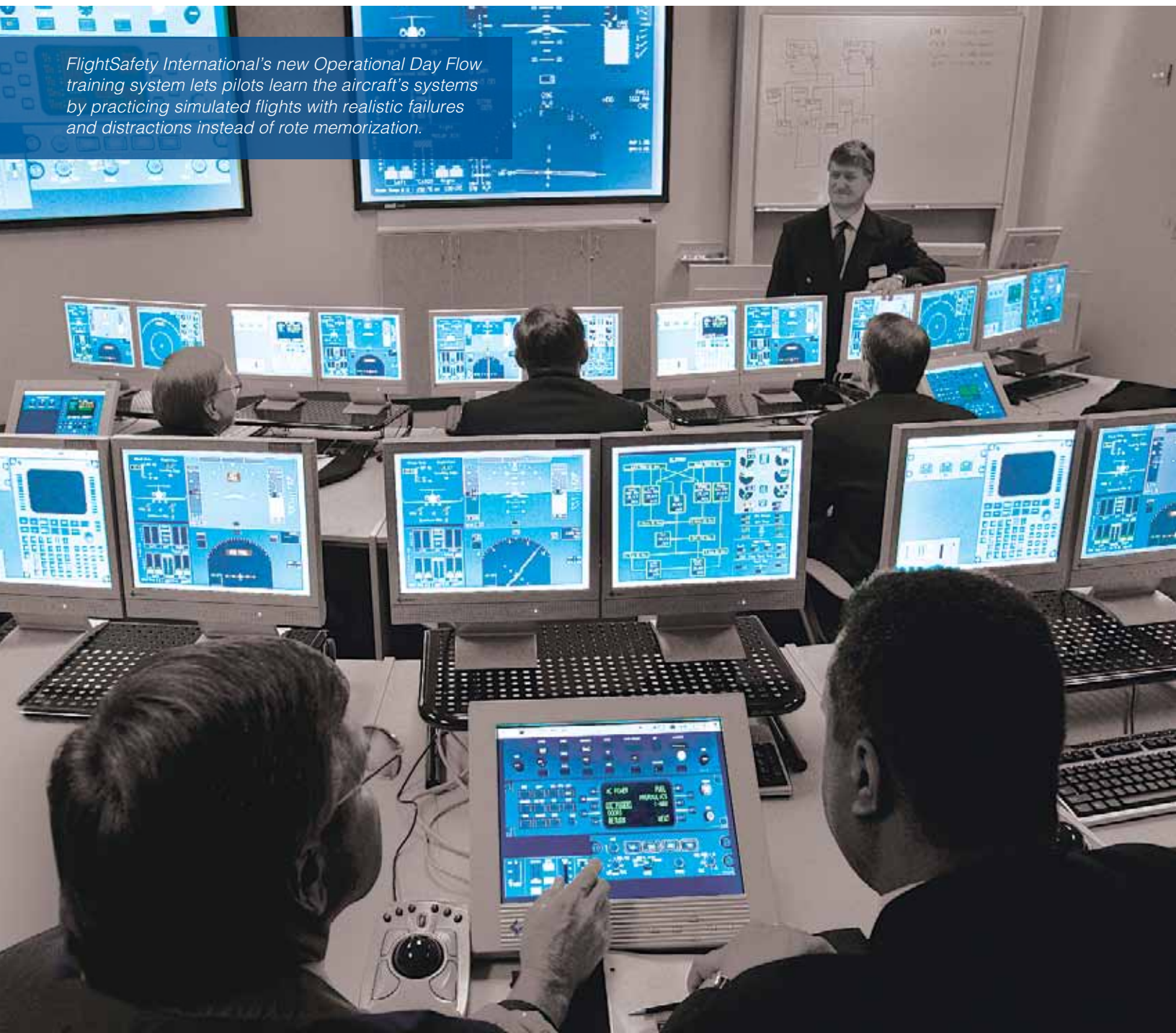


The Future of Pilot Training

FlightSafety International's new Operational Day Flow training system lets pilots learn the aircraft's systems by practicing simulated flights with realistic failures and distractions instead of rote memorization.



