CFIT AVOIDANCE STRATEGIES

Avoiding unnecessary groundbreakings

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A disturbing trend is under way. Accident statistics show an increase in the number of crashes involving pilots who fly into the ground without any apparent awareness and with their airplanes fully functional. This phenomenon has been studied heavily in recent years and has even been given a name — controlled flight into terrain, or CFIT (pronounced "see-fit"). FlightSafety International, a major provider of simulator-based training to general aviation pilots, figures that 112 CFIT accidents have occurred between 1966 and 1992. Recent averages run about four CFIT accidents per year in the United States and up to eight a year in foreign locations.

In terms of relative risk exposure, FlightSafety notes that in 1991 there were 21 accidents involving business jets. Of this number, nine involved fatalities. And of those nine, eight were CFIT accidents. So the risk of a CFIT accident is higher and deadlier than most might think. Compared to midair collisions, CFIT accidents produce many more fatalities — 340 fatalities between 1966 and 1991, compared to 15 fatalities for midairs, according to FlightSafety.

Although most of the CFIT investigations have centered on airline and corporate flying, this certainly doesn't mean that pilots of lighter airplanes are exempt from the risk. If the full truth about so many otherwise unexplainable night and/or IFR general aviation accidents could be told, we'd probably learn that CFIT played a larger part than any of us might imagine. It's just that the smaller the airplane, the less likely it is that a thorough accident investigation will ensue.

How does a CFIT accident happen? A good question, and one with many answers. Like any other accident, CFIT is a product of a chain of events. However, topping the list is a loss of situational awareness. In other words, the pilot (or pilots) loses track of where the airplane is or has a distorted perception of how the flight is progressing. Of course, this problem is most critical at low altitude, when maneuvering for an approach, or while on an instrument approach. Flying at night and flying in instrument meteorological conditions multiply the risks of CFIT.

We can look at some past examples for classic accident profiles. Perhaps the best-known illustration of a CFIT accident would be the December 29, 1974, crash of an Eastern Air Lines DC- 10 in the Florida Everglades. In this case, the airplane was flying toward the Miami International Airport, when all three cockpit crewmembers became preoccupied with a landing gear problem. The flight was at 3,000 feet when the gear was lowered, but one of the green "gear down" lights failed to illuminate. The crew focused its attention on the landing gear and failed to notice that the airplane's autopilot was commanding a shallow descent of about 100 to 200 feet per minute. By the time the crew learned that the airplane was dangerously low, it was too late.

On October 11, 1991, the crew of a Beechjet took off VFR from Rome, Georgia's Richard B. Russell Airport. The crew was in a hurry and decided against picking up an IFR clearance on the ground. They reasoned that, once airborne, they could obtain a clearance. Ceilings were at 1,000 feet and nearby mountaintops were obscured, though inbound flights reported cloud tops at 2,000 feet. The airplane weaved around as the pilots attempted to remain VFR and keep from hitting the mountains they knew were close by.

"Do a one-eighty to the left?" the copilot asked the captain.

"You're gettin' close [to the mountain]. You're gonna [sic] to the right," he replied.

"Should I just punch up?" the copilot asked a few moments later. This was a suggestion to climb quickly through the overcast and fly on top of the cloud layer.

"No, there's a guy on approach out there," came the answer.

"Which way do you want to go?" the copilot then asked.

To which the captain said, "Go back to the right."

Five seconds later, the copilot said, "I can't see over here. That's why I wanted to go the other way."

Then the captain began coaching. "Don't climb any more.... Bring it right on around.... Pull it back a little.... Slow 'er down a little." But just six minutes after takeoff, the Beechjet crashed into nearby Mt. Lavender.

The March 6, 1991, crash of a Hawker-Siddeley 125 after departing San Diego's Brown Field Municipal Airport had some similar elements. Many people know this as the flight that killed country singer Reba McEntire's band. In this case, the crew expressed some preflight concern over San Diego's departure procedures and worried that it might fly into San Diego's Class B airspace without a clearance. The crew chose to depart and remain under VFR until it could pick up a clearance in flight. Unfortunately, the pilots apparently felt that an altitude of 3,500 feet would be sufficient for both terrain clearance and remaining below the floor of Class B

airspace. (The floor along the Hawker's route of flight was in fact 5,800 feet.) At approximately 1:45 a.m. — four minutes after takeoff- -the airplane crashed into Otay Mountain, 25 nautical miles east of San Diego. It hit at the 3,300-foot level, just 172 feet from the mountain's summit.

