Landmark Accidents: Working a Hole

A Cessna gets knocked around in a Florida thunderstorm

By Bruce Landsberg

As we fly along here in midconvective season, it is especially important to understand what assistance air traffic control (ATC) can provide when it comes to dealing with thunderstorms. Based on recent accident records, there seems to be some confusion about what pilots can expect from ATC. Although many other types of accidents are on the decline, accidents involving light aircraft and thunderstorms have spiked. There were 10 fatal crashes involving aircraft under ATC control during 2004.

One particular accident, involving a single-engine airplane tangling with convective weather, could easily have been added to the total for 2005, but fortunately resulted in a reasonably happy ending. This incident highlights a relatively common misconception among pilots; just because you are talking with ATC about thunderstorms doesn't mean the controllers have the ability or the time to help you stay clear of them.

On March 28, 2005, a Cessna 172S carrying a flight instructor and instrument student departed Kendall-Tamiami Executive Airport, Miami, on an IFR flight plan headed to Sarasota/Bradenton International Airport about 8:45 a.m. Eastern Standard Time. A cold front extended into central and Southern Florida and across into the Gulf of Mexico. Areas of scattered embedded thunderstorms and rain showers were located in the frontal zone with mostly visual conditions elsewhere.

The flight first contacted Palm Beach Approach control at 8:59 a.m., at 5,000 feet on a heading of 010 degrees. At 9:05 the controller asked if the flight was planning to fly to Vero Beach for practice approaches and then continue on to Sarasota. The pilot responded, "Negative. If we could get Sarasota direct and you could help us out with the weather, that would be greatly appreciated."

The controller replied, "I don't see any way of getting to Sarasota without going through the weather."

The pilot replied, "Uh, roger that. Just, uh, on the cells."

The controller stated, "We're not displaying any right now. It's outside our airspace," and asked the pilot if he wanted direct Sarasota.

The pilot replied, "Affirmative" and asked for a higher altitude. Although this may have sounded "sort of" like a deal had been made with ATC to keep the Cessna out of thunderstorms, that was not what happened. The accompanying sidebar spells out how the negotiations might be conducted (see "Let's Make a Deal," page 89).

The Cessna was equipped with a panel-mount datalink receiver that had the capability of showing Nexrad radar mosaics. This may have played a part in the pilot's decision to tackle the line of weather. The standard disclaimer with this equipment is that it's not to be used for tactical weather avoidance. It

displays precipitation and typically updates every few minutes. This is similar to the Center controller's display.

The Cessna was assigned 6,000 feet and given a vector of 290 degrees toward Sarasota. From 9:08 to 9:10 a.m., Palm Beach Approach assigned several vectors for traffic separation, ending with the aircraft flying 270 degrees. At 9:13, the pilot again requested higher altitude, and was cleared to 8,000 feet. As the Cessna was flying toward the front it was evident the pilot was attempting to maintain visual contact above the lower clouds to avoid the buildups.

The hole

At 9:14 a.m., the Miami Center controller asked Palm Beach to vector a different aircraft, on a 300-degree heading, toward a hole in the weather northwest of Palm Beach International, near Pahokee, Florida. The Palm Beach controller advised that pilot that there was a line of weather extending about 30 miles. At 9:15, the Palm Beach controller advised the Cessna, "Apparently at your one o'clock and about 35 miles [there] is a hole the Center's working. We've got to keep you westbound for now; expect a turn that way shortly." The Cessna pilot acknowledged. Most of us would probably believe that ATC was advising us on the weather.

At 9:19 a.m., there was additional coordination between Miami and Palm Beach concerning other aircraft being vectored for weather. At 9:22, the Palm Beach controller instructed the Cessna to fly 290 degrees, and at 9:25 the flight was handed off to Miami Center. The Center controller acknowledged and issued the Fort Myers altimeter setting. At 9:28, the controller transmitted, "November-Five-Eight-Nine, after deviations permitting, proceed direct Sarasota and advise." The pilot acknowledged direct Sarasota and stated that he would advise on deviations. This was the controller's way of saying that the Cessna pilot was largely on his own to stay clear of the thunderstorms. At 9:34:12, the pilot asked, "Center, Five-Eight-Nine, how's the weather look in front of us?"

