FLYING LESSONS for September 20, 2012

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.

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

FLYING LESSONS is an independent product of MASTERY FLIGHT TRAINING, INC. www.mastery-flight-training.com

This week's lessons:

Three September preliminary reports from the NTSB…

Several witnesses heard an increase in engine rpm consistent with a pilot adding power to perform a go-around. Two witnesses came out of their hangar at the airport and observed the landing gear of the accident airplane retracting. Several witnesses reported hearing a subsequent loss of engine power. The nose of the airplane came up and then dropped. The airplane impacted the grass approximately 800 feet off of the departure end of the runway. The pilot was killed.

Liftoff was achieved at about 65 knots after the airplane had accelerated normally on the takeoff roll. The initial climb after liftoff was uneventful until 400 feet above ground level when the pilot reportedly sensed that the airplane was not climbing normally. He identified that the engine was not producing takeoff power and was unresponsive to his throttle movements. He verified that the mixture lever was in the full rich position before he focused on completing a forced landing. The airplane impacted a small tree during touchdown and subsequently descended a small hill before coming to a stop. The fuselage, engine firewall, and both wings were substantially damaged during the forced landing.

The pilot reported the airplane experienced a sudden and complete loss of engine power during the initial climb after takeoff. The pilot was unable to restart the engine and performed a forced landing to a cornfield, which resulted in substantial damage to the aircraft, and minor injury to the two on board. Initial examination of the wreckage did not reveal any catastrophic engine failures. The airplane's fuel tanks contained approximately 21 gallons of 100-low-lead aviation gasoline, which was absent of contamination.

We think about engine failure on takeoff, but do we consider the possibility *every time* we line up for takeoff? How about the possibility any time we must make a go-around for any reason?

Whether you're flying a single- or twin-engine aircraft, a loss of power at initial climb speed and a high angle of attack requires an immediate reduction in pitch attitude to preserve speed and, in the case of multiengine airplanes, airflow over control surfaces to maintain control.

Visualize what happens with a power loss during initial climb. If the airplane's pitch attitude remains constant, even for mere seconds, the airplane will begin to descend while still pointed nose-up. The angle between the wing's chord and the relative wind—the angle of attack, or AoA—becomes almost instantly greater as the power decreases and there's less to keep the airplane in its climb.

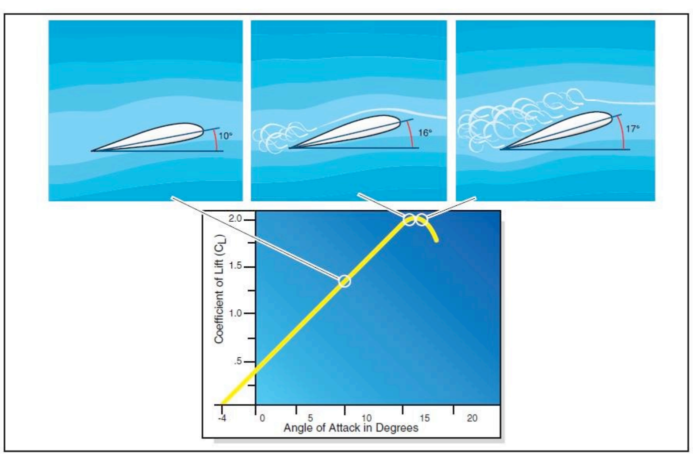

Figure 4-2. Critical angle of attack and stall.

Very rapidly the AoA can reach the critical point, drag increases and lift decreases, and the wing is stalled.

In the first example, the pilot allowed the airplane's nose to rise, increasing angle of attack. Very soon the angle of attack became critical and flying speed was lost.

In examples two and three, the pilot apparently lowered the nose sufficiently to maintain a flying angle of attack while attempting an engine restart and executing a forced landing. The difference meant the life of the pilot and, in one case, a trusting passenger.

You can simulate the "push" needed to avoid a stall if the engine quits immediately after takeoff or in the first stages of a balked landing go-around. If you're not very current in stalls and stall recoveries in the airplane's you're flying, bring along a flight instructor who is.

At a safe altitude and after clearing the practice area, put the airplane in the takeoff configuration, including any flaps you might use on a normal or short-field takeoff. Slow the airplane to liftoff speed, then raise the nose to a normal climb attitude at climb power.

