FLYING LESSONS for November 6, 2008

suggested by this week's aircraft mishap reports

FLYING LESSONS uses the past week's mishap reports as the jumping-off point to consider what *might* have contributed to accidents, so you can make better decisions if you face similar circumstances. In almost all cases design characteristics of a specific make and model airplane have little direct bearing on the possible causes of aircraft accidents, so apply these *FLYING LESSONS* to any airplane you fly. Verify all technical information before applying it to your aircraft or operation, with manufacturers' data and recommendations taking precedence.

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This week's lessons:

The last two weeks have seen three separate mid-air collisions. Miraculously, everyone involved in all three mishaps survived…which almost *never* happens. Preliminary and/or press reports on the three individual events are at:

www.ntsb.gov/ntsb/brief.asp?ev_id=20081022X34515&key=1
www.faa.gov/data_statistics/accident_incident/preliminary_data/media/H_1103_N.txt, record #10
http://tinyurl.com/66h6xx

Although the threat is terrifying, there are things we can do to avoid midair collisions. In his book *See and Avoid* (Times Journal Publishing Company, Oklahoma City, OK 1988), aerobatics instructor Fred G. DeLacerda tells us how we can quantify the threat of a midair collision, and more importantly, how we can lessen our chances of that most terrifying encounter. DeLacerda says that the typical midair collision follows this pattern:

- They usually take place in daylight hours.
- Skies are usually clear and visibility unrestricted at the time of the collision.
- Most often the airplanes are not talking to Air Traffic Control.
- Midairs usually happen at a slow speed and within 3000 feet of the ground, with a faster airplane overtaking a slower one -- more than one-third (35%) of the time the faster airplane comes directly from behind. The airplanes approach head-on only five percent of the time.
- 75% of all midairs happen within five miles of an airport.
- Half of the pilots involved have over 1000 total flying hours; of those with fewer than 1000 total time, pilots with fewer than 100 hours are the most frequently involved.
- Midair collisions are almost universally fatal.

Seeing other air traffic in time to evaluate the threat of collision, and to maneuver to avoid impact as required, demands we consider:

- Window obstructions: Remove *all* cabin shades and open all curtains before flight. Bugs or bird-dropping smears may hide airplanes until it's too late. If windows or the windscreen is scratched or crazed enough so can't see out, the airplane isn't airworthy.

- Your eyes: Wear glasses if you need them -- don't let pride lead to a collision. Use non-polarized sunglasses in sunny weather. If you have poor night vision, don't fly at night.

- Your passengers: Passengers have useful sets of eyes. Brief passengers before takeoff that they should point out *any* airplane they see in flight.

- Air Traffic Control: ATC is a great help to you in avoiding collisions. But don't delegate traffic avoidance entirely to ATC. You're still responsible to see and avoid.

- Airport traffic patterns: Don't shortcut the suggested pattern at non-towered airports. It's designed to make you predictable, and therefore avoidable, to other pilots.

- Radio calls: Use your radio as suggested in the *Aeronautical Information Manual*. But never assume no one's there just because you hear nothing on the radio.

Reaction time is a factor. DeLacerda's research states it takes one-tenth of a second for the average pilot to see an airplane at the distance of four miles, and for that information to transmit to the pilot's brain. About a second lapses while the pilot's brain recognizes that object as an airplane. It takes five more seconds to determine if there's a danger of collision.

Next the typical pilot requires four seconds to decide about an evasive maneuver, and half a second to command his/her muscles to make a control input. The airplane's lag time between control input and the beginning of the evasive maneuver is one to two seconds.

According to DeLacerda, then, it takes a minimum of 11.5 to 12.5 seconds to see and avoid an airplane on a collision course. If you are closing on another airplane with a relative speed of 60 knots, such as when overtaking a slower airplane or on an intersecting course, you'll travel almost a quarter mile between identifying a threat and the beginning of your airplane's evasive maneuver—*if* you see the airplane and act immediately.

