Stall Awareness

By John Morris

Since the recovery of the Air France Flight 447 cockpit data and voice recorders, the worldwide aviation community has been having vigorous discussions about stall recognition and the training philosophies associated with the (stall) recognition and recovery phase. This accident is one of several in the past few years involving, worldwide, transport category aircraft entering a stalling condition, usually during the landing phase, and then not successfully recovering from it.

The primary change, still under review at this time, is to alter the concept of immediate altitude recovery after the onset/recovery from the stall. What *now* appears to be the answer is to regain sufficient airspeed first, via maintained reduced angle-of attack (AOA), and only after this recovery will the pilot attempt to recover to the previous altitude before the stall.

For general aviation the preceding paragraph should be a question mark since we already practice what the transport community wants to preach. At least I hope so!

Interestingly this appears, to me anyway, as a classic training cycle. Do you recall when the B-737 lost control due to rudder hard over and crashed outside Pittsburg [09/94]? After that accident upset, training was requested/required. Is it still? Or the DC-10 accident in Chicago [05/79] - one of the sticking points of this accident was the training to fly with the stick shaker active to regain/maintain altitude [the pilots did not know that the aircraft had physically lost an engine and damaged some of the leading-edge flaps]. It was proven in the DC-10 simulators that a reduction in AOA with the then resultant increasing airspeed would have been sufficient to recover. Of course this was after-the-fact but I believe training was altered after. Are the transports still adhering to this after accident training philosophy? Aircraft design and engines have improved but wings and aerodynamics are still the same. So the stall training cycle is back, again. It should never have gone away, but lack of regular, subjective training, not enough compelling accidents, and complacency always seem to prevail.

So what does this have to do with the PC12? It is a single-engine, non-transport category, less than 12,500 lbs aircraft. Plus we have a Stick Shaker/Pusher system that will keep us out of trouble. No worries.

That is true most of the time, but as we should all know, a stall is a function of angle-of-attack (AOA), along with unwelcomed help coming from weight/balance/CG and acceleration (G's) in a turn or hard pull/push. A stall can happen in what appears to be near level flight if the relative wind shifts or is dramatically reduced (instances that can occur at flight levels as well as near to landing). And lets not forget icing, which will increase stall due to wing contamination, instrument error (possible cause of Air France 447) or both.

Why was the Stick Shaker/Pusher installed, since the PC12 is a single-engine? Because those single engine/propeller combinations can produces a large yawing force around the vertical axis called "P"-Factor, or wing drop. While stall testing the PC12, it was determined that with approximately 20% power the wing drop was less than 15° from level flight in both the clean and landing configuration. However, if 60% or more power was used then the wing drop was near 45° in the clean configuration and greater than 90° in the landing configuration.

That is something I would rather not experience! So to counter these effects, and gain certification, the installation of a Stick Shaker/Pusher System was added. The basic idea of the system is to cause a reduction in AOA by pushing the nose down before the aircraft reaches the natural stall point.

No one intends to stall an aircraft during the normal course of flying, but "stuff" happens. We also expect that if "stuff" does happen we will receive some kind of an alert or indication prior to onset of a natural stall. On that account we do know how to (and train to) recover before we even reach the "push".

Do you know how to recover if the PC12 does "push"? Or worse, what if the aircraft just suddenly drops a wing for no apparent reason? Can't happen, right. There are many publications relating to the recovery technique. All have the same answer. The recovery is quite basic: reduce angle-of-attack. That's it. Well, maybe not quite all. We also need to increase airspeed, usually by adding power.

How about if you are IMC, and somehow a stall or wing drop happens? What would your first reaction be? Be honest!

If the Stick Pusher activates, then the recovery is to follow through with the push, then smoothly recover, once airspeed is increasing and positive control are established, with power to a wings level then positive rate of climb, as needed. However, if the aircraft drops a wing first, with no other indication, then we have to reduce the AOA (and possibly reduce power-depending on the amount at the time). Actually, the AOA is being reduced for us since the wing dropped and we are falling, right? Not. *And* we are in the beginnings of a possible spin or spiral if we do not stop the potential turning tendency. Has anybody not seen the Pilatus video of a PC12 entering a wings-level, natural stall, at approximately 55% power?

What we, the PC12 drivers, have to be careful of is when you introduce power or if you were already at a high power setting thereby possibly reducing power. With the amount of "P" factor possible, we need to positively reduce the AOA and increase airspeed before using (more) power. Also, with no reference to the horizon, we need to know how to stop a turn by use of our flight instruments. With electronic instrumentation our best bet is the sky pointer. Look for it and step on it.

A good source for reviewing stall awareness is from the FAA, AC 61-67C CHG 1, Stall and Spin Awareness training.

"A safe pilot is always learning"

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ACFT Services provides training ONLY for all PC12's, no other aircraft.