FAA Views Stall Training As Critical Part of Pilot Education

by Matt Thurber

The flight in the Citation started out normally enough. A takeoff followed by steep turns, slow flight, stall recognition and recovery, then descend and level off before reaching the final approach fix. Everything was going well, at least from my viewpoint in the copilot's chair. The air was smooth as silk, and my captain's touch on the controls rock steady, although at this point we were back on autopilot.

Suddenly, the control column vibrated rapidly. Stick-shaker! That means stall! Realizing the mistake, my captain simultaneously clicked off the autopilot and pushed the nose forward to unload the wings and then added power. The unobservant copilot (that was me) had failed to notice the loss of airspeed after we leveled off and I also neglected to let my distracted captain know that we needed to add power.

Luckily, this flight was not in a real airplane but in a FlightSafety Citation simulator, and I learned an excellent lesson about what I should be watching when flying as copilot and also how to apply the FAA's new recommendations on stall training. That advice comes in the form of [Advisory Circular 120-109 "Stall and Stick Pusher Training."](#) a comprehensive resource that came out just before my training session. The FlightSafety folks didn't waste any time adopting

the new protocol, which emphasizes reducing angle of attack as the primary means of stall recovery. This protocol is in marked contrast to the FAA's earlier advice, which was to try not to lose altitude and to use power to recover from a stall event.

The FAA doesn't identify the accidents on which it based the changes in AC 120-109, but it's clear that the agency was galvanized into action by the Colgan Air Flight 3407 Q400 accident near Buffalo, N.Y., on Feb. 12, 2009, and the loss of the A330 operating Air France Flight 447 in the Atlantic Ocean on June 1, 2009. Both involved stalls, although the circumstances were not similar. In any case, according to the FAA, "A growing causal factor in LOC [loss-of-control] accidents is the pilot's inappropriate reaction to the first indication of a stall or stick pusher event." Another stall-related accident, in which the pilots failed to add power after leveling off during an approach, was the Circuit City Citation 560 crash in Pueblo, Colo., on Feb. 16, 2005.

Reinforcement of Basic Training Needed

The FAA emphasized in the AC that stall training should not be considered just a part of pilots'

initial training or their training for pilot certificates. Rather, "it is important to reinforce this basic training throughout their careers." It's also important that some pilots "may need to unlearn previous stall recovery procedures based on their prior experience." In any case, the FAA added, stall training should be either standalone or part of other training areas, and approach-to-stall and stick pusher (if applicable) training should be part of initial, transition, requalification, differences, conversion, upgrade and recurrent training.

The FAA notes that full-motion flight simulators can be used for approach-to-stall training, but instructors and pilots must be familiar with the limitations of the simula-

**U.S. Department of Transportation
Federal Aviation Administration**

Advisory Circular

Subject: Stall and Stick Pusher Training **Date:** 8/6/12 **AC No:** 120-109
Initiated by: AFS-200 **Change:**

The information contained in this advisory circular (AC) was developed based on a review of recommended practices developed by major airplane manufacturers, labor organizations, air carriers, training organizations, simulator manufacturers, and industry representative organizations. This AC does not provide guidance for full aerodynamic stall training, which industry and government stakeholders are now developing. Once developed, this AC will be revised to include that guidance.

The goal of this AC is to provide best practices and guidance for training, testing, and checking for pilots, within existing regulations, to ensure correct and consistent responses to unexpected stall warnings and stick pusher activations. This AC emphasizes reducing the angle of attack (AOA) at the first indication of a stall as the primary means of approach-to-stall or stall recovery. Additionally, this AC provides guidance for operators and training centers in the development of stall and stick pusher event training.

Core principals of this AC include:

- Reduction of AOA is the most important response when confronted with a stall event.
- Evaluation criteria for a recovery from a stall or approach-to-stall that does not mandate a predetermined value for altitude loss and should consider the multitude of external and internal variables which affect the recovery altitude. (Reference: Safety Alerts for Operators (SAFO) 10012, Possible Misinterpretation of the Practical Test Standards (PTS) Language "Minimal Loss of Altitude").
- Realistic scenarios that could be encountered in operational conditions including stalls encountered with the autopilot engaged.
- Pilot training which emphasizes treating an "approach-to-stall" the same as a "full stall," and execute the stall recovery at the first indication of a stall.
- Incorporation of stick pusher training into flight training scenarios, if installed on the aircraft.