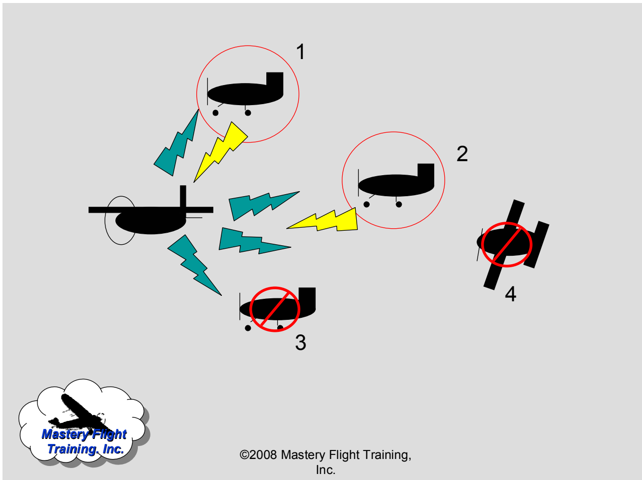
Remember an airplane on a collision path will have no relative movement. The human eye is more sensitive to movement in peripheral vision. An object that is not moving is harder to detect since there's no relative motion. You must actively scan the sky.

Cockpit traffic detectors are a tremendous boost to traffic avoidance. I've done quite a bit of flight instruction in detector-equipped airplanes and find it much easier to see and avoid other aircraft with an initial warning from the panel.

Like any technology, traffic detectors have their limitations. Most listen passively for transponder replies from other aircraft, so if the "other guy" is not transponder equipped, does not have his/her transponder turned on, or is at an altitude or location where the airplane is not being interrogated by ATC radar, the traffic will not be displayed. Any active traffic alerting units (those that interrogate other airplanes' transponders) still rely on the other airplane to be transponder equipped and with the unit turned on.

Transponders and traffic detectors use line-of-sight transmission, i.e., the signal must be uninterrupted between the transponder source and the traffic monitor's reception antenna. Care is necessary to mount transponder antennas where portions of the airplane's own structure will not block the signal. This is why detector-equipped airplanes have multiple transponder antennas, including on top of the fuselage. But most *transponder*-equipped airplanes have only a single antenna, on the bottom of the wings or fuselage to permit line-of-sight transmissions with Air Traffic Control radars.

This explains why not all transponder-equipped airplanes will appear on in-cockpit traffic displays. If a "target" airplane is in most locations relative to the display-equipped aircraft its transponder reply will be detected and the target plotted. If the target is above (position 1 in diagram) or nearly level with the display-equipped airplane (position 2), there is usually no interruption of target plotting. If the target passes below the display-equipped airplane, however (position 3), its signal will be blocked by the target airplane's wings and fuselage as it get nearer; the traffic will get within a mile or two of the display-equipped airplane and then "disappear" from the screen. If you're descending or the target is climbing you need to visually locate the target airplane for avoidance. Perhaps most hazardous, a target that is level with the display-equipped airplane and *turning toward it* (position 4) will **not** appear on the traffic avoidance display. Cockpit traffic avoidance technology is meant to be used to more quickly detect other airplanes visually, but *not* to replace see-and-avoid as your primary means of collision avoidance.



Even if you're IFR, you're responsible to see and avoid other traffic any time you're in visual meteorological conditions (VMC). Remember the VFR requirements for visibility and cloud clearance—pop out of a cumulus on an IFR flight and you may be as close as 2000 feet from a VFR airplane climbing or descending legally through your altitude, a distance your 150-knot cruiser will cover in about 12 seconds…Delacerda's computed avoidance time. Climb or descend through the cloud and you'll be even closer to the legal VFR airplane. Drop down to minimums on an instrument approach into a nontowered airport, and a VFR pilot may be (legally) immediately below the cloud bases in one-mile visibility. Your eyes, and the other pilot's, are the only means to avoid a collision.

Questions? Comments? Send me a note at mastery.flight.training@cox.net.