These are but a few well-known CFIT accidents. Think hard enough and many more will come to mind.

To a certain extent, technology can help in reducing the number of CFIT accidents. After the initial publicity created by CFIT accidents in the early 1970s, the Federal Aviation Administration mandated the installation of ground proximity warning systems (GPWS) in all aircraft operated under FAR Part 121. In fact, the Everglades crash was the prime justification for the enactment of Part 121's GPWS rules, which went into effect on December 1, 1975. Since April 1994 all aircraft with 10 or more seats flown under Part 135 are required to have GPWS, and many operators of large turbine aircraft flown under Part 91 have installed GPWS voluntarily.

Even so, GPWS is not a cure-all. The first GPWSs to hit the market had some flaws. These were tied only to radio altimeter information and earned reputations for putting out false alarms. Because of this, many pilots came to disregard GPWS warnings.

Later-generation GPWSs are much more sophisticated and yield fewer false alarms. They incorporate radio altimeter information, as well as computer logic that considers airplane configuration. Alarms are calculated based on various terrain closure rates and airspeeds. For example, with flaps at the landing setting and the airplane on glideslope, newer GPWSs will sound off with a "Terrain, terrain, pull up" command if the terrain closure rate goes higher than 2,000 feet per minute. With an airplane in takeoff configuration, a "Don't sink" command is issued if the airplane descends after takeoff. "Too low, flaps," and "Too low, gear" warnings will also be issued during approach if those checklist items have been ignored and the airplane is within specifically designated airspeed and descent rate envelopes. Wind shear, glide slope, and altitude callouts are also provided with the latest GPWS equipment.

However, the best equipment in the world can't help pilots who lose situational awareness.

Take the case of a Flying Tigers Boeing 747 on approach to the Kuala Lumpur, Malaysia, airport on February 19, 1989. This night cargo flight was cleared for an NDB approach and the airplane descended to 400 feet msl before it even reached the final approach fix. The published altitude for this segment of the approach was 2,400 feet msl. Audio tapes of the flight recovered from the ship's cockpit voice recorder indicate great confusion in the cockpit. The controller, whose English was not the best — and certainly not aviation standard — told the 747 to "descend two four hundred." He meant "descend to two thousand, four hundred feet," but the 747 crew interpreted the clearance as an authorization to descend "to four hundred feet."

They did, and the airplane's GPWS sounded eight times before the airplane flew into a mountain. Neither pilot acknowledged the "Pull up" warnings or made any attempt to climb. It

was clear from the tape that the crew didn't prepare for the approach and didn't really follow a checklist. The GPWS performed, but the crew didn't.

FlightSafety says that situational awareness is on its way down the drain when one or more of the following happens:

- Failure to meet targets (e.g., altitudes, airspeeds, clearances, or other procedures).
- Use of an undocumented procedure.
- Departure from standard operating practices.
- Violation of minimums or limitations.
- Absence of any crew member really flying the airplane.
- Failure to look out the window.
- Breakdown of communication, either between crewmembers or between pilots and controllers.
- Ambiguity, caused by disagreement of instruments or other conflicting information.
- Discrepancies which are unresolved.
- Preoccupation or distraction.
- A feeling of confusion or emptiness.

Another organization, the Flight Safety Foundation (FSF), has developed a CFIT checklist. It's designed to identify the potential for a CFIT accident. The user evaluates various risk factors, each of which is rated in terms of its relative danger.

The FSF's set of highest risk factors? Flying to an African destination, in a non-radar environment, at night, on an NDB approach, using an autopilot with a vertical speed mode, and without a GPWS.

Flying into the ground completely unaware may be difficult for some pilots to understand. Difficult, that is, until they find themselves in instrument weather, a high-workload situation — and then confusion sets in. Hopefully, this would happen only in a simulator or other training environment. This may be the most visceral way to cultivate a sensitivity to the CFIT problem without having a close call — or worse.