/s/ John M. Allen
John M. Allen
Director, Flight Standards Service

for

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tor “to mitigate negative training.” The skills covered by the curriculum should include takeoff or maneuvering, clean and landing configuration approach-to-stalls; scenarios that include level flight with bank angles of 25 to 30 degrees, manual and autopilot control, visual and instrument flight conditions, high and low altitudes and various weight-and-balance conditions.

Also important are emphasis items that cover such subjects as the “abrupt pitch up and trim change commonly associated when the autopilot unexpectedly disconnects during a stall event. This dramatic pitch and trim change typically represents an unexpected physical challenge to the pilot when trying to reduce AOA [angle of attack]. In some airplanes, this may be exacerbated by an additional pitch up when the pilot increases thrust during stall recovery.”

Another critical emphasis item is fundamental to the whole issue of stall training: “Reducing AOA is the proper way to recover from a stall event. Pilots must accept that reducing the airplane’s AOA may often result in altitude loss. The amount of altitude loss will be affected by the airplane’s operational environment (entry altitude, airplane weight, density altitude, bank angle, airplane configuration and

so on). At high altitudes, stall recovery may require thousands of feet.”

In the Colgan Air Flight 3407 accident, after the stick shaker activated and the autopilot disconnected, the captain reacted with “startle and confusion,” according to the NTSB. Even though the pusher activated three times, the captain pulled back on the yoke and raised the nose to 19 degrees nose-up pitch, resulting in loss of control.

The FAA wants pilots who fly airplanes equipped with stick pushers to undergo academic training and flight training in a full-flight simulator. “It is important for pilots to experience the sudden forward movement of the control wheel during a stick-pusher activation. From observations, most instructors state that, regardless of previous academic training, pilots (on their first encounter with a stick pusher) usually resist the stick pusher and immediately pull back on the control wheel rather than releasing pressure as they have been taught. Therefore, pilots should receive practical stick pusher training in a FFS to develop the proper response (allowing the pusher to reduce AOA) when confronted with a stick-pusher activation. Stick-pusher training should be completed as a demonstration/practice exercise, including repetitions, until the pilot’s reaction is

to permit the reduction in AOA even at low altitudes.”

The concept of “startle” is also a factor in many incidents and accidents, according to the FAA. “Although it may be difficult to create the physiological response of startle in the training environment, if achieved, startle events may provide a powerful lesson for the crew. The goal of using startle in training is to provide the crew with a startle experience that allows for the effective recovery of the airplane. Considerable care should be used in startle training to avoid negative learning.”

“The FAA is making a serious push these days for different types of stall recoveries as they relate to recent accidents,” said Richard Sears, founder of Carlsbad, Calif.-based Citation training provider Loft. The company offers training in both a full-motion simulator and Citations, as well as upset recovery and stall training in an Aero Vodochody L-39. Among other things, the L-39 is used is to teach students how to deal with the startle factor that results when the autopilot suddenly shuts off during a stall. “What we’ve done is to incorporate real-life events,” he said. “I think the FAA and training companies are understanding the need for real-world [training], and we’re in agreement with that. ■



Training for a lifetime of safe piloting

by Matt Thurber

Recurrent training—and the way it is delivered—could hold the key to improving training for business aviation pilots, according to the NBAA Training Advisory Committee (TAC), which is tasked with improving and modernizing business aviation training. The TAC is a result of a two-year effort by the NBAA Safety Committee, called the Business Aviation Training Project.

According to the TAC, “Currently, [recurrent training consists of] just a check ride and an FAR 61.58 check, with no opportunity for training. Also, the check doesn’t address training needs based on any evidence. We propose to change this concept and use evidence-based training to mitigate risk.” The evidence can come from flight operational quality assurance (FOQA) systems, which few business jets currently offer unless they have a system to record usable data, but also something like an Aviation Safety Action Program (ASAP) for business aviation, similar to what airlines and now some charter operators employ. The TAC also hopes that business aviation operators will more widely adopt safety management systems (SMS), which could help provide data for evidence-based training. Additionally, FAA studies on use of automation, pilot monitoring and the FAA’s Aviation Safety Information Analysis and Sharing Program (ASIAS) will be helpful in providing more data.

