FLYING LESSONS for November 19, 2020

FLYING LESSONS uses recent 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 airplane have little direct bearing on the possible causes of aircraft accidents—but knowing how your airplane's systems respond can make the difference in your success as a scenario unfolds. Apply these *FLYING LESSONS* to the specific 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:

In the most recent *FLYING LESSONS* I used the fatal crash of a Cessna 310 at Henderson, Nevada, as the starting point for a discussion of **Command and Control**—the exercise of options in an emergency ("**Command**") in addition to the usual training emphasis on procedure ("**Control**"). Experiencing an engine failure immediately after taking off from the North Las Vegas airport, he followed ATC's direction to "remain clear of the Class B" airspace and flew well around and past Las Vegas' main airport only to crash just short of landing at Henderson. I noted that, at least at that time, it appeared the airplane descended under control into terrain. The *LESSON* I was trying to impart, however, is:

> Might the pilot have declared an emergency and used that to substantiate his telling ATC he was landing at McCarran? If he still wanted to go to Henderson, could he have used emergency authority to cut through the Class B and take a direct route? As he found he could not make the Henderson runway, could he have landed off-airport in some of the open area nearby, and avoided running into the building?

See https://www.mastery-flight-training.com/20201105-flying-lessons.pdf

The pilot of that C310 appeared to do what we train and evaluate pilots to do: **control** the airplane. He appears not to have done what we do *not* usually teach pilots to: to **command** the operation and the environment. Beyond the fatalities, that's the tragedy of this awful event.

Since that time several readers have forwarded a link to a video that reveals the Cessna twin appears to entered a V_{MC} roll prior to impact—a loss of directional control brought on by asymmetric power (lots of power from one engine on one side of the airplane) and insufficient airspeed (rudder and aileron control authority decreasing to the point there is insufficient force to overcome the effects of that asymmetric thrust). So let's continue the *LESSON*.

See: https://twitter.com/onukai/status/1322054160573898752?s=21

The V_{MC} Demonstration is a maneuver required to earn a pilot certificate if the Practical Test is taken in a multiengine aircraft, or is adding a multiengine rating to an existing pilot certificate. The FAA's *Airplane Flying Handbook* does not directly address how to perform this maneuver, nor does the *Aviation Instructors Handbook* detail how to teach it. Numerous private sources (such this one at Avstop) provide a deeper discussion of technique for flying the V_{MC} Demonstration maneuver, the *LESSON* being taught, and some of the hazards to watch for while flying it.

See http://avstop.com/ac/flighttrainghandbook/vmcdemonstrations.html

The Airman Certification Standards (ACS) details what an examiner expects of applicants when taking the checkride, and by extension what pilots should know, consider and do about the V_{MC} Demonstration Task.

But I've not seen any regulatory, advisory or instructional document that presents what I think is **the true *LESSON*** being taught and evaluated by the checkride V_{MC} Demonstration. That true *LESSON*, I believe, may have saved the occupants of that Las Vegas Cessna, and many, many more besides.

The V_{MC} Demonstration is conducted (with very good reason) at a significant height above ground. The aircraft is placed in the demonstration configuration (skills a through g on the ACS), then placed in a climb attitude. Bank and pitch input are applied as described to maintain control and a very gradual rate of deceleration, until aircraft directional control is lost.