The controller responded, "Five-Eight-Nine, I'm showing a line of precipitation that extends five miles along your route of flight; then you should be clear until you get about 25 southeast of Sarasota." The controller did not provide any intensity information. Things were about to get interesting.

At 9:37:23, the Cessna pilot transmitted, "Center, I got an emergency."

The controller responded, "Aircraft calling the Center, state your emergency and intentions."

At 9:37:40, the pilot continued, "Five-Eight-Nine...I'm in some serious weather. Can you help us out?"

The controller responded, "Five-Eight-Nine, maintain 8,000 feet. If feasible, turn right heading 090, weather permitting. Five-Eight-Nine, your present position, ah, heading 090 or right 100 degrees heading should get you clear of the weather soonest."

At 9:38:04, the Cessna transmitted, "I can't see a thing. We're showing 1,500 feet." The controller advised that there was no other traffic in the vicinity. At 9:38:31, the controller asked if the flight was

clear of the clouds, and the pilot replied that it was not. The controller recommended an easterly heading to clear the precipitation.

The pilot responded, "I'm trying, I'm trying." At 9:39:11, the controller reported that he'd lost radar contact. About 40 seconds later radar contact was reestablished, and the controller verified the aircraft's position as three miles northeast of Pahokee.

The controller advised that the present heading, or slightly to the right, would allow the Cessna to exit the weather in about three miles. At 9:42:23, the controller again advised that radar contact was lost and asked for an altitude report. The pilot transmitted, "We're still in trouble, we're still in...." The controller asked the pilot to say again, but the reply was unreadable. At 9:42:55, the CFI in the Cessna stated, "OK, we are...got Okeechobee here." The controller asked for an altitude report and the pilot replied, "Ah, 500." The controller concurred and reported the Cessna nearing the edge of the weather in a mile or less.

At 9:43:25, the controller told the CFI that the minimum safe altitude in his vicinity was 1,300 feet, and he instructed him to climb and maintain 8,000 feet.

The pilot refused and requested, "We need to go back to the airport." The controller asked for the nature of the emergency and the preferred destination.

The pilot replied, "OK, uh, we're coming out of fine precipitation — we've got it covered, uh, we're coming out of precipitation. We got the land down below us so we're OK now."

The controller acknowledged and again asked the pilot for his intentions. The pilot then requested direct to the nearest airport. At 9:44:35, the controller handed the Cessna off to Palm Beach Approach for vectors to the nearest airport.

Getting it on the ground

At 9:45 a.m. the CFI said that he wanted to "land at the nearest airport." The controller asked if the aircraft was in visual conditions. The pilot replied, "That's affirmative, that's affirmative; uh, if we could get to Palm Beach I'd greatly appreciate it." The Palm Beach controller confirmed the 172's location 10 miles northeast of Pahokee.

The nearest airport was North Palm Beach County General Aviation Airport. The controller continued, "I can get you to Palm Beach or I can get you to North County. Your closest airport right now is North County."

The pilot responded, "OK, uh, we're OK for now. If we could get to Palm Beach, that would be great." The flight was instructed to fly 100 degrees for vectors to the right downwind for Runway 27R at Palm Beach International Airport.

At 9:47 the controller asked if the Cessna was experiencing any problems and the CFI replied, "Roger, we're OK right now." The controller then advised that the Palm Beach winds were 220 degrees at 22

knots. The pilot acknowledged and then asked if the controller showed any thunderstorms in their path. He was now taking a more active role in staying clear of weather.

She replied, "Negative, sir."

At 9:51 the controller again queried the flight's status. The pilot responded, "Oh, we're doing fine. We're back to normal operation."

The controller said, "OK, great. The wind at Palm Beach is 210 at 23 so you're going to have a really nice crosswind there."