At last year’s NBAA Convention, the Safety Committee released a document that summarizes the problems with business aviation pilot training and offers solutions. The document—Training Management Systems (TMS) for Business Aviation—points out: “There has been a migration from learning to checking at 142 [training] centers; the 61.58 is often repeated and predictable; emphasis is needed on risk awareness, aviation decision making and scenario-based training.” It added, “excellent infrastructure currently exists at 142 centers to address future needs.”

What the TMS does is describe a systematic approach to managing ongoing training, from identifying the need, to implementing the training plan, then making sure it meets the need of the operation. A TMS can work alongside a SMS, according to the NBAA document. “A successfully implemented TMS will provide the necessary competencies and qualifications to flight department personnel to safely operate within today’s complex environments. An effective TMS leverages the safety risk management activities of the operator’s SMS.”

“That’s pretty much the thrust of our efforts,” said JR Russell, a Boeing 777 airline captain and chair of the TAC, “not to focus on initial qualification type training but more so on recurrent training, so it’s really valuable. Why not spend more time on the real threats that have been identified?”

Recurrent Training

Because the SMS helps identify threats, it is ideally suited to help operators discover areas where training could be applied. “Whether the threat is identified by one of your pilots or through industry sources,” he said, “it is identified and now you have to decide if the level of risk of that is unacceptable and do something to mitigate it. One of the primary tools of a good SMS is training. It would be nice if we could use the training tools of the SMS to their full potential, to be able to go to the training provider and say, ‘These are the threats we’ve identified; help us train to mitigate the risk we’ve identified.’”

While training providers are working with the business aviation industry to help improve recurrent training, they aren’t the sole source of training, and flight departments and operations can do a lot of in-house training to mitigate identified threats, Russell pointed out. “We want to open operators’ eyes to other options,” he said.

“It could be a good article [in a magazine] that happens to coincide with a threat that you’ve identified—say, high-speed rejected takeoffs. Maybe one of our jets had a high-speed abort, but everything worked out fine. [But maybe] the brakes overheated and we had to do an inspection. But the fact is we aborted in the high-speed regime for something that was minor, and we should have kept on going and handled it as an in-flight emergency rather than a

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high-speed abort. Because of that, our flight department wants to train on high-speed-abort decision-making. Say there's a good article, let's make that required reading. That is training. We're making sure the pilots read it and if they have any questions and comments, the point of contact is the safety officer. That's an example of how easy or how non-complex in-house training can be."

Another way to gather information that can help mold training events is to use FOQA data to spot areas that need improvement, but not all aircraft have sophisticated flight data monitoring (FDM) systems that can interface with FOQA programs. A low-cost option is offered by companies such as Appareo Systems, which sells the small portable Vision 1000 cockpit imaging and FDM device designed for aircraft that aren't equipped with FDM systems. The Vision 1000 collects not only GPS data but also attitude and acceleration via inertial sensors. Appareo's Alerts FDM system is used to analyze the data.

An even lower-cost solution is available from Apple iPad app developer CloudAhoy. The Cloud-Ahoy app uses GPS (either an iPhone or iPad's internal sensor or an external receiver) to record a flight, after which the data is uploaded automatically to CloudAhoy's servers. The pilot or operator can then view and share the flight's debrief using any web browser, in a 3-D view using the Google Earth plug-in. The debrief view shows graphical views of each maneuver performed, as well as overlays of charting information such as IFR approaches, making deviations easy to spot.



At the request of Mitsubishi and after a number of serious accidents involving the MU-2 twin turboprop, the FAA mandated initial and recurrent pilot training, the value of which is evident in an improved accident rate. SimCom offers MU-2 training in its simulator, shown here.

Loft Off the Shelf

In working with training providers, Russell and the TAC recommend taking advantage of the line-oriented flight training (Loft) scenarios that these companies have developed. "[They] have these Loft scenarios already created and developed," he said, "and sitting on the shelf. The operator can go to them and say, 'Do you have anything on high-speed aborts that we can use?' The TAC will be able to direct more of the development needs for that type of training to the providers, so the providers realize that the primary threats are [such and such], so make sure you have these scenarios ready to go. As we were developing [the TMS] and talking to the training providers on the committee, they brought this up and told us that very few customers use this resource."