X. Multiengine Operations

Task	*B. V_{MC} Demonstration (AMEL, AMES)*
References	FAA-H-8083-2, FAA-H-8083-3; FAA-P-8740-66; POH/AFM
Objective	To determine that the applicant exhibits satisfactory knowledge, risk management, and skills associated with a V_{MC} demonstration. ***Note:*** *See Appendix 6: Safety of Flight and Appendix 7: Aircraft, Equipment, and Operational Requirements & Limitations.*
Knowledge	The applicant demonstrates understanding of:
PA.X.B.K1	Factors affecting V_{MC} and how V_{MC} differs from stall speed (V_S).
PA.X.B.K2	V_{MC} (red line), V_{YSE} (blue line), and V_{SSE} (safe single-engine speed).
PA.X.B.K3	Cause of loss of directional control at airspeeds below V_{MC}.
PA.X.B.K4	Proper procedures for maneuver entry and safe recovery.
Risk Management	The applicant demonstrates the ability to identify, assess and mitigate risks, encompassing:
PA.X.B.R1	Improper airplane configuration.
PA.X.B.R2	Maneuvering with one engine inoperative.
PA.X.B.R3	Distractions, loss of situational awareness, or improper task management.
Skills	The applicant demonstrates the ability to:
PA.X.B.S1	Configure the airplane in accordance with the manufacturer's recommendations, in the absence of the manufacturer's recommendations, then at V_{SSE}/V_{YSE}, as appropriate, and:
PA.X.B.S1a	a. Landing gear retracted
PA.X.B.S1b	b. Flaps set for takeoff
PA.X.B.S1c	c. Cowl flaps set for takeoff
PA.X.B.S1d	d. Trim set for takeoff
PA.X.B.S1e	e. Propellers set for high RPM
PA.X.B.S1f	f. Power on critical engine reduced to idle and propeller windmilling
PA.X.B.S1g	g. Power on operating engine set to takeoff or maximum available power
PA.X.B.S2	Establish a single-engine climb attitude with the airspeed at approximately 10 knots above V_{SSE}.
PA.X.B.S3	Establish a bank angle not to exceed 5° toward the operating engine, as required for best performance and controllability.
PA.X.B.S4	Increase the pitch attitude slowly to reduce the airspeed at approximately 1 knot per second while applying rudder pressure to maintain directional control until full rudder is applied.
PA.X.B.S5	Recognize indications of loss of directional control, stall warning, or buffet.
PA.X.B.S6	Recover promptly by simultaneously reducing power sufficiently on the operating engine, decreasing the angle of attack as necessary to regain airspeed and directional control, and without adding power on the simulated failed engine.
PA.X.B.S7	Recover within 20° of entry heading.
PA.X.B.S8	Advance power smoothly on the operating engine and accelerate to V_{SSE}/V_{YSE}, as appropriate, +10/-5 knots during recovery.

The primary hazard of performing the V_{MC} Demonstration is the possibility of a single-engine stall. Especially in normally aspirated twins, it is likely airspeed will degrade to stall speed before directional control is lost, because the altitude at which we must perform this maneuver is high enough the "good" engine does not develop enough power to cause loss of directional control before the wing stalls.

Consequently, the ACS directs recovery at the first sign of loss of control *or* a stall warning or buffet, whichever comes first. Recovery includes reducing power on the operating engine, to reduce engine asymmetry that drives the loss of control, while simultaneously lowering the angle of attack to avoid a stall and to increase indicated airspeed, making flight controls more effective.

As presented in the ACS, and the training that prepares pilots for the Practical Test, is an example of what I call a **checkride circus trick**—a maneuver that we learn to perform so we can demonstrate that we know how to do it. The maneuver is never put into context, it's just a hurlde to jump on the way to a certificate or rating. It appears most multiengine pilots are not taught to go beyond the rote repetition and demonstration of the maneuver or more importantly, to correlate that to the true *LESSON* of the V_{MC} Demonstration.

So what *is* that **true *LESSON***, in my view?

It's simply this: *Any* time you are unable to maintain directional control on one engine in a multiengine airplane, immediately perform the V_{MC} maneuver recovery. Reduce power on the operating engine while lowering angle of attack for stall avoidance and control.

We teach and evaluate the V_{MC} Demonstration in a very defined and prescribed way because it is an extraordinarily hazardous maneuver to fly. We seem to focus on that specific demonstration scenario, engine failure immediately after takeoff, as the (only) exposure to these hazards.

But look at the accident record and you'll see many cases of engine failure that was addressed correctly by the pilot, only for that pilot to lose control and enter a V_{MC} roll into the ground after having done everything else right up to that point. Sometimes the time (and distance) between propeller feathering and loss of control is significant—as was the case with the Las Vegas C310. At times the engine failure occurred in cruise flight, but control is lost during descent or landing.

Even if you think you've done everything right after an engine failure, no matter where it occurs, watch for the indications of a loss of directional control or the first indications of a stall. If you can't hold heading, the stall warning activates or you feel the shudder of airflow separation, ***immediately*** reduce power on the good engine while lowering angle of attack to reattach airflow and increase control effectiveness.

