

FLYING LESSONS for May 26, 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:

There are situations when fuel in the tanks, even above the "unusable fuel" sump level, become unusable in flight. Before you scoff, consider that fuel starvation—an engine failure resulting when fuel is available somewhere on board the airplane but for some reason does not make it to the engine—is responsible for as much as 40% of all off-airport landings according to some researchers. I call power interruption from fuel starvation a "*pilot-induced engine failure*."

Removing cases when the pilot selects an empty fuel tank and does not restore fuel flow before an unscheduled landing, there are other scenarios that can lead to an "unusable fuel" state and engine failure:

Slips With Low Fuel Levels: As long as the airplane is in coordinated flight, fuel will flow normally from the tanks into the fuel delivery system. In other than straight-and-level attitudes, centripetal force will replace gravity to force fuel "down" relative to the airplane. But if aileron and rudder are not coordinated, forces acting on the airplane may pull fuel away from the fuel lines. This unporting of fuel can cause fuel starvation and engine stoppage. Obviously the risk is greatest when fuel levels are low.

Fuel unporting is most commonly seen in a slip when landing into a crosswind when the pilot has inadvertently selected the "downhill" fuel tank, or -- if turning steeply immediately after takeoff or in a go-around -- the pilot is not careful to maintain rudder coordination. Practice maneuvers with low fuel levels in the selected tank(s) can also lead to uncoordinated flight, fuel "sloshing" away from the tank pick-ups, and fuel starvation.

The "fix" is to keep the ball centered with coordinated use of aileron and rudder, so that "down" for the fuel is toward the bottom of the tanks and the fuel lines, and to select the "uphill" tank when planning a slip to landing.

Turning-Type Takeoffs: Another low-fuel unporting "gotcha" happens if you make a fast turn onto the runway for takeoff and fuel sloshes toward the outboard end of the tank. A fast turn on the ground will naturally be uncoordinated (you're moving in two, not three, dimensions before takeoff), and again the risk is greater with less fuel in the tanks.

Some airplanes have baffles in the tanks to inhibit "sloshing," but it's still a good idea to get aligned with the runway completely before adding power for takeoff. Not only does this avoid the fuel unporting issue, it also puts much less side-load on your landing gear.

Auxiliary fuel tanks: Many airplane types have main and auxiliary fuel tanks. In every model I'm familiar with, the Pilot's Operating Handbook (POH) calls for fuel selectors to be moved to a main tank position for everything except straight-and-level flight.

If the airplane has been modified with additional fuel tanks after it first left the factory, this limitation will appear in the POH supplement for the modification. Auxiliary fuel tanks often are located, plumbed or vented such that fuel flow may become interrupted in high angles of attack.

Vapor lock, or an interruption in fuel flow caused by air in the fuel lines, often results when a fuel tank is unported or drained completely and the fuel pump is allowed to draw air into the lines. This is especially common in airplanes with auxiliary fuel systems that have long fuel delivery lines from the tank to the fuel selector.

In some cases fixing a vapor lock is easy (switching to a fuel-filled tank and running a boost pump), but in others it make take a complicated purging process and may not even be possible until you're on the ground. To avoid the dangerous potential for vapor lock, avoid unporting fuel tanks or running a fuel tank completely dry in flight.

To avoid making all your fuel "unusable" for takeoff, maneuvering or landing, following the POH's guidance and double-check positions before takeoff, climbs, descents, and when entering the approach or traffic pattern.

Many older airplanes have less ergonomically friendly fuel systems, with complicated and sometimes hidden fuel selectors, unusual fuel pump operating procedures, and fuel gauges that must be manually switched to display fuel level in the tank being used.

Review your airplane's fuel system operations and limitations thoroughly during initial checkout (insist your instructor point them out to you in the POH and/or supplements), and again at least annually. If you're tasked with providing instruction, read the POH and supplements for that specific serial number airplane and aftermarket system before meeting with your flight instruction customer, especially in older airplanes and those equipped with auxiliary fuel systems.

Use a printed "Before Takeoff," "Before Practice Maneuvering" and "Descent" checklist to ensure selecting a main fuel tank with enough gas to complete the operation before departing the ground or straight-and-level, cruise flight. Don't fall victim to a pilot-induced engine failure.

Comments? Questions? Tell us what you think at mastery.flight.training@cox.net.



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Debrief: Readers write about recent *FLYING LESSONS*:

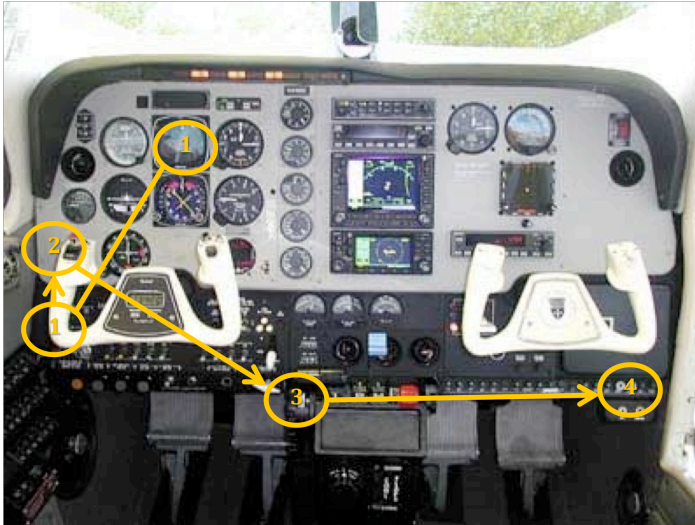
Several readers wrote about last week's discussion of pitch trim runaway emergency procedures. The procedure and picture below, repeated from last week, applies to a post-1983 Beech A36 Bonanza. But the concept applies to all airplane equipped with an electric trim system—see the Pilot's Operating Handbook and autopilot/trim system supplements for the correct procedure in the airplane(s) you fly.

