FLYING LESSONS for September 30, 2010

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.

If you wish to receive the free, expanded *FLYING LESSONS* report each week, email "subscribe" to mastery.flight.training@cox.net.

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This week's lessons:

"Just a little further…." It amazes me how many fuel exhaustion mishaps end a mile (or less) from the planned destination airport. Unless the pilot was totally unaware of the actual fuel state, those last 10 minutes before the gas ran out must have been agonizing—"just a little further, come on, just a little bit more"—until the engine quit and the glide began.

Fuel exhaustion really begins before the pilot walks out to the airplane. You may flight plan the traditional way, calculating an estimated time en route, determining the expected fuel burn, and confirming enough fuel is loaded to make it to destination as planned with enough left over in reserve to change plans as needed.

Or you may plan a different way, choosing to determine actual fuel burn once in flight, comparing that to actual ground speed, and repeatedly calculating whether the existing fuel state is adequate to make it to destination with a reserve, diverting as necessary if at any time the fuel state will become critical before landing.

Both strategies require you to actively determine fuel burn, ground speed and distance remaining repeatedly in flight. More importantly, they mandate you have the discipline to begin diverting as soon as your calculations show you'll be burning into your planned reserve at destination.

Your planning does no good if you're not willing to execute your escape when needed. It's the pilot who convinces him/herself that it's OK to burn out of the planned reserve, or who second-guesses a diversion once begun and turns back on the original course, that may one day put it down just short of destination.

Taking off with a tailwind will increase takeoff distance, but it also reduces the climb angle once the airplane is airborne. If you try to force the airplane to fly below the proper speed, it can lift off into ground effect but may not be able to climb further…leaving you in the precarious position of having to lower the nose to keep flying, at a place where lowering the nose will point you at an obstacle.

Taking off with a tailwind may work if the runway is long enough and there are no obstacles off its end.

Any takeoff you plan, however, should include an estimate of where on the runway you'll reach flying speed. If you don't achieve your target by that point, immediately chop the throttle (s) and abort the attempt. Any delay can have grave consequences.

If you choose a runway that is not long enough to accelerate to the liftoff speed and still have room to stop before going off the far end (this is called a "balanced" field, making use of an accelerate-stop chart in most multiengine airplanes' handbooks), then you need to choose a decision point closer to the beginning of your ground roll, and a decision speed you'll compare to actual to make this abort decision. It gets complicated—but mastering the complications makes it easy to fly safely.

We spend a lot of time talking about stalls in training, but not a whole lot developing real understanding of what causes the airplane to "lose lift" and begin to fall. One of the least-understood concepts of pilot-side aerodynamics is the "accelerated" stall.

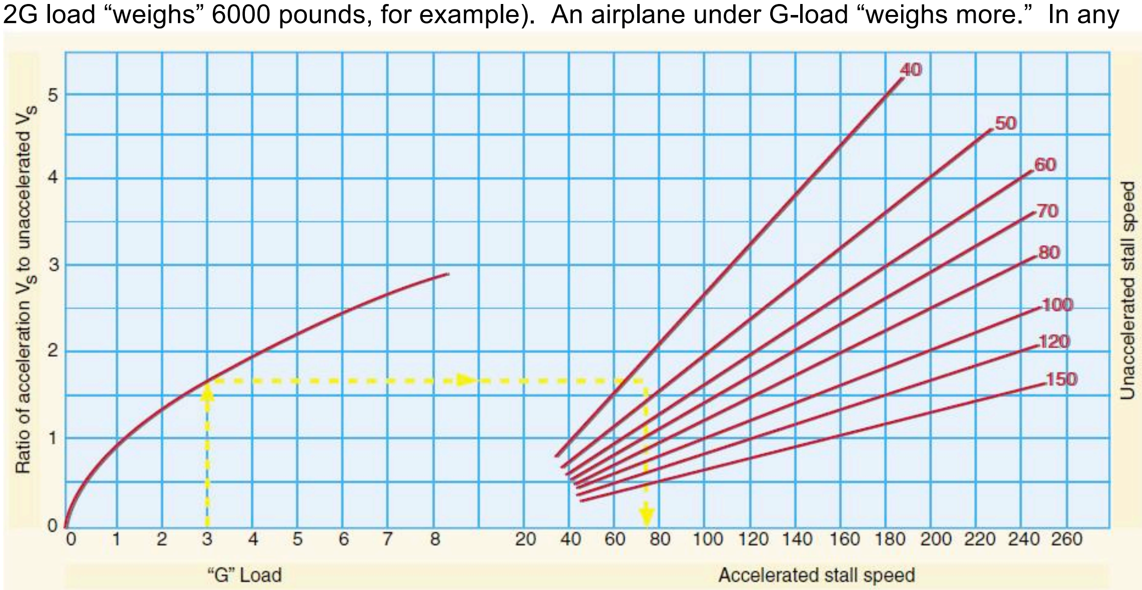
An "accelerated" stall is any stall that occurs at a higher-than-"book" stall speed. Since airplane flight manual stalling speeds are usually defined at maximum gross weight, and since stall speeds decrease with reductions in airplane weight, when could the airplane stall at a speed that is higher than the "book" V-speed? Answer: when the airplane weighs more than maximum weight.