In the airline world, Russell (who was previously director of safety and chief pilot and is now a Boeing 777 line captain) and his colleagues would review ASAP reports and FOQA data. "I had a good idea where the primary threats were," he said. "I could call my counterpart in training and say, 'We've got this and this identified, can you develop some training that will address that?' We would incorporate that at recurrent training, then I could look at the data and see if that was working, whether there were fewer ASAP reports or if FOQA data was showing stabilized approaches increasing rather than a negative trend. Since the late 1990s, it's made us so much safer, and it's so much better than jumping through hoops like 61.58. We still have some maneuvers we have to perform, but

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we've taken out a lot of those and put in things, and the FAA has seen the outcome of this, which is enhanced levels of safety, and it's made the agency a big believer in it.

"But we have a long way to go before Part 91 operators have the same type of training, and it boils down to evidence-based training. The more our industry comes to realize how valuable that is toward elevating safety, hopefully that will open more doors and allow us to get even better."

The Mitsubishi Way

Pat Cannon, president of MU-2 product support provider Turbine Aircraft Services and an FAA designated pilot examiner on the MU-2 and Beechjet, agrees with the NBAA committee's assessment. "The current 61.58 system is not set up the best way that it could be," he said. The problem is that the 61.58 regulation requires only a check ride but says nothing about the training leading up to the check ride. "Check rides are task-driven," he explained, and this means that pilots end up practicing for whatever maneuvers are on the check ride. "What would be beneficial would be to say that people have to go do certain training rather than just perform [for a check ride]."

Cannon would rather see pilots spend less time learning specific tasks and more time learning to operate in the complexity of the aviation environment. He is encouraged that training companies are offering more scenario-based training opportunities. The benefit of this kind of training is that the required tasks can still be covered within each scenario, but in a much more realistic fashion.

For example, the tedious V_1 engine cut, instead of being an item to practice, can be a complete surprise for a pilot taking off on a scenario-based trip. Or the takeoff could include an unexpected wind shear encounter or a stall that happens when the pilot is distracted trying to solve a different problem. Cannon is encouraged at the efforts by the NBAA TAC to improve training for business aviation pilots. "It's not going to be the FAA mandating by regulation," he said. "NBAA's got the right idea; [it is] encouraging these companies to do better training and make sure pilots are proficient."

For the MU-2 community, the special FAR (SFAR) enacted by the FAA in 2008 has changed the landscape of pilot training for the high-performance twin turboprop. While FAA regulations allow any private pilot with a multi-engine rating to fly a twin-engine turboprop weighing less than 12,500 pounds without additional training (although it's unlikely an insurance provider would cover that pilot), Mitsubishi, for many years, asked the FAA to require a type rating or formal training for MU-2 pilots. Since the SFAR was enacted, the MU-2's accident rate has improved dramatically. "The SFAR has been helpful," Cannon said. "It's pulled in people who have never trained or trained infrequently or weren't trained to a set of prerequisites."

All MU-2 pilots are subject to the SFAR requirements, which mandate initial, recurrent and requalification training, to specific standards that basically mirror the flight manual. "We're driven to make them perform to these standards," Cannon said. This has helped not only to

make sure MU-2 pilots are flying to a high level of consistent standards but also involves reviewing accidents and teaching pilots skills that will help them avoid the situation that led to the accident. For example, the MU-2 training includes accelerated stalls, unusual for that type of aircraft.

Overall, Cannon believes that pilot training can be improved by adding new material in training programs, to help avoid complacency. "Then we start to pump them up with new information," he said. "It makes them more aware and improves the learning process."

But, he added, "the big picture is to get training. In a perfect world, every pilot would train more often. The [current FAA biennial] flight review system is a joke. It's meant to put people in an airplane with somebody who knows something. In many cases it's accomplished well below the levels it was intended to provide. In a perfect world, they would go for training and demand instructors who challenge them, and when they come away they'd actually have learned something."