Debrief—Reader discussion of past *FLYING LESSONS* reports

Approach and landing: Bobby Reed is the Central Region FAA Safety Team regional program manager, and long-time supporter of *FLYING LESSONS.* Speaking about last week's *LESSONS* concerning approaches, missed approaches and landings Bobby writes:

> As always you seem to sense the pulse of the FAASTeams focus areas before most. One of our focus areas for our staff and representatives is called TOAAL, for Takeoffs, Approach and Landings, and your article is very timely and on the mark with advice to pilots in this critical decision making environment. Most of the accidents and incidents take place in the approach and landing phase and your suggestions are both appreciated and on the mark. I hope others take with them the simple truths that you have captured. Thanks again for all you do!
>
> Bobby Reed
> ACE Regional FAASTeam Manager

Thank you, Bobby! TOAAL will "provide pilots safety information and education for safety of flight. Place special emphasis on Takeoffs, Approach and Landings." FAA's project outcome includes a planned safety event on takeoffs, approaches and landings in each of the 48 regional FAASTeam areas of responsibility. Watch SPANS for dates and times.

Gear-up landings: Regarding the continuing epidemic of gear-up landings former Pan American captain and frequent *FLYING LESSONS* commenter Lew Gage writes:

> I am a very firm believer that in all light single and twin engined airplanes the pilot is begging for a gear up landing if ANY flaps are extended before the gear is lowered and confirmed down. In my small world of gathering information I know of several who landed gear up, flaps down. I think there is no operational need to extend any flap before the gear is down unless an intentional gear up landed is needed. In your wide world of collecting these events you know of many, all of which drive up our insurance rates. Regards, Lew

There is no one way to fly an airplane, but Lew's may make the difference. Thanks again, Lew!

Loose fuel caps: Dr. Mac Barksdale responds to a recent *FLYING LESSON* about misleading fuel indications with a loose fuel cap:

> You said: As the suction that pulls fuel out may also hold fuel floats in the full-up, fully-fueled position. My understanding and experience is that when there has been a siphoning of fuel [in the Beech usually the antisiphon tube stopped up with a bug or mud or even paint, and I mean the little hole at the top of the bend of the antisiphon tube] and the suction pulls the bladder tank loose from its snaps the tank contracts and if any fuel remains it registers Full or High because now the tank is smaller. On occasion a tank may appear from observation of the gage to be filling back up. That is registering more and more fuel as the flight progresses. Also I can tell you that with a cap off the main tanks in a Bonanza or Travel Air and some Barons. It takes about ten minutes to empty a tank. Amazing how much fuel will flow out of the filler opening. Regards, Mac

Mac is correct that if a fuel tank's air inlet vent is blocked that a fuel pump pulling fuel from that tank can (and often does) cause the fuel tank to buckle. Metal or fiberglass tanks can collapse under the suction. Rubber bladder tanks, like those in the Beech products Mac describes, can come unsnapped (or in later airplanes, un-Velcro'd) from the bottom of the wing and bunch up. In either case (metal/fiberglass or rubber) this may make some fuel in the tank unusable; to make matters worse, this may push a fuel float sensor upward in the tank so that the cockpit fuel level gauge for that tank indicates higher than actual.

In the case of a loose fuel cap the suction is not usually great enough to cause the fuel tank to buckle—if the air vent is unobstructed the tank will draw in air as fast as fuel is pulled out. Depending on the position of a float sensor relative to the fuel filler port, however, a false fuel level sensation may still be created when a float is sucked upward.

In any event, as we said in last week's *LESSON*, watch for signs of fuel streaming out of filler caps shortly after transitioning to cruise climb. If flying a high-wing airplane, look for fuel streaming off the trailing edge of the wing. If you see an unexpected increase in fuel level during flight (in some airplanes fuel return or transfer may result in an *expected* tank level increase), land as soon as practical to determine whether you have loose fuel caps or obstructed fuel vents.

Thanks, Mac!

Do you have any comments or suggestions? Email mastery.flight.training@cox.net.

FAA's Runway Safety Council

The FAA's Runway Safety Council is a joint effort between the FAA and the aviation industry to look into the root causes of runway incursions. The Council, which began meeting in late March, is comprised of 12 to 15 representatives from various parts of the aviation industry. A working group integrates investigations of severe runway incursions and conducts a root cause analysis. The working group then presents its root cause analysis to the Council and makes recommendations on ways to improve runway safety. For more on this effort to prevent runway incursion mishaps see www.faa.gov/news/fact_sheets/news_story.cfm?newsId=10166.

Fly safe, and have fun!
