V_{mc} Training and Angle of Attack

The General Aviation Joint Steering Committee (GAJSC) has determined that improved and more frequent single-engine training in multi-engine airplanes could reduce the number of multi-engine loss of control events. In particular, refresher training on V_{mc} is recommended to improve pilot response during a power loss. The GAJSC further suggests that stall/spin accidents could be reduced through the equipage and use of angle of attack indicators in GA aircraft.

What is V_{mc}?

Familiar to pilots of multi-engine aircraft, V_{mc} is the speed below which aircraft control cannot be maintained if the critical engine fails under a specific set of circumstances (see 14 CFR part 23). It is marked as a red radial line on most airspeed indicators. The blue line that's found on many (but not all) multi-engine airspeed indicators is the Best Single Engine Rate of Climb Speed. It's good to be at or above this speed whenever possible to give you some climb performance if an engine should fail. V_{mc} only addresses directional control.

What's So Critical About It?

While you could argue both engines of a multi-engine airplane are important, the laws of physics dictate that losing a particular engine will make maintaining directional control more challenging. Any engine failure on a multi-engine airplane will result in a yaw toward the inoperative engine, but if the critical engine fails, the yaw forces will be greater due to P-factor. Engines that rotate clockwise from the pilot's perspective (like most U.S. aircraft) will produce greater thrust on the descending propeller blades when the aircraft is flown at a positive angle of attack. Because there is a longer moment arm associated with the right engine, the yaw will be harder to manage if the left engine fails.

Practice Makes Perfect

Too often pilots will practice V_{mc} before their checkride, but may fall short in experience and skill when a real-world situation strikes. To stay fresh on engine failure procedures, get with an instructor and practice a V_{mc} demo or two. It'll also give you chance to review some of the unsuspected conditions that can easily make a V_{mc} situation worse, like an aft CG, retracted gear, and/or holding wings level.

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Angle of Attack

The "Angle of Attack" is the angle between a plane's wing and the oncoming air (relative wind). If the angle of attack becomes too great, the wing can stall and lose lift. If a pilot fails to recognize and correct the situation, a stall could lead to loss of control of the aircraft and an abrupt loss of altitude.

More than 25% of GA accidents occur in the maneuvering phase of flight. Half of those accidents involve stall/spin scenarios. Stalls can happen during any phase of flight, but they are critical when planes are near the ground and have less room to recover, such as during landing and takeoff.

What is an AOA Indicator?

We often discuss stalls with respect to airspeed and that can be a problem. Part of that problem is that stall speed changes with the aircraft's configuration (e.g., cruise, landing, etc.) Also, as an aircraft's load or weight increases, so does its stall speed. Using an AOA indicator can help prevent a stall as it provides a more reliable indication of airflow over the wing, regardless of its configuration. Without it, AOA is essentially "invisible" to pilots.

An AOA indicator can help when used in conjunction with airspeed and existing stall warning systems, when available. It can be used to get the pilot's attention (via audio and/or low cost stick shakers) even if the pilot is not looking at it. This focuses the pilot's attention on where it needs to be to avoid the stall.

How Can I Equip with an AOA Indicator?

AOA indicators have recently become more available and affordable for GA aircraft. The FAA's Small Airplane Directorate has helped with this by streamlining the process for production and retrofit approval of AOA devices.

A New Angle on Safety

AOA systems offer many benefits to safe flying so consider looking into one for the aircraft you own or fly. And if you do install one, make sure you're familiar with its operation and limitations. It's also a good idea to keep your skills sharp through practice of stalls and slow flight as well as pattern and instrument work with a CFI. Be sure to document your achievement in the Wings Proficiency Program too. It's a great way to stay on top of your game.

Resources

- FAA news release on streamlining the AOA installation process for small aircraft: http://go.usa.gov/cgu2Y
- FAA policy on AOA installation: http://go.usa.gov/cgu95
- Safety Enhancement Fact Sheet on AOA Systems: http://go.usa.gov/cgu8w
- FAA *Airplane Flying Handbook* — Engine Inoperative Flight Principles for Multiengine Airplanes (Chap 12, pgs 23-31): http://go.usa.gov/cguEQ
- "A Finesse for Vitesse: Mastering the Maze of V-speeds" May/June 2015 *FAA Safety Briefing* www.faa.gov/news/safety_briefing/2015/media/