Then quickly retard the throttle to idle. For more realism, have your instructor make the power reduction. See how rapidly airspeed drops; visualize the increasing angle between the wing and the relative wind as the airplane follows a curving path toward the ground. Push the nose down to keep the speed on Landing Without Power speed (see last week's *FLYING LESSONS*). Make note of the pitch attitude needed to hold this speed in this configuration with limited power. The actual attitude will be slightly lower yet, because even at idle throttle the engine will develop a little thrust. Recover back to level flight.

See www.mastery-flight-training.com/20120913flying_lessons.pdf

After the first exercise, set up for another. This time, configure the airplane as it would be in the first stages of a go-around. Repeat the technique: slow to go-around speed, raise the nose at full power, then pull the throttle to idle. Lower the nose to maintain Landing Without Power speed. As you did before, note the pitch attitude necessary. Recover.

This practice sessions will do three things. First, is reinforces the need to push the nose down if there's any power interruption right after takeoff or in the beginning of a balked landing/missed approach. Second, it gives you a precise pitch attitude target to aim for in the event of a takeoff or go-around configuration engine failure. Third, it (at least should) remind(s) you to think about the possibility of engine failure on every takeoff and in every go-around.

It's highly unlikely you'll ever face either of these scenarios. But if you do, you won't have time to think about what you need to do, or to experiment with the pitch attitude necessary to maintain a safe speed while you conduct the engine failure procedure and prepare for an off-airport landing.

As *FLYING LESSONS* has stated many times, a successful off-airport landing comes by landing **W**ings level, **U**nder control, at the **S**lowest **S**afe speed—a WUSS landing. You can only achieve this lowest safe speed by rapidly lowering pitch if the engine quits at low speed and a high angle of attack. In turn, you'll only be prepared for this speed if you've thought about the need to do so *before* the need arises.

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

Debrief: Readers write about recent *FLYING LESSONS:*

Reader Paul Hekman anticipated this week's *LESSONS* with his comment on last week's report:

> Tom, another good article. I've been thinking about the G.A. training process and I think that a big part of the reason why airline training works so well is the quality of the simulators, in which any number of life threatening scenarios may be presented with no physical consequences. I've been genuinely frightened on a couple of occasions while doing dead engine landings at the request of an instructor. Once I nearly lost control of the plane at 25 AGL, and another time narrowly missed a cell tower while descending toward an "open" field. I do practice these on my own occasionally, but always stay on the safe side of my personal envelope. We all know of numerous occasions in which the single engine MEL training has had tragic consequences – one example this week again.
>
> How does one train for an engine failure 10 seconds after takeoff? Yes, you can think about it; I always scope out available spots at my home airport; and you can practice the drill at a safe altitude, but it just isn't the same as the real thing.

Thanks, Paul. I'm a huge advocate of simulation in general aviation training. I truly miss the full-visual "sim" (actually, Flight Training Device) I used two decades ago when teaching Beech Bonanza, Baron and Duke pilots at the factory airfield in Wichita. Unfortunately, except for the very few, simulation has not been available to most general aviation pilots. Until recently. Over the past few years, the much lower cost of training device development as a result of PC-based operating systems has dramatically reduced the cost of flight simulators. This in turn has increased the number of available training locations dramatically. Google "Redbird flight simulator locations," for instance, to see how (relatively) available just one type of device has become. Barring that, however, the types of exercise I propose in this week's *LESSONS* are the best we can do.

See www.bing.com/search?q=redbird+simulator+facilities&form=APMCS1

Reader John McMurray comments:

> RE: the [Beech] Bonanza that landed hot and long and ended up in the fence. Go-arounds are maneuvers, just like landings, and must be practiced regularly. A recent poll on the BeechTalk forum revealed many, possibly a majority, [of] pilots have not flown a go-around for practice or for real in a year or more! The physical skill is certainly important but even more important is the mental readiness to go-around. Someone who never goes around is not only rusty on the physical skill, he may well be mentally unable to make the go-around decision.

You wisely bring up a second, equally important component to safely flying a go-around—making the decision to go around in the first place. Any landing may become a go-around, up to and even after the point the wheels touch the ground. It's not a failure to go around; it's the proper exercise of superior pilot judgment. Practicing a go-around should be as common as practicing steep turns and stalls—which means most of us could use to practice them a lot more frequently. Thanks, John.