The pilot acknowledged. At 9:52 the approach controller advised Palm Beach Tower that the Cessna that had been having "a lot of problems" was about 12 miles northwest of the airport, and requested that the Cessna be given the long runway for landing (27R).

At 9:54 the pilot advised the controller that he wished to declare an emergency because of structural damage to the aircraft, and asked for fire equipment to be standing by at the airport. The controller then asked if the aircraft was still flying all right, and the pilot reported that it was, but that he wanted to go direct to the airport. The controller then requested that Palm Beach Tower stop departures. She reported that the wind was 220 degrees at 22 knots, that 27R remained the best runway, and that the flight should enter a right downwind.

The pilot replied, "OK, uh, just stay with us and we'll try to make it." At 9:56 the pilot asked, "Is there any way I can get a direct landing in?"

The controller responded, "November-Five-Eight-Nine, proceed direct to the airport, sir; you can land any runway you need to, sir; the winds are currently 220 at 22."

The pilot stated, "Uh, roger that; 220 at 22? I'm going to try to make Runway 27 Right."

The controller then advised the pilot that he was directly between North County airport and Palm Beach International, and said, "North County is off your left, if that will help any." The pilot elected to continue to Palm Beach.

From 9:56 to 10:02, the approach controller continued to provide wind updates to the pilot and relayed clearance for the pilot to land on any runway at Palm Beach. The aircraft landed safely on Runway 27R at 10:02.

From the cockpit

The CFI later recounted his story. As he proceeded on the assigned heading, the CFI said the flight encountered rain and turbulence, so he elected to make a 180-degree turn and exit the precipitation. While performing the turn, the airplane encountered a downdraft, with an immediate altitude loss of about 2,000 feet, followed by increased turbulence. In the course of the turbulence encounter the door hinge pins fractured and the passenger side window burst and struck the right-side horizontal stabilizer. The CFI then declared an emergency.

The instrument student's view was similar. He remembered that Miami Center said they had five miles of rain to pass through. There was no mention of heavy rain or cells. "After a few bumps," the student said, the instructor took control and began a 180-degree left turn to exit the showers. At about 90 to 120 degrees of turn in 30-degree bank, they encountered strong updrafts and downdrafts, and the airplane went into a 90-degree bank. The right door was blown off the hinges, pushed back about 8 inches, and the window blew out.

They continued flying with the attitude indicator (although the report says HSI, this is unlikely) tumbled, as the instructor finally regained control at 6,000 feet, at which time the attitude indicator [HSI] returned to showing normal wings-level flight. Apparently they encountered more strong turbulence because the Cessna flew out of the storm at a mere 500 feet msl.

The weather

The National Weather Service Radar Summary Chart for 1519Z (10:19 a.m. EST) depicted an area of very light to light intensity echoes over southeast Florida and portions of the Everglades, with another area of strong to very strong echoes extending west-southwestward from the East Coast across central Florida to the north of Lake Okeechobee, into the Gulf of Mexico.

Several areas of intense to extreme intensity echoes were embedded within that area. Another area of echoes extended from the general vicinity of the accident site and eastern Lake Okeechobee northeastward off the coast, where a solid line of heavy to extreme intensity echoes was located. Echo tops in the vicinity of the encounter were identified to 39,000 feet, with cell movement to the northeast.

Commentary

About three minutes elapsed from when the pilot last asked about the weather until he declared an emergency. During that time the aircraft moved about five miles while the storms were moving at roughly right angles to the flight path. The "hole," such as it was, either filled or moved about four miles. This, in thunderstorm flying, is called threading the needle and should only be attempted with good on-board radar in a heavy aircraft, and most experienced pilots would describe the situation as a sucker hole, especially given the intensity of the storm as evidenced by the cloud tops. The conventional wisdom used by most airlines is to avoid all severe storms by at least 20 miles.

So how did this happen? First, the Cessna crewmembers likely couldn't see the buildups, or they believed that ATC wouldn't let them blunder into a cell. Miami Center is equipped with the latest digital weather display capability, which is designated to show precipitation levels that are now described as "moderate," "heavy," or "extreme." The old terminology described Level 2 through 6 on the National Weather Service VIP (video integrator and processor) scale, but that language is now outdated.

