FLYING LESSONS for December 18, 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.

FLYING LESSONS is an independent product of MASTERY FLIGHT TRAINING, INC. www.thomaspturner.net

This week's lessons:

Would you fly IFR without an autopilot? Although most of us earned our ratings while hand-flying 100% of the time, conventional wisdom is that single-pilot flight in IMC without a functioning autopilot is (at best) ill-advised. Agree or not, most pilots of high-performance piston and turbine-powered airplanes train with an expectation of a working autopilot…and the safety record seems to support the wisdom of this philosophy.

Nonetheless the day may come when your autopilot fails. Consider this news report of a fatal King Air crash, one of several similar reports in recent times:

> The Roseburg (OR) News-Review reports [the pilot] told air traffic controllers the aircraft's autopilot failed and he was having difficulties controlling the aircraft.

"Difficulties controlling the aircraft" may have been the result of:

1. One of several autopilot and/or trim failure modes at an inopportune time, resulting in a radically out-of-trim airplane and control forces that left unchecked can rapidly overpower the physical strength of the pilot; or
2. A pilot who, because of lack of recent hand-flying experience and subsequent overdependence on the autopilot is incapable of hand-flying for extended periods or in high-workload phases of flight.

Guard against the first cause by becoming extremely familiar with your autopilot. Remember that similar autopilots may have very different design and interface with other avionics, even in the same make and model of airplane. Autopilot use, like GPS operation, is airplane serial number-specific, with every installation having its own foibles and requirements. Your autopilot checkout must include, *at a minimum*, absolute **mastery** of these items as appropriate to the airplane you're flying:

- Operation in all attitude, altitude hold and vertical speed modes, including use of any altitude preselects.
- Operation of all heading and navigation modes.
- Operation of all approach coupling modes, including "go-around" and missed approach requirements that often requires autopilot disconnect and re-engagement once climb begins.
- Operation of a stand-alone flight director in all the modes listed above.
- Recognition of expected and abnormal annunciator indications for all modes.

- Knowledge of the instruments required to operate the autopilot, including those the failure of which will shut off the autopilot and those that will degrade but not disengage the autopilot.
- Operation of the electric trim system(s).
- All means of disengaging the autopilot in normal and abnormal/emergency modes.
- Methods of overriding a malfunctioning autopilot and/or run-away trim condition, including memorization of Emergency Procedure checklists and the ability to locate and pull required circuit breakers by memory and feel.

Guard against the second cause with:

- Frequent practice in all modes—fully coupled, flight director, and hand-flying. Alternate between all three methods in your normal flying to remain proficient in them all.
- Prior consideration of workload management if hand-flying becomes necessary. Just as you may develop and review electrical load-shedding techniques for the event of an alternator or generator failure, so too can you create a *"workload-shedding"* strategy for hand-flown operations. Such a strategy could include:
    - Deviating toward the best possible weather conditions within a reasonable cruising time or distance. VMC is your best defense.
    - Minimizing situations requiring you reprogram a GPS or flight management system. If you have to deviate, use vectors, "direct to" or VOR guidance. Keep navigation simple.
    - Asking ATC for a vector when a change of direction does become necessary, until you are able to tune or program guidance into your avionics.
    - Avoiding complicated procedures like nonprecision approaches without vertical guidance, procedure turns, DME arcs, etc. Again, keep navigation simple.
    - Avoiding changes in direction and altitude at the same time as much as possible.
    - Asking ATC to provide instrument approach details if you are having any difficulty programming or briefing an approach while hand-flying.
    - Using knowledgeable passengers to help you with charts and checklists. To be useful, you'll have to train your passengers *now*, before an in-flight problem arises.
    - Taking your time, and delaying descent and approach if you need time to prepare.
    - Declaring an emergency if necessary to obtain the clearances and assistance you might need.

Remember that if your autopilot fails because of an instrument failure that you may have to very quickly transition from monitoring a functioning autopilot to taking over by hand while recognizing that an instrument has failed, identifying the precise instrument(s) that no longer work(s), and transitioning to hand-flown, partial panel flight—a task not well accomplished, historically, by pilots either private or professional.

