FLYING LESSONS for November 10, 2011

suggested by this week's aircraft mishap reports

FLYING LESSONS uses the past week's mishap reports 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. You are pilot in command, and are ultimately responsible for the decisions you make.

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This week's lessons:

Last week's *LESSONS* included discussion of see-and-avoid techniques, the primary method of collision avoidance even if you're flying under Instrument Flight Rules (assuming you're in visual conditions). Reader Jim Herd sent a Debrief comment that leads into this week's follow-on about technology that helps us see and avoid other airplanes. Jim writes:

> Your recent comments in *FLYING LESSONS* covering the need to look out the window prompt me to offer the following reminder.
>
> As we all know, aircraft above 10,000 feet MSL in the USA are required to operate with a transponder [unless within 2500 feet of the surface]. And it is no coincidence that aircraft in that airspace are not restricted to 250 knots. The FAA thinking is obviously that aircraft above 10,000 feet may be flying very fast (perhaps over 500 knots), and as a practical matter it is far from certain that a vigilant and observant pilot will see another aircraft that presents a collision threat. Fast aircraft almost always have avionics such as TCAS that electronically allow them to "see" every transponder-equipped aircraft that presents a threat.
>
> But how many of us know that sailplanes are exempt from the mandatory transponder rule? As a result, in some areas of the country, there will be a bunch of sailplanes above 10,000 feet MSL with no transponders! And these are the most "invisible" of all aircraft due to the white color and sleek profile. Yes, it is truly crazy!
>
> This is not just a theoretical risk. About four years ago a Hawker Jet collided with a glider with no transponder at 16,000 feet MSL near my home airport of Minden, Nevada (near Lake Tahoe & Reno). Incredibly, no lives were lost, despite very extensive damage. The sailplane pilot jumped out and successfully deployed his parachute. The jet pilot successfully landed at Carson City despite having lost her hydraulics and having the wing spar of the glider impaled in the nose of the jet just a foot or two from her body! Neither saw the other until it was too late. The NTSB recommended revocation of the sailplane exemption from transponders, but the FAA has not done so. I suspect this is because they are placing their bet exclusively on ADS-B.
>
> The moral of the story is to never assume that TCAS or similar traffic devices are infallible, and to know when you are entering a high sailplane traffic area - they are marked on Sectional charts.

Thanks, Jim, for this good reminder. Not all traffic will appear on cockpit traffic detectors.

Traffic avoidance systems aboard airplanes are great. I've flown several airplanes with various versions of traffic detectors (TIS, or Traffic Information Systems), some of the sort that send out an interrogation signal and prompt a reply from other airplanes' transponders, others that passively listen for transponder signals. It was a real eye-opener when I instructed an L-3 Communications pilot in an F33A Bonanza several years ago near Portland, Oregon, and could see all the traffic plots on his SkyWatch-equipped panel while we practiced maneuvers and IFR procedures in roughly five miles' visibility on a typical Northwestern day.

L-3 Communications' SkyWatch—one of a number of great options for "assisted see-and-avoid"

See www.as.l-3com.com/products/skywatch/

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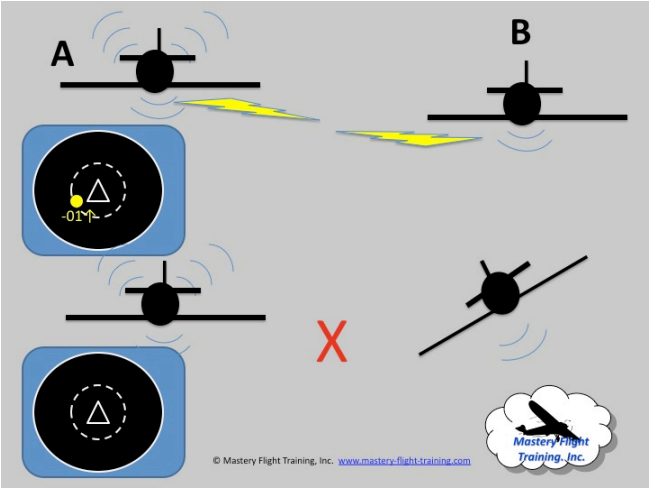
Subsequently I've made several cross-countries in airplanes with similar equipment, and done quite a bit of instruction in airplanes so equipped. And I've noticed some patterns to their operation. Targets may appear in the outer ring (usually six to 10 miles around my airplane), but then disappear when they get close. Sometimes I'll see an advisory of a target within the inner ring (usually set at two miles) that disappears and then reappears later, behind the airplane.