That may result to a power-off, off-airport landing. That was one option mentioned in the last *FLYING LESSONS*. As long as it is conducted wings level, under control, at the slowest safe speed—exactly as we discuss for a single-engine airplane with engine failure—there's an extremely good chance of survival, far greater than if the airplane enters a V_{MC} roll.

Although many checkride maneuvers may not have a practical application to everyday flying, at least not obviously, I believe everything we do on Practical Tests teaches one *LESSON* or another that is designed to teach mastery of the aircraft, and possibly save our lives. There are no simple checkride circus tricks. Everything is for a reason.

Immediately perform the V_{MC} recovery technique at the first sign of stall or loss of directional control on one engine, even if you think you've done everything right. That is, I believe, the true *LESSON* of the V_{MC} Demonstration.

Questions? Comments? Experiences of your own to relate? Send them to mastery.flight.training@cox.net.

Debrief: Readers write about recent *FLYING LESSONS:*

Aerobatics and multiengine instructor Tony Johnstone adds his views on the November 5 *LESSONS*:

> [Regarding] the Vegas 310 accident…here is my take. Engine failure shortly after takeoff from North Vegas, asked to divert to Henderson. He was told to stay clear of the LAS Bravo, apparently wasn't able to climb much either due to performance limits or trying to stay clear of the Bravo. He crashed short of Henderson after flying past the huge runways at LAS. I don't know why the engine failed or why he couldn't fly a relatively lightly loaded C310 on one engine. But a *LESSON* that I learned from my DPE [Designated Pilot Examiner] on my ATP checkride [is that] **losing an engine is an emergency**. **Declare it and you can do whatever you need to get the airplane back on the ground safely**. The LAS controller would have given him priority to land and not told him to stay out of the Bravo.
>
> I know this airspace pretty well. There are multiple airports close to each other.
>
> I have no idea why he felt he had to get to HND. Could have turned back and landed at North Vegas or straight ahead to LAS. But the endpoint should be: **if the aircraft is broken, that is an emergency. Get it on the ground ASAP.** No penalty for declaring an emergency. Just because you can fly on one engine doesn't mean you should. Lifetime penalties if you don't and come up short.

See https://www.mastery-flight-training.com/20201105-flying-lessons.pdf

Reader, flight instructor and Air Traffic Controller Dean Brown adds his unique insights:

> Perhaps this is a reminder to follow Bob Hoover's timeless advice to **fly the airplane under control all the way through the landing**. Presumably no pilot wants to land a C310 off-airport, but if you are forced to do so then it's probably best to reduce power on the good engine and land under control than to keep the power up while slowing to near touchdown speed, which is what appears to have happened.

> Second, as a controller I fully support that **the pilot should have declared an emergency** as soon as possible regardless of whether the decision was to return to VGT, divert to LAS, or divert to HND. Once the pilot has time to "communicate" after first "aviating" and "navigating", that communication should include an emergency declaration. **Losing an engine in a piston twin at low altitude is an emergency.**
>
> My question for you and for your readers is: ***Do you think that ATC should be required to automatically treat any engine failure in a piston twin as an emergency even if the pilot does not explicitly declare an emergency?*** If ATC does that, it would mean in a case like this that ATC would have very quickly stopped westbound traffic out of LAS and that would have given the pilot better options about either diverting to LAS or to take a more direct course towards HND. Of course, that choice would still be up to the Pilot-in-Command.

Two things: ***First,*** to Dean: an engine failure at *any* altitude is an emergency, not just at a low altitude. Of course, if it happens "up high" you'll eventually come down to a low altitude, so you'd still declare an emergency before approach and landing.

Second, to readers: take a moment and send me your answer to Dean's question:

> ***Do you think that ATC should be required to automatically treat any engine failure in a piston twin as an emergency even if the pilot does not explicitly declare an emergency?***

Thank you to Dean, Tony, and all the readers who sent comments about this tragic event and the *LESSONS* we can learn as a result.

Questions? Comments? Send them to mastery.flight.training@cox.net.

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