Simulation Developments

In the past four years, Flight-Safety International has revamped its training products, introducing the new concept of Operational Day Flow (ODF), which ties learning to the outcome instead of just asking pilots to learn information because that's the way it's always been done. The ODF concept is used for initial and recurrent training and meets the needs for the annual 61.58 check ride system, too. "It provides training

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for ground and simulator training that's scenario-based," said Dave Davenport, a FlightSafety senior vice president who oversees operations, marketing, sales and business development.

An example of how this works for ground school is that students will be presented with a hydraulic warning and have to figure out what it means and how to deal with it, instead of just learning this valve does this, this valve does that when this switch is actuated and so on. "This leads you into understanding how the hydraulic system works," he said.

In the simulator, more simulated trips are flown with pertinent failures occurring to help cement the learning. The crew might face a runway incursion while taxiing, for example, then have to revise a flight plan in flight because the boss in the back changed her mind about the destination. And then in the middle of the revision of the flight plan, another emergency will pop up and the crew has to delve back into the aircraft's systems. "It's much more dynamic," Davenport said, "and it has been well received. By the end of this year, it will be in all of our training programs."

FlightSafety International is actively participating with the NBAA effort, and FlightSafety director of regulatory affairs Steve Fedynyszyn is a participant in the NBAA Training Committee. "The feedback we've gotten from customers and [NBAA] is to make training more operational rather than just meeting the objectives of the regulations for recurrent training," said Davenport.

A direct result of communicating with customers about these issues is

a new rejected takeoff (RTO) training module that can be added to recurrent training, usually at the end of the regular session without needing an additional day at the learning center. "It's more comprehensive than a V_1 cut," Davenport explained. "It's about decision-making. If you get an indication that the cabin door has opened right at V_1 , what do you do? In the time we've discussed this, it's too late to make a decision. So many people would reject the takeoff, and in two or three seconds you're well past V_1 and you go off the end of the runway. At that speed, it's best to go around."

Davenport confirmed that these efforts are all part of identifying hazards and training how to handle them to mitigate the risk involved. "We highly encourage flight departments to incorporate this into their before-takeoff briefing," he said, "so it becomes an awareness on each flight."

FlightSafety customers love the new focus on operational training, he said. "It really creates a challenging realistic environment for them. Chief pilots recognize and understand this. Pilots think it's not going to be a big deal until they're faced with a situation, and they're truly learning in a training environment so they're ready for it."

Caleb Taylor, founder of Cessna CitationJet simulator training company ProFlight in Carlsbad, Calif., is also working with the NBAA Training Committee on improving the recurrent training process. "We teamed with the committee to try to work with the horrible dilemma of box-checking [for the 61.58 check ride]," he said. "Scenario-based training is where it's at."

To that end, ProFlight has developed technology that allows students to practice scenarios on their own in a fixed-based simulator that runs on the same aerodynamic modeling software as its full-motion level-D-qualified CJ3 full flight simulator. (See *AIN*, February, page 44.) ProFlight's new Nextgen trainer replicates the full simulator's Rockwell Collins Pro Line 21 avionics and uses electric control loading for accurate control feel and feedback. ProFlight can build up to 100 scenarios in the Nextgen trainer, which students can practice flying on their own. Each scenario is graded against FAA Practical Test Standards, and students can replay any point in the maneuver to see where they went wrong. The practice in the Nextgen trainer prepares the student for later full flight simulator sessions because all the switches and knobs are exactly the same.

Flight Instructor Input

Robert Meder, chairman of the National Association of Flight Instructors (NAFI), believes that aviation safety can be greatly enhanced by helping flight instructors take pride in what they do and encouraging them to take advantage of the learning experience that teaching engenders. "What we'd like to do at NAFI is instill the sense that this is a wonderful opportunity to learn your craft," he said. "Don't look at it as purgatory or punishment; look at it as an opportunity to learn how to teach, how to learn and how to apply those skills to a crewed environment. Flight instruction is a crewed environment, and it's a way to learn how to coordinate with another person."



The future of flight training might lie in risk awareness and scenario-based training, according to some experts. Shown here is a FlightSafety G550 simulator.

To help instructors, Meder and NAFI are working on an effort to promote mentoring among the association's members and the pilot population at large. "We all have a responsibility to mentor each other," he said. "We at NAFI want to foster a mentoring environment. It's not just old gray-haired pilots mentoring younger people coming in; it is a two-way street.