What's happening? An airplane with a traffic detection device will have a number of transponder antennae, the standard antenna on the bottom of the aircraft and one or more additional antennae on the top. The idea is to be able to transmit interrogation signals and receive transponder returns from all around the airplane, to the sides as well as above and below.

In this example Airplane A is equipped with a traffic advisory system. Its antennae, on the top and bottom of the airframe, transmit interrogations and listen for responses from other airplanes' transponders.



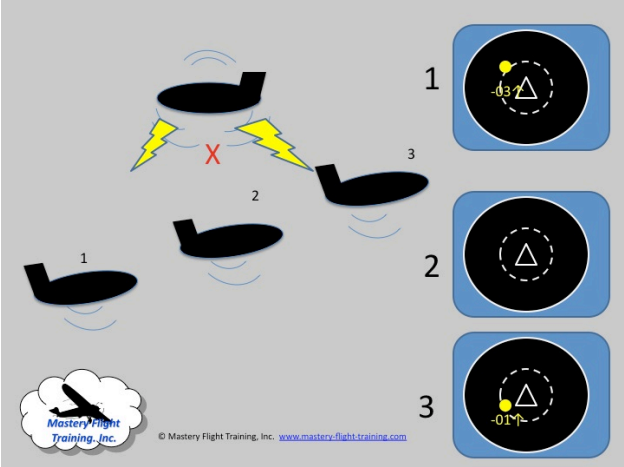
Airplane B in this example does not have a traffic alerter system, and is equipped with a standard transponder with an antenna on the belly of the airplane.

Transponders work on the principle of line-of-sight transmission. That's why standard transponder antennae are on the bottom of airplanes—so the airframe itself does not block the signal to radar interrogations from the ground.

Airplane A's traffic system will detect Airplane B because one or more of A's antennae can "see" Airplane B's transponder antenna. The cockpit display will show Airplane A's pilot where to look for Airplane B.

If Airplane B turns toward Airplane A, becoming a real collision threat, Airplane B's fuselage and wings may blank out its transponder signal. The target disappears from Airplane A's traffic display—just when Airplane A's pilot needs to see Airplane B the most.

Here's another diagram illustrating a limitation of traffic alerting systems. An airplane is in cruise flight (top), while another is climbing from beneath on an intersecting course. The cruising airplane has a traffic detection device, while the climbing airplane is equipped with a standard transponder.



When the lower airplane is in position 1 relative to the higher airplane, the higher airplane's traffic detector can "see" its transponder antenna, so a target is displayed. As the climbing target gets closer in, however, its wings and fuselage block the signal above, and the climbing airplane disappears from the cruising airplane's detector. At some point when the climbing airplane is behind the cruising airplane, the two airplanes' antennae will re-establish line-of-sight and the target will reappear on the cruising airplane's display.

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Portable traffic detectors, the kind that lay on the glareshield or elsewhere, may have even more blind spots for close-in traffic.

So don't make a sigh of relief if that target closing in on you suddenly disappears from the traffic alerter. The airplane may still be nearby. *Traffic detectors are great safety devices* further out, but a target that disappears from the scope is still a threat to see and avoid visually.

Best use of a traffic detector is not to use penetration the inner, close-in ring as your prompt to start looking for the other airplane. And certainly you cannot see and avoid airplanes entirely by use of the instrument panel device.

Instead, traffic detectors are best used to help you find other airplanes visually while they're in the two-to-six miles out range (or greater, in faster airplanes or when the target is faster). *That's* when you have to increase your visual scanning for traffic, to "have the traffic in sight" before a collision threat gets close enough to disappear in the blind spots. The alerter does its job by prompting you **to look outside of the airplane** for visual collision avoidance.