See www.beechtalk.com

A valued reader commented on recent *LESSONS* about minimum controllable airspeed in multiengine airplanes. Because I believe his view was correct in a strict definition but not in practice, I do not want to seem condescending in a public forum, but also because I've seen similar comments in other venues, I'll recount our e-conversation without identifying the reader. I request readers add to the discussion:

> You wrote: "**At reduced power output,** either from throttling back the engines or from the effects of altitude on naturally aspirated powerplants, V_{MCA} ***drops*** because there's less asymmetry to the thrust."
> I disagree with this statement. V_{MC} changes with CG location (V_{MC} up with aft & down with fwd), NOT Density Altitude (D.A.) or power setting and the corresponding changes in Torque, P-factor and Sprial [sic] Slipstream.
>
> VMC is a *speed* contingent upon the volume of airflow over the rudder surface area at full deflection. (and gross wt. and max aft cg and t.o. config.) Does V_{SO} and V_{SI} or more importantly V_{YSE} change with power

settings and/or D.A.? I don't think so.

What do you think...NOW?

Respectfully, here's what I think: I'd gone back and forth between using V_{MCA} and "loss of directional control speed" in that sentence and settled in the abbreviation. In the strictest sense V_{MCA} is always a SINGLE speed for a given airplane design, defined under a set if circumstances including maximum gross weight, aft most approved CG, windmilling propeller on the critical engine, and maximum rated power on the operating engine.

Similarly other speeds, such as V_{SO}, V_{SI} and V_{YSE} (blue line) speeds are defined under specific conditions. What's important for pilots to realize, however, is that although the strict definition of these speeds means they do not change, ever, the *performance effect* described by each speed (stall speed, best angle of climb on one engine, and in last week's *LESSON* loss of directional control speed) *does* change with changes in the aircraft condition. Failing to know that V_{MCA} is less than stalling speed at altitude, where less power is available on the operating engine, is likely a contributor to the unfortunately fairly common "flat spin" in fatal multiengine instructional accidents.

You're correct that by definition V_{MCA} does not change. The *effect* that certification speed describes, however, varies with changes in the airplane condition. One of those conditions is power available on the good engine, making the "V_{MC} Effect" a function of altitude in naturally aspirated engines. Thanks, reader, for challenging me to clarify.

Frequent Debriefer Karl (I apologize, I forget your last name, and it wasn't in your email) writes:

> You are always such a stalwart educator! Keep up the good work! You might well mention the 'Zero Thrust' aspect of engine out approaches?… recip or turbine. In this manner and procedure, you will have the simulated 'Out Engine' running and ready to respond. Students do not have to jam the throttles forward either!
>
> A MEL single engine 'Go Around' can easily become stupidity applied! 'Going Missed' during an 'IAP' is slightly different. I too have had stupid 'MEL' instruction over my long career. The best training and proof of capability is at 300 feet AGL…certainly as a prelude to the real deal!
>
> I cannot imagine actually, unnecessarily, 'Shutting A Good Engine Down' aloft, let alone for an approach. "It is wind-milling. It will start right back up!"

Thank you, Karl. "Zero thrust" is a combination of throttle and propeller settings that, at least in theory, provides just enough thrust to overcome the drag of that engine, so that the effect is the same as a feathered propeller. The zero thrust setting is usually presented in the Pilot's Operating Handbook or Approved Flight Manual of multiengine airplanes.

The FAA Practical Test Standards, however, does require an actual in-flight shut-down (and restart) at altitude. All practice engine-out work should be done using zero-thrust settings so, as you said, the "dead" engine is immediately available if needed. Unfortunately, all indications are the accident that sparked last week's *LESSON* took place at zero thrust. All the more reason for pilots receiving multiengine instruction to exercise extreme care, and for multiengine instructors to be even more attentive and careful.

Reader Amnon Shmueli also writes about multiengine safety:

> I'm almost a year out of the [Israeli] army [as commander of a flight instruction unit], and work part time as a flight instructor at the King Air B200 facility in Israel. About the last *LESSON*: We always practice one engine flight at a minimum safe altitude, and never, *never* below 115 knots no matter what. That gives you some safe envelope to compensate [for] pilot mistakes.

Excellent advice, Amnon. Best of luck in your new career.

Comments? Questions? *LESSONS* of your own? Send 'em in, to mastery.flight.training@cox.net.

Share safer skies. Forward *FLYING LESSONS* to a friend.

Personal Aviation: Freedom. Choices. Responsibility.

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
