Aviation cultural differences

By John Morris

Note to readers: This article was submitted mid- April, for the Summer- 2019 POPA issue but was withheld for technical reasons. As a result I will add an update, as of mid-October, regarding the 737 MAX and its relationship to the below unrevised article.

The three major changes for MAX to return to service are the following: 1. Both AoA's will be used for MCAS commands, 2. The system will require the pilot's to confirm reactivation of MCAS after an initial shutdown, 3. More control column authority to the pilot's (g force) to allow actual climb authority after a "trim runaway". Do any of the aforementioned have any similarity with PC12 operations?

One other interesting change: The FAA, using Boeing's safety analysis, wants evaluation groups composed of at least 15 crew pairs from around the world to evaluate the MAX changes in simulators. These crew pairs need to have varying skill sets and the evaluators are required to have less actual flight time but more "competency-based outcomes and simulator training" but must have prior MAX experience. This is due to past evaluations that basically were using U.S. pilots for the FAA Flight Standardization Board (FSB). JM

Aviation fatal accidents are never something we wish to hear or read about, whether a PC12 or a Boing 737 MAX. But since the two 737 MAX accidents and the resulting flood of sometimes incomplete information regarding the aircraft stalling, was it an anti-stall or stall prevention system? Designed for the 737 MAX only, the system is called the MCAS (Maneuvering Characteristics Augmentation System). Shortly after the first 737 MAX accident some in the Pilatus community, including myself, wondered if this was something like the PC12 Stick Pusher system. And as we tend to do after an accident, especially if it happens outside of the United States, we went about our daily lives and let the appropriate authorities investigate, give an initial report – "anti-stall system (MCAS) possible malfunction?" and pilots unable to override.

What is MCAS? The following is my short version interpretation of this system. The MAX comes with higher output thrust engines with a larger inlet than on previous 737s requiring Boeing to move/raise the engines forward for ground clearance. As a result the new location plus the additional available thrust created an "extra" pitch up moment at high power. So while flight testing the aircraft test pilots (probably) recommended an additional, redundant, not new, stall prevention system to prevent the regular pilots from entering a possible accelerated stall shortly after takeoff. The "prevention" is to activate the Horizontal Stabilizer trim "automatically" in a downward momentary action via one of the two standard AoA vanes input. Note: Before the software changes the MCAS system would receive input only from one of the AoA's and would automatically alternate between left and right for each flight. The test pilots and engineers then assumed this control yoke additional downward load, along with the big

trim wheels visually moving, would be a clue to the pilot to reduce pitch/bank and maybe power. Surprising to me was that this system is *only* functional when the pilot is manually flying and the flaps are fully up. As of writing this article I have not found any information regarding the stick shaker activating as a function of the MCAS. As far as I can tell shaker activation should be via both AoA's in some kind of agreement. But both accident aircraft had stick shaker activation within 30 seconds after takeoff! What should a pilot do if *any* stick shaker system activates?

This is where I want to write about the cultural differences, starting with United States pilots.

Differences: The first 737 was introduced in 1967 and since then there have been quite a few upgrades to the aircraft. However, like the PC12, the changes made over the years would usually be considered differences, not new. So when the MAX was certified for service Boeing's training for the MAX was not very extensive (about a 1 hour iPad review). For the PC12 family early differences really had nothing to do with flight handling but with systems upgrades and cockpit layout as the fleet grew and Pilatus was learning how and when to improve them. What I consider *actual* flight differences came with introduction of the Legacy/47. And that was due to the "power steering" handling and the additional takeoff weight and associated increased airspeeds. When the NG was introduced, /47E, the differences from the /47 were the cockpit layout, APEX suite and its integration to the existing airframe. The regulating authorities consider this not as a new aircraft from the /47 or the /45 but a "different" version of the original PC12/41.

The Stick Shaker/Pusher system and the associated training for the PC12 have not changed from the beginning with the exception of visual and aural recognition cues.

Of course new pilots who begin flying an unfamiliar aircraft would NOT get differences training but the more extensive initial training. It definitely appears that if the drivers of the MAX were new to the 737 family then there probably was not enough information given by Boeing and the training center. But new pilots, for the MAX or any 737, usually start in the right set to gain experience not only from just flying but from the left seater who should also act as a mentor. For the PC12 the mentoring may be not be as long, if at all, since prior pilot experience, most likely first in a single-engine aircraft and then high altitude/pressurization training and experience would be considered sufficient.

Culturally I like to consider myself a mentor as well as an instructor. Definition of a mentor: an experienced and trusted adviser.

Cultural: There are three US airlines flying the MAX. They comprise the largest segment of MAX aircraft flown based on the total amount of delivered MAX aircraft prior to the grounding (1st delivery May 2017, 1st MAX accident Oct 29, 2018). After the second accident and the

subsequent grounding of the MAX, US airline pilots flying the MAX began “speaking” about the MAX aircraft and the MCAS system in particular. What is disturbing is that the majority of pilots talking are requesting anonymity. According to one published article from an unnamed pilot, he states that he has experienced the MCAS operation and simply treated it as a trim runaway, which he properly states as trained on day-one. However the majority of the other unnamed sources have expressed a lack of prior knowledge with one exception. An unnamed captain is quoted in Aviation Week as stating “I added to the following to my pre-departure flight deck briefing when flying a 737 MAX: “We are flying an aircraft which, if not properly and closely monitored, may attempt to kill us. If, at any time in flight, we experience continuous un-commanded stabilizer trim movement we will execute the RUNAWAY STABILIZER procedure and, if necessary, disconnect the trim cutout switches below the throttles. We will then use manual trim to return the aircraft to a trimmed condition and continue to use manual trim for the duration of the flight and land as conditions permit.” “

Wow! I look this captain’s statement as very disturbing but not for the reasons given.