Questions? Comments? Let us know, at mastery.flight.training@cox.net

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Debrief: Readers write about recent *FLYING LESSONS:*

A reader who wishes to remain anonymous writes about recent *LESSONS* concerning "landing long":

> Tom -- Excellent topic and as always, real-world useful. Believe complacency is, indeed, an element, as you noted. But also have come to believe some of our landing-long events occur because of how information is passed on from pilot-to-pilot -- and not necessarily instructor-to-pilot.
>
> The item flashed me back to a demo flight in an airplane we were thinking of buying several years ago. The airport had 5,000-feet plus -- only 800 more than my home field -- so length wasn't an issue for this airplane; it needed only 2,200, per the book. But the seller demo'd the airplane terribly wrong; had me flying take-offs and landings about 20 knots faster than necessary...20 knots!! Following his directions we spent too much time on the runway outbound and ate up far too much in ground effect on arrival -- enough to make 5,000-plus begin to feel, well, short.
>
> Thankfully, the CFI who agreed to give me my transition training and serve as a safety pilot for my first 15 hours -- thank you, insurance company -- was a former owner of the type. He quickly caught on to the operating-speed mistakes I'd been infected with by the seller; as quickly, the CFI started working on teaching me to fly at the *appropriate* speeds...which, surprise! Were 20 knots slower.
>
> Next he had me eschewing my home airport for practicing and going to what's now Stearman Field (1K1, Benton, Kansas) -- which was, at the time, a spare 2,500 feet. Once comfortable there he moved us to tackle Westport (a.k.a. Dead Cow International, 71K, Wichita, KS) which, with displaced threshold, offered but 2,200 and change with obstacle issues approaching [runway] 17...
>
> Once comfortable there the rest of the world's airports became easy -- and landing stayed short. But when selling the airplane eight years later, I found it difficult to get prospects to fly the plane at the optimal speeds for take-off and landing...every one I flew with wanted to fly it too fast...sight picture, feel, comfort level...been taught that way...they were all explanations for why they wouldn't match my demonstrations, which one cited as "obviously too slow" -- even when it obviously worked...even at Dead Cow.
>
> My takeaway from all this: Pilots get taught bad habits they then resist unlearning -- even when definitively shown that other ways work, and safely; sometimes the penalty for ignoring optimal numbers is just a long landing; other times, a runway overrun accident.

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> Thanks for the great work. Anonymously yours...

My thanks for your input aren't anonymous. Australian reader Rob Kerr adds:

> Having flown more than 2000hrs in a [Beech] Bonanza, I agree with your comments on short field landings. I had to get a lightly loaded Bonanza into a 950ft grass field and I practiced at a longer airfield to make sure I nailed all the items you went through. The landing was uneventful. However, my concern is that every now and again, without warning the aircraft will float in ground effect increasing the runway length required to stop the aircraft. Even though all landing parameters have been adhered to in speed etc. I think these are the times when an immediate decision to go around must be carried out if their is any likelihood of not having enough runway. Imagine this scenario if the approach is too high or too fast, or both. Unfortunately, a friend's Bonanza was written off, by an inexperienced pilot overrunning a medium to short grass field by ignoring all your items of advice.

I do what I can. Thanks for adding to that, Rob.

Reader and instructor Dave Dewhirst continues the discussion about formation flying:

> Woodie Diamond's experiences in formation flight with the Travel Air are not unique. We do a lot of formation flying for photo work in a number of airplanes. There are some airframes that just do not allow comfortable formation flight. One of the worst airplanes we ever used for a photo platform was a turbo T-tail Piper Lance. It looked like a great idea in the beginning because the horizontal stabilizer is up and out of the way. With the aft door removed the photographer had a great field of view.
>
> The only problem was that the airframe left such a huge wake it was impossible for the subject airplane to maintain position. We discovered this while trying to shoot a new Mooney. As the Mooney pilot approached the left side of the Lance to get into position for the photographer, there was a position, about 20 feet out and 10 feet down, where the Mooney pilot could not maintain position. The vortex of the Lance produced a right roll effect that was beyond the roll capability of the Mooney.
>
> As soon as we all discovered the problem we discussed a plan. The Mooney pilot would approach on a line of sight merge until he ran out of aileron. Moving down 10 feet allowed him to escape. The Mooney pilot made a series of approaches and in the 15 seconds he could maintain position, we got the shots we needed. The only reason this worked was because the Mooney pilot had exceptional skills. The photographer later showed me the series of shots where the increasing aileron deflection of the Mooney could be seen as it approached the Lance.
>
> We find A36 Bonanzas and 58 Barons to be the superior photo platforms. Any time we use another airframe for formation flight we are always ready to discover wake issues. It is interesting to note that glider pilots know how to handle the wake and fly around it. That is because glider pilots are taught to fly in high, low, and offset positions with respect to the wake of the tow plane. That is one more reason to get a glider rating.
>
> Every time you have the chance, remind your readers that formation flight requires training. There are procedures to be learned and skills to be acquired. There are flight instructors who have the skills and it takes a skilled pilot in both airplanes.

Consider this my most recent reminder. Thanks, Dave for the benefit of your experience.

As always, readers, tell us what you think, at mastery.flight.training@cox.net.

The second most common cause of death in general aviation airplanes is **Loss of Control During Initial Climb**, usually right after takeoff. Last week we looked at three case histories, and I asked for your ideas on cause factors (no responses yet, but perhaps you're still working on it). While you're at it, take a look at these additional case histories:

4. Turning Takeoff

> Several witnesses reported observing the airplane shortly after takeoff flying and executing a number of turns. Prior to impact with terrain, the airplane "barely cleared the trees" and entered a steep left bank. The accident site revealed the left wing impacted terrain and the airplane came to rest upright. A postimpact fire consumed the airplane. Examination of airframe and engine revealed no anomalies that would have precluded normal operation prior to the accident. Each pilot had autopsy evidence of coronary artery disease and a previous heart attack, though it is possible that either or both were not aware of their heart disease. The pilot also had a history of a partial lung obstruction and glaucoma, neither of which appeared to have been causing

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symptoms or was likely to have affected his performance on the day of the accident. In addition, the pilot-rated passenger had recently ingested a medication containing an over-the-counter sedating antihistamine. The investigation, however, could not determine whether impairment or incapacitation affected either pilot. The National Transportation Safety Board determines the probable cause(s) of this accident as follows: The pilot's failure to maintain aircraft control for undetermined reasons.

5. Little Time in Type

The pilot had just purchased the experimental, amateur-built airplane. He began taxiing it around the airport, and then taxied to Runway 14. Shortly thereafter he departed, making a hard left bank turn. He flew between two airport hangars, struck a power line, and collided with the ground. The pilot's wife stated that he had less than 1 hour of flight time in the accident airplane. Examination of the wreckage did not reveal any preimpact mechanical malfunctions. The National Transportation Safety Board determines the probable cause(s) of this accident as follows: The pilot's failure to maintain control of the airplane during climbout. Contributing to the accident was the pilot's lack of experience in the make and model of the airplane.

To get the discussion started, answer a few questions about these and last week's scenarios:

1. What are the similarities between these examples?
2. What factors contributed to each fatal event?
3. Have you ever faced a similar situation in your flying?
4. What did you do that make the outcome of your experience much better than these?

Let us learn from you, at mastery.flight.training@cox.net.

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TEXAS/OKLAHOMA Pilots: *FLYING LESSONS* is coming to Denton, Texas the first Saturday of December for the fourth straight year, with *FLYING LESSONS: The Deciding Factor* on Saturday, December 3rd. This day-long event has sold out every year, with 25 seats available (at least five have already sold). See this announcement for more information about this new presentation, and to pre-register for *FLYING LESSONS* at Denton, Texas (KDTO).

See http://www.mastery-flight-training.com/masteryflight_groundschoolt.pdf

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Thomas P. Turner, M.S. Aviation Safety, MCFI
2010 National FAA Safety Team Representative of the Year
2008 FAA Central Region CFI of the Year

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