It's unusual to hear of a gear up landing in IMC, when pilots tend to be more procedurally attuned and standard procedure is to extend the landing gear at or before the final approach fix. As in visual weather, distractions and pilot workload create an environment rife with pilot

omissions. How many other types of mishap besides landing gear omission could be avoided with improved workload management?

Expect spotty IMC near dawn anywhere, if adequate moisture is present, but especially in areas of variable terrain. Don't expect to be able to maintain visual separation from clouds and fog in the dark.

Debrief: Reader comments on past *FLYING LESSONS*

Regarding a recent *FLYING LESSON* about obstacle-clearance landings and arriving at a desired touchdown zone, well-know "ancient aviator" Bob Siegfried writes:

> Good Evening Tom. A couple of points that I would like to comment upon.
>
> I think we should be training pilots so that they are proficient at six degree glide paths as well as the three degree ones. Makes for a lot easier spot landings and I know of no popular crosscountry light plane that is not capable of making a six degree approach. As you point out, steep approaches allow a lot more clearance over obstacles.
>
> The other point has to do with picking a landing spot. Most of our light airplanes can be comfortably landed on a two thousand foot runway at sea level under standard conditions. I think we should train our clients to decide before any approach just how much runway is needed for a safe comfortable landing under the conditions that prevail.
>
> Landing in the last two thousand feet of a six thousand foot runway could be a very good idea as long as it was planned for. Using the last part of the runway allows us to be certain of a clear path for our final approach. Sure can be comforting on a dark night and helpful on a low visibility circling approach
>
> If a wild dive is attempted, I think that is not good at all, but if a nice six degree approach angle and a normal approach speed somewhere around 120 to 130 percent of configuration stall speed is made to the touchdown point, I see nothing wrong and a lot of potential good in landing in the last portion of the runway. Whadda ya think?
>
> Happy Skies, Old Bob

Certainly there are cases when obstacles call for a steeper approach angle to a precise touchdown spot, and/or when intentionally landing long (with adequate runway margins) makes sense—emergency landings, arrivals at airports with 10,000-foot runways and the GA terminal at the far end, and hitting the colored dot at Oshkosh comes to mind. Consider these tools for your practice (under controlled circumstances, with safe margins) and use. Thanks, Bob!

Regarding the same item and its mention of landing "on the numbers," reader Charles Lloyd adds:

> The landing distance for jets is based on 50 feet above the threshold at Vref (1.3 Vs), idle power and in the case of most manufacturers the total landing distance does not include the use of thrust reversers. As the aircraft continues on a 3-degree glide path the touch down point is approximately 1,000 feet from the runway threshold. This 1,000 feet is included in the landing distance published in the flight manual. So why do we need to land on the numbers in a single engine aircraft?

> I base my single engine fixed gear aircraft at a lighted sod field with no visual approach guidance. With the help of a user-defined waypoint in the GPS at the threshold of both runways, I use the 3 degrees equal 300 feet per mile technique for approaches both at night and in the daytime. Three mile equals 1,000 feet above runway elevation and five miles equals 1,500 feet above field elevation [which is] is what I monitor on approaches.
>
> Set up the runway threshold at your next waypoint and then switch to OBS [mode] and dial in the runway magnetic heading. You have an extended runway centerline with miles to go.

Thank you, Charles!

Questions? Comments? Email me at mastery.flight.training@cox.net

Two from the Flight Safety Foundation:

The Flight Safety Foundation's recent e-newsletter includes items applicable or "translatable" to single-pilot operations in piston and light turbine aircraft:

Deadly Omissions: Developing and using Standard Operating Procedures (SOPS) to guard against memory lapses. Although airline-oriented, consider how *repetitive-task*, *false-memory* and *expectation-bias* threats can affect proper configuration for takeoff and landing in your airplane.

Early and often: New guidance for activating deice boots. What we've all been taught, and what sometimes still appears in manufacturer's guidance and operating specifications, isn't what's best to protect again ice accumulation.

See:
www.flightsafety.org/asw/dec08/asw_dec08_p20-24.pdf.
www.flightsafety.org/asw/dec08/asw_dec08_p10-16.pdf.
www.flightsafety.org