First, like the current other unnamed pilots this should be a safety of flight issue, based on the captain’s view, and the plane should have been written up and reported immediately to all proper authorities.

Second, if the captain felt this way he/she should have at least refused to fly and/or personally authorized grounding of the bird.

Third, what a great mentor he/she is to the co-pilot! I cannot write more of the appropriate kind of words I have towards this “Captain” but I will stop here, for now.

More cultural issues: If there have been the type of post-takeoff MCAS events as previously stated, why has there been not been more reports generated that would have, or should have made their way to Boeing and the FAA? And this includes the worldwide operators. Is this because airline management is blocking or burying these reports? I would like to think that is too ludicrous but then why are pilots wishing to remain anonymous? If management is doing that, as well as supposed pilots filing ASRS reports, this seems to represent an internal issue not related to safety of flight. I would think speaking up, for your life as the pilot alone, is worth more than possible internal repercussions.

Again cultural: In an AOPA article a named United pilot who is the chairman of the safety committee is quoted as saying that all of their (United) pilots are properly trained for the MCAS system malfunction. He goes on to stay he is trying to “debunk” statements being made by other pilots. If this isn’t a culture thing then…

As a mentor one of the most important aspects is passing along previous experiences and in the case of an instructor/mentor the shared experiences (confessions) from other pilots. This is valuable information for me as well as other pilots, to learn, correct, teach and gain from. This absolutely includes the flow of information to and from the aircraft manufacturer. But if other pilots of similar aircraft – Pilatus, Boeing or whoever do not speak up, no one benefits.

I believe that internationally the training culture is too rigid. And as a possible result pilots trained via this type of culture will not or tend not to think past the prescribed procedure trained for. Also pilots not flying will hesitate to speak up to the pilot flying if they might see something is being performed improperly for fear of loss of job (or face). This type of culture definitely was a part of the past in the US but for the most part I believe that has been eliminated. At least as it relates to crew coordination.

As to why I believe the two MAX accidents are culturally similar I will first refer back to the captain and use two words - bad attitude. Regarding attitude, isn't a basic concept of flying is using the attitude indicator? And if your stick shaker activates what should be the first immediate response? Look at the attitude indicator of course but reduce your angle-of-attack! But what if at the same time your control yoke is being pulled forward, as was the case of the MAX? This is due to the auto-stabilizer trim reaction from MCAS. But if the attitude indicator shows no erroneous pitch – 15 degrees is normal takeoff pitch for the 737 and by now you would also probably want to look at your airspeed – basic airmanship. So which system is correct? Not enough information in a very short time frame but this is why procedures known as immediate actions are trained-memorized short actions, no time for checklists until actions steps are taken. Fly the freakin' airplane!

This is where the difference between the US pilots and pilots outside the US who have experienced this malady (quantity unknown), and the two accident aircraft. The US pilots apparently performed the immediate actions based on ALL visual information and we can only assume that included the basic airmanship of pitch attitude/airspeed/power since this scenario is based on post-takeoff, initial climb out while hand flying, not on the autopilot. Note: The first MAX accident aircraft the prior day had the same malfunction but a jump seater 737 MAX pilot from another international carrier informed the crew on the correct procedures. This information was informally released a month after the accident and there has been zero talk about this since!

So what is different about the stall system of the MAX and the PC12?

The 737 fleet does not have a stick pusher, just a stick shaker. According to basics of transport aircraft design only the "T" tail aircraft will also have a stick pusher. If the aircraft has a pusher then it must have means to override in case of inadvertent activation. Sound familiar?

The PC12 Stick Pusher activation is considered a (artificial) stall. This is to prevent the PC12 from encountering a natural stall since is it not nice – technical term! Is this an anti-stall or stall prevention system?

Where I think there is still some misunderstanding about the PC12 Stick Shaker/Pusher system is when approaching to land and power/pitch/airspeed are not performed correctly the pusher CAN, and has done in the past, activated simultaneously with a shaker, not after 3 shakers from the test. This then will cause a sometimes very unwanted surprise. And as a result of these surprises some drivers are [still] using the Pusher interrupt to prevent the surprise from occurring, again. This is NOT what the pusher interrupt was installed for!

Final thought: it is vitally important for drivers of all type of aircraft to "confess" to at least your instructor, if not the maintenance or the manufacturer if you have an occurrence that could be considered unsafe. Not speaking up due to ego or company internal differences or whatever is not good for anyone, with possibly your own future wellbeing at stake. I can't help and Pilatus can't help if we don't know.

It is equally vital that the manufacturer do the same "confession" to the pilots flying their aircraft as to incidents that may have an effect on any part of the flying experience. If a driver is informed about something unusual then it may cause feedback from what might have been considered a "one-off", not worth mentioning.

A safe pilot is always learning- and confessing!

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