BY J.A. DONOGHUE | FROM ISTANBUL

Stop Stalling

Loss of control accidents have safety experts looking closely at stall prevention and recovery training.

Aerodynamic stalls lately have had roles in an unusually large number of accidents, helping to boost the "loss of control" accident category to the top of the rankings of killer events in aviation. So it was not surprising that one of the most compelling segments of Flight Safety Foundation's 23rd annual European Aviation Safety Seminar, in Istanbul, Turkey, concerned how to deal with the onset of stalls and how to train for stall recovery.

After a lot of discussion, Claude Lelaie, special adviser to the Airbus president and chief operating officer, cut to the heart of the remedy for pilots finding themselves in a stall or near-stall condition: "If you push on the stick, you will fly!"

This seemingly obvious bit of wisdom needed to be said in light of the number of fatal accidents and near-accidents in the past decade that wouldn't have happened if the flying pilots had just followed Lelaie's sage but simple advice.

Michael Coker, Boeing's senior safety pilot, flight technical and safety, recited a litany of accidents in which forward stick pressure was either never used or was insufficient. The crew of the Colgan Air Bombardier Q-400 that crashed near Buffalo, New York, U.S., in 2009 "never put the stick forward of neutral," Coker said. The West Caribbean McDonnell Douglas MD-82 that, in 2005, crashed in Venezuela after the crew, reacting to a stall at cruise altitude, "went to full aft controls all the way to the ground." In 2004, the crew of a Pinnacle Bombardier CRJ-200, near Jefferson City, Missouri, U.S., starting from a high cruise altitude, "overrode multiple stick-pusher activations all the way to the ground." More recently, in the Air New Zealand/XL Airways Airbus A320 accident in France, the aircraft was 57 degrees nose-up at 3,800 ft and 40 kt airspeed — "high power, high pitch, full stall," Coker said.

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These accidents, and other incidents that nearly became accidents, occurred because recovery attempts failed, Coker said, and some of the blame for that can be laid on the training, or the lack of training, that line pilots receive.

Stall-recovery training in turbine airplanes, what little there is of it, typically emphasizes a minimum reduction in pitch attitude to minimize altitude loss. During recurrent training, this procedure usually has been demonstrated at an altitude of 10,000 ft, Coker said, while recent stall accidents or incidents happened either from cruise altitude or on short final approach. "Don't mandate altitude or minimum loss of altitude. … The solution is to follow proper procedures, reduce the angle-of-attack [AOA] and set the appropriate power." Coker's focus on less-than-full power is related to the trim state of the aircraft, noting a Thompsonfly Boeing 737-300 that nearly crashed in the United Kingdom when a full-power go-around in a poorly trimmed state resulted in an extreme nose-high condition that the crew overcame with great difficulty.

In a presentation coordinated with Coker's, Lelaie said that major aircraft manufacturers have combined to push for changed stall-recovery procedures. "The key point — nose down, pitch to reduce AOA — is nothing new.

"At the first indication of a stall during all flight stages except liftoff, disconnect the autopilot and autothrust, put the nose down (you may use nose-down trim, but this is not essential) and retract the speed brakes."

Lelaie warned that simulator training for stalls does not replicate actual experience very well, especially pre-stall and stall buffet, and, in actual approach stalls, a clear break may not be evident, but the aircraft may show signs of the nose moving laterally.

Airbus did a series of stall-recovery procedure tests, using an A340-600 operating in direct control law. Airbus concluded that the test results showed that the procedure calling for the pilot flying to "apply full thrust while maintaining altitude can contribute to reaching stall conditions," Lelaie said.

"After coordination with other manufacturers in the [U.S. Federal Aviation Administration] stall recovery training working group, a basic training sequence has been developed and then validated," he said. "It includes stall recovery demonstration in the following conditions:

- "Low altitude, clean and landing configuration;
- "High altitude; and,

- “Specific exercise with startle factor.

“Except for the last exercise, there is a demonstration followed by the execution.”

Using four experienced Airbus training pilots, the company ran a series of actual stalls at altitude, in part to determine the fidelity of the full flight simulator experience to real life. It also produced a few, somewhat predictable, results: “There was some initial reluctance from one pilot, the most experienced, to positively reduce AOA by moving the stick forward before increasing thrust, even in normal [control] law. When out of the stall, we discovered a tendency of the aircraft to pitch up due to thrust increase, which led to a secondary stall warning.”

One of the main conclusions of the Airbus tests is that while simulator buffeting in the pre-stall and stall condition should be improved to better replicate real life, the simulator remains a viable device for stall training, especially in the medium-to-low altitude regimes.

Paul J. Kolisch, Mesaba Airlines supervisor, flight operations training, noted, “Virtually every pilot we train on a stick pusher will pull against the pusher.”

The traditional training regime for stalls has little to do with reality, Kolisch said. “The approach-to-stall training has traditionally had pilots following a pedantic choreography, hand flying to an approach to stall while taking special care not to trim the aircraft so much that it cannot be controlled to maintain attitude and altitude during recovery. … Pilots have had more difficulty satisfying evaluators with the setup than with the stall recovery. The training is akin to synchronized swimming: It requires a good deal of skill and preparation but has nothing to do with swimming safely across a river.”