There are three conditions where an airplane exceeds its maximum published weight. One is when the pilot has overloaded the aircraft, inadvertently or with foreknowledge. Operating above maximum gross weight decreases performance margins and heightens risk; an increase in stalling speed is one of them.

The second condition when the airplane is heavier than "maximum" is when the airplane is being operated in accordance with a Supplemental Type Certificate (STC) that permits a higher operating weight. "Gross weight increases" are popular STCs because most airplanes are a tradeoff between filling the fuel tanks or filling the cabin. Pilots generally want it all, and gross weight increases get us closer to our goal. It may be perfectly safe—the FAA approval (or international equivalent) tells us so—but in many cases the Pilot's Operating Handbook (POH) supplement and other STC paperwork do not supply stall speed increase information with the good news about weight increases. It's up to the pilot to get a "feel" for the airplane's handling, to avoid stalls at higher-than-book speeds when operating at higher-than-book weights.

The third situation that causes the airplane to stall at speeds higher than "book" is when *the airplane wing is loaded at greater than one G*. Enter a banked turn and hold altitude, and the wing will "load up" with more than the normal force of gravity. This is called a *load factor*. The steeper the bank, the higher the G-load in level flight. A rapid pull-up from a dive also loads the wing, increasing stall speed. Abrupt, severe maneuvering adds G-load.

Additional G-load is by definition an increase in weight (a 3000-pound airplane under a 2G load "weighs" 6000 pounds, for example). An airplane under G-load "weighs more." In any



configuration a loaded wing will stall at a higher indicated airspeed than the same wing at one G. If the "effective weight" of the airplane under G-loading exceeds the maximum gross weight of the airplane, then the stalling speed under that load will be higher than the published V-speed for the flap (and other lift-generating devices) position.

Next week we'll further visualize the effect of load factor on stalling speeds, then come back to the concept of angle of attack as it relates to an airplane wing under load.

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

Debrief: Readers write about recent *FLYING LESSONS*

Regarding last issue's discussion of potential misfueling accidents, reader Dave Dewhirst warns us not to be complacent because of differences in jet fuel vs. avgas fuel nozzle design:

> I think our industry has done a terrific job of defeating the safety procedures put in place 20 years ago to eliminate the possibility of putting jet fuel into a piston airplane. There are too many airplanes that use Jet-A, but have a fuel port designed for 100LL. This largely due to a number of piston airplanes converted to turbine engine or diesel. There is also one turbine single in production with the 100LL ports carried over from the piston versions of the same airframe. The result is that it is common practice to carry an adapter on the jet truck to allow the fish-mouth fuel nozzle to fit the 100LL port on the airplane. We have effectively defeated the safety procedure and put the security for the event back in the hands of the line guy. That is why the restrictor neck was created in the first place.
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> Keep up the good work—Dave

Thanks, Dave. Another reason to personally observe fueling operations if at all possible. Reader Alan Davis adds:

