly what that means either, but we're pretty sure the logic in answer **b** is sound. Answer **c** is legal, too, and, of course, **d** is always a possibility.

5. **b.** Answer **c** speaks the truth in that you must have a current database to use GPS in lieu of DME or an ADF. However, you can ask ATC for alternate missed-approach instructions that don't require DME or an ADF (or GPS for that matter, because the missed is still an approach activity). If you get the alternate missed instructions, you're free of the published requirement and can now fly the approach. This does *not* apply to approaches that have "DME" in the title.

6. **c.** The GPS units may detect that they have different database revisions, and functions like crossfiling a flight plan from one GPS to the other should cease to work. You can use the GPS with the current database to drive your navigation, fly approaches, and act as a substitute for ADF or DME.

They were not able to disclose any release dates for the new products. But, even when it is released, if you don't use WxWorx's own product, WxWorx on Wings, you might be waiting for a while for your avionics manufacturer to display the new data. Be patient. It will be well worth the wait.

Keep in mind that they are bandwidth-challenged. Satellite data link is more like dial-up rather than broadband. There are dozens of other products that we'd all like to see, but bandwidth will remain an issue.

Satellite-based weather might not be as important in the cockpit as the introduction of the GPS. But there's no denying that it's a close runner up — and the next best thing to having Superman's x-ray vision.

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SMART PILOT TRICKS

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The clever PIC tuned into the game during the ride to the airport, and confirmed that it was over. He even listened to the post-game traffic report because he didn't know the precise time the game had ended. A leisurely preflight insured launch an hour beyond the traffic report and, so the reporter thought, beyond the expiration of the TFR.

Starting down the Hudson River corridor at dusk, the pilot self-announced on the river Unicom. When the stadium came into view, the pilot noticed the stadium lights on but didn't think much of it. Shortly thereafter, a helicopter in the area came up on frequency and advised the TFR was active. Confused, the pilot reported that he knew the game had ended. The helicopter came back with a surprise: It was a double-header.

Is this what it has come to? Does a complete preflight briefing now include a perusal of the sports page and attention to the post-game highlights? We've all got our favorite indicia of the post-9/11 anti-GA insanity but this report points up just how silly the whole thing has become. If the benighted soul who rammed a Cessna 172 into an office building in Tampa a few years back proved anything, it's that the average GA aircraft doesn't have the weight, speed, or volume to do substantial damage.

Yeah, OK. We've read Black Sunday and, yes, it is theoretically possible – however remotely – that a 172 could dump bad bugs or some such on a stadium of people. Then again, have you ever watched the aftermath of scattering ashes from an unmodified Skyhawk or the like? Generally, most of the deceased winds up in the back seat or streaked down the side of the fuselage. In other words, it frequently doesn't work like one would think.

This poor soul potentially got blued and tattooed because he planned a flight in a light aircraft precisely down the sort of VFR corridor created for same, did indeed check the sports page and the game broadcast, but forgot to find out from someplace — certainly not 1-800-WXBRIEF — whether it was a double-header. Maybe we're missing something, but that seems just plain senseless to us.

Luckily for all our intrepid reporters, if the FAA comes a-knockin' with raised eyebrows about these events, the pilots can show they turned themselves in. This system is supposed to help uncover the safety and regulatory holes that might swallow otherwise well-intentioned souls.

The system works, and provides a bizarre story or two on the way. We'll keep you posted as we sift through more reports of smart pilot tricks.

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