"If we do that, it raises that sense of community or pride, or doing the very best job we can. I think the safety issues will start to mitigate themselves organically. We can pound the table and say, 'You will be safe!' But forcing that kind of thing takes a while. What it really takes is a cultural shift. I think we're somewhat into the statistical noise now [as far as safety improvement is concerned]. I'm not being complacent. We need to improve, but it isn't going to be the traditional method of pounding the table or having the insurance companies [set standards]. It's setting an attitude and building a culture that says this is the way we should behave."

At the University of North

Dakota (UND), associate professor Jim Higgins described an ongoing process of evaluating accidents and incidents to improve training delivered to the university's students. UND has reached level two in its implementation of a safety management system, the only aviation university in the U.S. to accomplish this, according to Higgins.

As part of its SMS, UND employs FOQA and ASAP, using data to drive improvements in the training process. "We're always seeking to improve," he said. "In our opinion, students get a lot of exposure to data-driven safety and how to work in a larger organization. [UND students] should be able to go to a corporate flight department and bring some of the latest state-of-the-art systems to the commercial world. Even for a small operation, they can bring these principles and make it a better place. A lot of people think you don't need a college degree to operate aircraft, but if you do have it, you get exposure to these programs. That's value added and beneficial for ongoing safety."

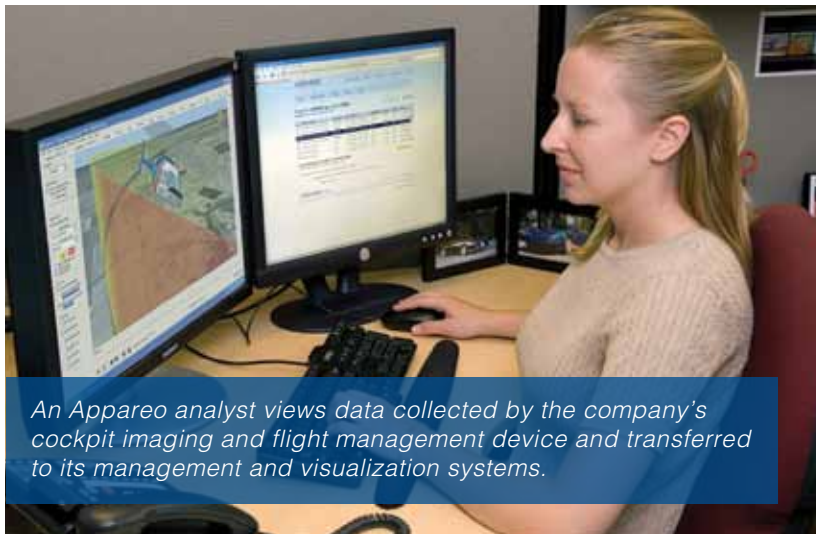
UND uses Appareo's FDM to record and analyze flight data. When

the university introduced new glass-cockpit Cessna 172s into its Phoenix branch, replacing a Piper fleet, the FDM showed that some pilots weren't adhering to airspeed- and glideslope-management standards. "We had some safety meetings and looked at the data," Higgins said. The point wasn't to emphasize the problems that individual pilots were having but rather to address the issue as a group. "We closed our gap between what we do and what we say we do—stabilized approaches—to almost zero," he said. "That's how an airline would work an issue."

Another example was making sure students understand what happened in the Colgan Flight 3407 accident, and having them practice stall recoveries after the autopilot switches off. "I was an airline pilot and check airman," Higgins said, "and we never practiced stall recoveries with the autopilot on. That's something that's been incorporated [at UND]."

Last year, the UND fleet flew approximately 130,000 hours. Standard operating procedures are part of the university's processes and, he said, "Our standardization is

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An Appareo analyst views data collected by the company's cockpit imaging and flight management device and transferred to its management and visualization systems.

at a high level. It's a fine line; we can write too many policies, but it's tough to argue with our safety data. Whenever we do put an SOP in place, we make sure it's well thought out and validated with the monitoring systems."