> When I was the Director of Aviation Programs at Cochise College, I arrived for my first day at work in August of '99 and was told that the supplier that provided our avgas had filled our avgas tank with jet fuel! How's that for a heck of a way to start? Fortunately, one of our staff that had taken the fuel truck over to be filled noticed the odor immediately as the filling process began and stopped the process and quarantined the fuel truck. Despite the tank being clearly labeled for "AVGAS ONLY", the truly big question was, how did this happen. There were two primary causal factors identified:
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> 1. When the fuel was ordered by the college purchasing department, the terminology used was not correct. The request was for a quote for "100 LL Aviation **fuel**" rather than "100 LL Avgas". The person on the other end at the supplier heard "**fuel**" and wrote the order as jet fuel rather than avgas - a really bad miscommunication. The cure for this was to make sure that in the future the correct terminology was understood and used by purchasing personnel at the college when ordering. Not being aviation people, of course, they would not have known the difference.
> 2. Prior to my arrival, no one had put in place an appropriate sampling procedure to insure that the correct product was being delivered. All they did was stick the tank to make sure that the load would fit, connect the truck, and pump it into the tank. Since that was a "sealed" process, the odor could not be detected at that point. Of course, there is also a "color" issue as well, but without sampling that was not noticed. The fix for this was to insure that, for all deliveries, a sampling procedure was in place. This used a white plastic bucket so that color, odor, and any particulate contamination could easily be seen, and this was done directly from the truck hoses and prior to any hooking up of the truck to the tank.
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> It was truly fortunate that none of the jet fuel got into any aircraft! The alert staff member that halted the process of filling our fuel truck, and the quarantining of the system, prevented the potential for finding a "pile of metal" off the end of the runway after an engine failure. The supplier took full responsibility, given the past record of our purchases, and removed the jet fuel from both the tank and the truck, cleaned both, and then provided new fuel and a drum for the placement of samples to insure that everything was then correct.
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> What was most alarming was learning from other sources that jet fuel could be present in smaller quantities (enough to cause engine problems) but not enough to be smelled, or seen - due to the light

color of 100LL - when a normal sampling would be made at the aircraft. The percentage concentration of the jet fuel in the avgas actually needs to be pretty high before it will show or be smelled when taking the sample at the aircraft as part of the preflight.

So, it was a good ending - but a heck of a way to start my first day on a new job!

Reader Phil Webb discusses high density altitude takeoffs:

In your Sept 16, 2010 issue the following statement caught my eye: "However, after breakfast, the T/O climb out of Payson was abysmal. T/O was very slow to accelerate, but initial climb wasn't scary. After the gear and flap were up I accelerated to best climb of 85 kts and didn't. I had to go to best angle of 71 kts to get a positive rate of climb."

My concern is WHICH best rate of climb speed he was using. The one for max gross weight at sea level which most of us memorize or the best rate for his density altitude and gross weight, which can normally only be found in the POH.

Most pilots believe that there is only one best rate of climb speed, but it decreases as your weight decreases and/or density altitude increases. In my Grumman Tiger best rate at max gross weight is 90 kts at sea level, and decreases to 79 knots at 10, 000. If I only weigh 2,000 lbs at 10,000 feet it further decreases to 74 kts.

Remember, best rate of climb speed is based on max gross weight at Sea Level. As your density altitude increases or your gross weight decreases your best rate of climb speed decreases, so 71 kts might be closer to best rate of climb speed than 85 Kts.

Thanks, Phil.

At Least I Know You're Reading…

Several readers correctly pointed out the last issue of *FLYING LESSONS* jumped the gun about implementation of the new "line up and wait" terminology for ground operations at tower-controlled airports. FAA reminds us now, however, that the rule is in effect. And it offers training…

Beginning Sept. 30th the familiar ATC instruction "taxi in position and hold" is history, replaced with the phrase "line up and wait." Starting last June 30th ATC is required to issue an explicit clearance to aircraft crossing any runway…whether active, inactive, or closed. FAA's online course "Line Up and Wait: Taxi Authorization and Runway Clearance Guidance for Airmen" is in the Featured Courses portal at www.faasafety.gov. The course covers safe taxi operations, ATC procedures and phraseology, and pilot responsibilities. It also reviews best practices for avoiding runway incursions, such as knowing and understanding the meaning of the runway hold markings. Some three-fourths of runway incursions result from a failure to comply with this marking. For more specific information on line up and wait see FAA Notice JO 7110.536.

Despite my gaffe, reader Eric Basile writes:

I agree with your larger point, though. The runway crossing clearance policy changed a little bit ago to require an explicit clearance to cross all runways. Yet, I've noticed that many smaller airports (particularly when they are not busy) still occasionally forget to do this. We both know "un-learning" an ingrained habit can take a long time…and there is some question of whether it can be "un-learned" at all…

And while I'm making corrections:

Thanks for your weekly *"Flying Lessons"*. Just for the record, the June 26, 1988, newly delivered Air France Airbus A-320-111 crash occurred during a "fly-by" during an "air show" at Mulhouse-Habsheim Airport in Alsace/France. (did not occur during a Paris Air Show). Keep up the good work....Michael Weidhaas.

Reader Woodie Diamond wrote about our on-going angle of attack discussion:

"Excellent! Never understood the difference between "mush" and "stall", but your explination has made it perfectly clear. Thanks!!"

Question of the Week

Have you ever inadvertently stalled an airplane? What were the circumstances? Were you in coordinated or uncoordinated flight at the time?

Let us learn from you at mftsurvey@cox.net.

Fly safe, and have fun!

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