The new radar display is far superior to the old lines and H's that used to grace the Center controller's scopes, but it's not a constant stream of data and it may be up to six minutes old. Not bad, but not perfect for tactical maneuvering in rapidly developing situations as described in this accident. So, small

holes can close up and, as mentioned previously, they move. A strategic look by the Center controller would have shown the weather to be far less intense to the north and that a deviation of about 50 miles would likely have avoided all the heavy weather. That was probably the best solution other than landing short of the front. This information would have been substantially the same as displayed on the aircraft's datalink receiver.

The NTSB also felt that controller training on the equipment and light-aircraft capabilities had been somewhat lacking. The AOPA Air Safety Foundation is developing a training program for controllers that will be ready for next year's convective season (see "Thunderstorm Avoidance," below).

I will second-guess the CFI slightly, who obviously did a good job getting the aircraft on the ground. Once an aircraft has encountered severe turbulence and if there is visible damage, get on the ground as quickly and gently as you can. The instructor gave the impression after getting things under control that he was doing fine. He said, 'We're back to normal operation.' Structural damage, no matter how slight, is a big deal. In this case it appears that the right door was hanging askew with the window missing. North County airport might have been a more conservative option, assuming the runway and wind considerations were appropriate for the aircraft. You don't want to be shedding pieces of the aircraft while looking for the perfect airport. In some cases, an off-airport landing might make a lot of sense.

This accident raises questions as to how well the pilots understood what was being displayed and how close they could safely maneuver to a powerful and rapidly moving system. According to the CFI, the datalink did not display any heavy or extreme precipitation.

It is said that experience is a tough teacher because she gives the test first and the lesson afterward. Thunderstorms often don't give pilots a second chance.

Bruce Landsberg is executive director of the AOPA Air Safety Foundation.

Links to additional information on thunderstorm avoidance may be found on AOPA Online.

Thunderstorm Avoidance

See the AOPA Air Safety Foundation's new online course on thunderstorm avoidance and remember that learning to fly around thunderstorms in light aircraft is not something learned from a book, online, or an ignorant firsthand encounter. The most experienced guides will approach the big clouds very carefully. The FAA's Web site also has some guidance on thunderstorm flying.

Let's Make a Deal

1. Air traffic control's primary job is to separate traffic, and weather avoidance is secondary. The controller's handbook requires controllers to inform pilots of weather, but this is an extra duty and controllers, like pilots, have varying degrees of weather proficiency. We work as a team.

2. Confirm with each sector that you would like to be advised of any precipitation the controller sees. If it's moderate or heavier, avoid it. If it's looking questionable out the windshield, ask for an update, as the controller may be busy with other duties.

3. The radar sees precipitation, not turbulence. There is a rough correlation, but severe turbulence can occur some distance from precip areas — hence the 20-mile rule. Picking your way through widespread thunderstorms is not a life-prolonging strategy — avoid the area. In a typical year thunderstorms score fatal blows nine out of 10 times, and in this case did severe damage to the aircraft. Now, how important was that trip again?

4. Be prepared to deviate immediately when something you or ATC sees doesn't look good. It could be a five-mile detour or it could be 50 miles. Ask sooner rather than later. It's much easier to ask for a 20-degree heading change and give the controller a minute or so to work out his or her side of the equation than it is to wait until the last minute when an immediate 50-degree turn is needed. In the rare case that ATC is unwilling to give you the deviation needed, insist and be prepared to declare an emergency if necessary. You may not be popular but you'll get to fly another day.

5. Got enough fuel? Significant rerouting can easily add 30 minutes or more to the time en route. If you're IFR, lots of aircraft may be going to the same place to get away from the weather and there may be more delays. In some cases there may be so much weather that landing outside of the entire area is the only safe option. Radar can help identify the convective areas but it cannot predict how fast or where storms will develop.

6. ATC can give you suggestions but in the end, you are pilot in command. — *BL*