A few readers commented:

I fly an F33A Bonanza and I have never been exposed to the runaway trim procedure you described today. Thank you for sharing that experience and your preflight process. I plan to add that to my preflight procedure at once. Thanks again for everything you do to help us all fly safer.—Don Ward

Tom, This is a VERY valuable, concise procedure. Many thanks.—Andy Reardon

We've added a slide and your procedure on runaway trim to our Emergency Procedures presentation—Hank Canterbury, Beechcraft Pilot Proficiency Program



Autopilot Malfunction/ Pitch Trim Runaway Procedure

From the POH Autopilot Supplement. Adjust as necessary to the individual aircraft. See your Supplement for details.

1. Maintain control of the aircraft (this may require considerable force on the controls).
2. Depress and HOLD the Autopilot Disconnect/Trim Interrupt button on the pilot's control yoke.
3. Trim the aircraft using the manual trim wheel.
4. Pull the SERVO POWER or PITCH TRIM circuit breaker.
5. Release the Autopilot Disconnect/Trim Interrupt button.
6. If the electric trim continues to run, turn OFF the Battery and Alternator switch(es) and follow the Total Electrical Failure procedure.

Removing electrical power from the trim servos will resolve an autopilot malfunction or electrical trim system failure. The aircraft may be hand-flown using manual trim.

Sample Autopilot Malfunction/Electric Trim Runaway Procedure (1984 – 2005 A36 Bonanza)

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Readers, what's *your* opinion? Tell us at mastery.flight.training@cox.net.



We're still receiving reader comments about the seventh most common cause of fatal general aviation accidents, according to a 2010 FAA study. So we'll hold off a week on moving on to Cause #6, and run some reader insights about attempted visual flight in Instrument Meteorological Conditions.

Reader Lorne Sheren writes:

Well said as usual. Being a current instrument rated pilot flying a capable airplane, I had always dismissed VFR flight into IMC as a "can't happen to me" event. Not true. In fact this can happen very easily during the final phase of flight, [when] weather looks good, IFR has been cancelled (going into a non-towered field), and, "poof" a wisp of ground fog, innocuous when viewed from above but deadly when viewed from the side. Unless a go around is immediately initiated under these circumstances there is no terrain or obstacle clearance and you are perilously near the ground. A second can make a difference. And although we all give it lip service, at that point in time how many of us are really spring loaded to go missed?

Another, more subtle point- going IFR into a non-towered field: what is VFR? How many of us cancel IFR while still in the air? Most of us, right? It's easier, and more considerate if there are departures waiting. But suppose something, anything, happens, before or during landing. You lost the benefit of having someone know you are missing. So I would urge us all not to cancel that valuable IFR [clearance] until you are safely on the ground. It's not like we have to sprint out to the pay phone anymore [to cancel], and the difference to the fellow departing a mere minutes. In fact my wife gets really angry now when I cancel in the air.

Reader Joseph M. Foresto of FAA Headquarters AFS-810, Flight Standards Liaison to the Office of Runway Safety, reminds us of a handy tool to help avoid VFR into IMC. Joseph writes:

I want to congratulate you on a great learning site. Regarding VFR into IMC, allow me to offer your readers this: [Estimating In-Flight Visibility](#) [posted on the Mastery Flight Training [Tools for Flying Safely page](#)]. It's easy to remember, if you have to fly less than 3000 AGL to maintain contact with the ground, your in-flight visibility is less than three statute miles.

See www.mastery-flight-training.com/tools_for_flying_safely.html

Thanks, Joseph, for this excellent weather evaluation tool.

Reader Bill Caton adds about the [Categorical Outlook Flying](#) decision-making matrix that was the subject of our VFR into IMC discussion last week:

Several [of my] friends are going to your matrix and love it. One owns the Comanche I had [previously owned] and the other owns the Arrow I owned. They passed it along to their friends.

Thank you, Bill. I'm glad you find this valuable.

See www.thomaspturner.net/Categorical%20outlook%20matrix.htm

Next week, we'll begin our look at ways to avoid the sixth most common cause of fatal general aviation accidents: Initial Climb—Aerodynamic Stall.

Setting Personal Minimums

FLYING LESSONS reader and newly minted private pilot Jay Graph makes an astute observation, and asks:

I wonder if pilots sometimes get in dangerous situations, such as flying into IMC, because they evaluate the weather subjectively (e.g. "It looks good enough"), instead of objectively (e.g. "I will not fly if clouds are lower than X feet AGL"). I hear a lot about "personal minimums", but I don't really know what this means. Can you give me some examples? What does a personal minimum look like for someone like me with less than 100 hours?

Congratulations on beginning the adventure of a life in the air, Jay! Setting personal minimums is one of those things we all hear about, but few instructors provide any guidance to new pilots on how to go about it. Luckily FAA *Safety Briefing* editor and *FLYING LESSONS* Susan Parsons addressed the issue recently in the FAA's general aviation safety magazine. See her article "[Getting the Maximum from Personal Minimums](#)". I also wrote an article a couple of years ago that may help, as part of my "Leading Edge" series on AVweb. See "[After the Checkride: Your Next 100 Hours](#)".

Hopefully these two items will get you started on a strategy to create and employ safe decision-making limits in your flying, and to slowly expand your personal minimums envelope as you gain experience. Let me know if you have any questions or suggestions.

See:

www.mastery-flight-training.com/faa_developing_personal_min.pdf
www.avweb.com/news/leadingedge/194320-1.html

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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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