Preparing and properly executing go-arounds, the presentation of Bertrand de Courville, corporate safety manager, Air France, also had a loss-of-control theme. He related the stories of several crews that lost situational awareness and, while executing the go-around, kept pushing the aircraft’s nose down, especially during the level-off phase, despite repeated warnings from the terrain awareness and warning system. “Neither of the pilots could explain why they caused the pitch-down,” he said about one incident; in another, the aircraft pulled over 3 g (i.e., three times normal gravitational acceleration) when the crew finally recovered, and in another the airplane crashed as the crew flew it into the ocean while trying to go around.

Go-arounds remain relatively rare events, de Courville said. On average, there are only one or two go-arounds per 1,000 arrivals, one per year for short-haul pilots, and as few as one every 5 to 10 years for long-haul crews. Nonetheless, about 30 percent of all fatal accidents every year are associated with go-around decisions, with weather being a prominent factor in many of these accidents, as well. “There is a potential accident rate reduction of 25 percent if better go-around decisions are made,” de Courville said.

A stall also was involved in the 2009 crash of a Turkish Airlines 737 on approach to Amsterdam Schiphol Airport, but it was a consequence of a minor failure in the aircraft’s automation system, not caught by the pilots in time, that caused the airplane to be too slow at an altitude too low for recovery, said Turkish Flight Safety Officer Aydın Özkazanç, an A330 first officer.

The weak link in this automation story was one of the radio altimeters, and “it didn’t fail, it just became ‘non-normal,’” Özkazanç said. “There were no warnings, no drastic change in the cockpit, nothing to draw the pilots’ suspicion.” Accidents such as this, he said, raise the question: “How suspicious of automation should you be? Automation doesn’t mean automatic. It still needs people.

“Technology needs to trigger human interest into what it is doing,” he said. There are many ways in which automation can go adrift. “It can fail

Left to right: Coker, Kolisch, Lelaie, Learmount, Özkazanç and de Courville

fully, it can fail partially, it can produce unexpected results, and some failures are difficult to detect. Humans form the last line of protection" against the consequences of automation failure, yet "sometimes system design prevents" this intervention. Özkazanç used the term "the automation surprise" for a problem that suddenly reveals itself fully.

David Learmount, operations and safety editor, *Flight International* magazine, expressed similar thoughts about the subject. "Automation can do strange things when something in the system goes slightly wrong. So, by all means, use automation, but don't ever trust it completely; monitor what it is doing to ensure it makes sense.

"In modern airplanes, it is tempting to trust the automated systems because they normally provide very accurate flight path control — better than a pilot can fly — and they hardly ever fail. And the airlines encourage pilots to use them.

"But pilots need to be frequently retrained never to ignore the basics, like airspeed, power setting, aircraft attitude and altitude. Recognizing subtle automation failures should be a part of routine recurrent training, but it is not a regulatory requirement, so airlines don't do it."

Training was a recurring theme in the seminar, with Mike A. Ambrose, director general, European Regions Airline Association, discussing the importance of training in a different context, as a defense against legal charges in the wake of an accident.

"During the past decade, it is unlikely that any day has passed in which senior airline executives, somewhere in the world, have not been faced with criminal charges arising from an air accident. Criminalization of air accidents has become a new and threatening feature in the responsibilities of directors and key post-holders," Ambrose said.

"Airline boards and senior management need to prepare not only for an accident or incident, but also for potential criminal prosecution. Preparation should include various measures, including insurance, training, media strategy and establishing within the airline, in anticipation of a future incident/accident, the capability of conducting a parallel internal air accident investigation. Failures by senior managers to take the necessary measures can expose companies and their employees to 'corporate manslaughter' charges," he said.

One of the problems Ambrose sees in defending against post-accident charges is the lack of consistency in the training. "Why does one training organization teach more than 30 ways of flying a well-known and widely used aircraft type?" he asked.

"The recurrence of replica accidents [the same type of accident repeated] is distressing, frustrating and avoidable; no formal requirements exist to teach new-intake pilots the lessons learned from tragic experience. Addressing this knowledge shortfall might help crew detect situations that could otherwise lead to repeating past mistakes."

The international aviation system might be considered safe, but it has ceased becoming safer, Learmount said, pointing out little or no change in accident rates since 2003 or 2005, depending on the data used. "The status quo: Aviation has reached the limits of performance that can be achieved under the traditional ways of thinking and operating. The traditional way of thinking is that safety is achieved by compliance with regulations. This is a mentality that abrogates personal responsibility for company standards," Learmount said, echoing Ambrose's ideas.

Higher goals must be set for progress to resume, Learmount said. "After an accident, a CEO with that mindset would say: 'It wasn't our fault. We operated within the law.' That is a fatalistic/deterministic, passive attitude. The thinking that will cause a resumption of safety improvement sees safety management going well beyond compliance. Remember, the law sets minimums; compliance with the law results in minimum standards."

Photos: J.A. Donoghue