The Radar Wizard

By Rick Wheldon

Archie Trammell has been instructing on the best techniques for the operation of airborne weather avoidance radars for decades now. In 1997, I had the pleasure of attending Archie's seminar for the first time. Boy, there was a lot I didn't know. Judging by his synopses of major airline convective weather accidents between 1975 and 1994, it appears that I wasn't the only pilot who didn't know everything.

Archie presents a number of tried and true radar techniques over the course of one day. He has rules for determining how high thunderstorms rise in front of you. He shows where hail may reside in or near a thunderstorm. There's a great discussion of radar theory, and weather phenomena, but the best tip I got that day was about radar shadow avoidance.

Until then, I had never heard the term "radar shadow." It turns out that a radar shadow is the same thing as a light shadow. If you point a flashlight at a solid object in the dark, you can't see behind that object. In a similar manner, a radar shadow is an area behind dense precipitation returns, or a mountain, for that matter. All of the radar energy has been reflected back to your radar receiver by the weather or the mountain. You can't "see" behind those returns, and the radar display of the shadow will indicate an absence of returns.

Of course, it's obvious that we don't want to fly into dense radar returns or mountains, but what about the storm where the heavy "red" or "magenta" returns are only a small band width wide? It might be tempting, when confronted with a long line of thunderstorms, to penetrate the line where the heavy stuff is thinnest and the area behind appears to be clear. That's what the captain of a Southern Airways DC-9 did in 1977. A number of people lost their lives as a result.

That captain didn't know about radar shadows. What lay behind the thin area of heavy returns was an area of even heavier weather which literally pummeled his aircraft out of the air. Both engines were lost and, probably because of the physical damage from hail ingestion, restart attempts were unsuccessful.

How might that tragic result have been avoided? By following one of Archie's rules: "*Never*, positively EVER, continue flight toward a radar shadow."

And how can a pilot determine whether the display contains a radar shadow? It's really simple. Using the tilt control, point the radar down at the ground, so that ground returns cover the outer 1/3 or 1/2 of the display. Now, look at the weather that's of concern. If you can see ground return behind the weather, there's no radar shadow. The heavy red precipitation in Figure 1 at the1 o'clock position is not so dense as to prevent ground returns behind the heaviest weather. Some of the radar energy is reflected by the storm, while some is able to penetrate the storm, reflect off the ground behind, and return to the receiver. However, if no ground return is visible behind the storm, that's a radar

shadow. Stay away!!! In Figure 1, note the large radar shadow at 10 o'clock with another shadow at 11 o'clock. Figure 2 has a substantial shadow at 11 o'clock.

Incidentally, the same technique can be used to avoid mountain peaks at night. The Cali crash of an American 757 was preventable if the crew had been using their radar and properly trained to avoid radar shadows.

Want to learn more? Archie will be presenting his radar seminar on Sunday April 4, 2004, following the Dallas PROP He will also offer his seminar after the Orlando PROP, on Sunday May 2. A special price of $185 is available to PROP participants for either event. The price of the seminar includes lunch, refreshments and all of Archie's training materials. Sign up on line at www.turbineair.com, or register with Carol Cannon at 972-248-3108. If you haven't attended, it will be a worthwhile day. Don't make the same mistake as that DC-9 captain.

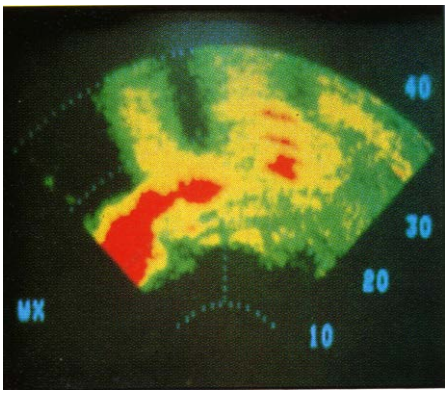

Figure 1

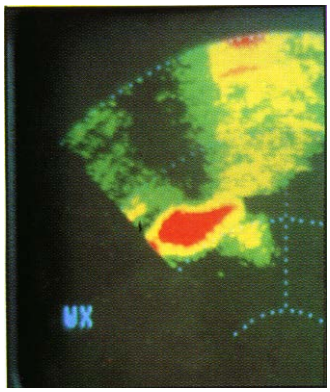

Figure 2