Redbird Simulations

Michael Phillips is one of the many instructors who has generated new business by putting a Redbird simulator to work in his flight schools. Available in both full-motion and fixed-base models, the Redbird devices are low-priced yet effective. The low cost of technology makes it possible for Redbird to make simulators that replicate modern glass-cockpit-equipped airplanes, from Garmin G1000 Cessna 172s to King Airs with Rockwell Collins Pro Line 21 flight decks. For Phillips, who has been teaching flying for more than 40 years, "the Redbird added years to my professional life as an educator," he said.

Now Phillips focuses on teaching pilots who fly high-performance singles such as the Columbia 400 (now Cessna TTx). What he has found working with these pilots is that their skills deteriorate because they are flying airplanes with a high level of automation. "Stick and rudder is important," he said. Also of concern is that "people don't push themselves or demand enough in terms of ongoing training. It's a mentality about ongoing improvement. I bought this [simulator] for people who own airplanes and need to continually challenge themselves."

Another problem area that Phillips sees is a weakness in the ranks of flight instructors. "There's plenty of information out there on how to create good pilots. Where I see a challenge is in the delivery system. If instructors are well led and receive continuous quality checks on how they are doing, that's great. But a lot of instructors learn the mechanics but not the relationship part:

understanding the person they're [teaching]." Phillips wants to see instructors who can be good mentors and coaches and communicate well with their students. "That's what we need to teach instructors."

Last October, Redbird Simulations held the annual Redbird Migration at its Skyport facility in San Marcos, Texas. The Migration is a gathering of pilot education experts from all walks of aviation, many from schools that use Redbird devices, and serves as a forum for participants to share flight training best practices and also a demonstration of new Redbird concepts and technologies.

Redbird chairman Jerry Gregoire is a perennial experimenter, and last year's Migration featured plenty of new ideas from the Redbird crew. Participants were encouraged to try flying Redbird's new helicopter simulator, which replicates a Bell 47. The simulator will be full-motion, although the motion was not switched on during the Migration. Redbird also invited participants to compete against each other in steep turn, spot landing and formation flying challenges that were available on various devices in the Skyport facility.

Even more interesting was a prototype of a new system that allows students to learn on their own, demonstrated on a Redbird Jay device, a desktop simulator designed for home use. This system takes scenario-based training to its next logical step, not unlike what ProFlight is doing with its Nextgen trainer. "Training clients will practically teach themselves," said Jeff

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Van West, director of the Redbird Media division. “It’s self-guided instruction, with feedback from the environment that you’re in.”

In the demo on the Jay system, the student has to fly from San Marcos to Austin, pick up a passenger, then fly to Lockhart. The task involved using 14 different frequencies, understanding the different airspace encountered and interacting with controllers. While this was an early version of the system, it did demonstrate its potential. The main feature is that the system can be designed to prevent the student from progressing unless certain thresholds of skill are demonstrated. “We let them go through the situation and try it,” Van West said. “They have the resources to keep going, and with success there is reward. Now the bar moves up a bit. This is a hot topic in learning theory.”

With further development, this system could be used for all kinds of pilot training, including avionics,

weather, airport signage and markings, stalls, steep turns, instrument procedures, flight through complex airspace and so on. “We can manipulate the world and make it increasingly challenging,” he explained. Pilots who need to clean the rust off little-used skills could easily use this system to brush up. “We’ll take the reality and bring it into simulation,” Van West said. “The future of flight training is not out there, it’s right now.”

Insurance Opinions

When it comes to safety, insurance providers exert enormous influence. After all, insurance is one of the reasons that so much training is done in simulators, and the training involved with recurrent training events like the 61.58 check ride is also likely to be the result of insurance provider influence.

Brian Hogan, director and v-p of aviation claims at underwriter Allianz Global Corporate & Specialty,

is a pilot, aircraft mechanic and aeronautical engineer, and he believes that, overall, the industry is doing well on the safety front. Allianz provides insurance coverage for all types of operators and entities, from large airlines to corporate flight departments, FBOs, maintenance facilities and even agricultural operations. “I don’t think there’s an aspect of aviation that we don’t get involved with,” he said, and that includes working on a number of training initiatives to help improve safety.

“The industry is changing, and there is a significant desire to change with the things that are changing in the industry,” he said. “There are a lot of requirements, from the private pilot who can get by with a biennial flight review, to the airline captain who is going through recurrent every six months in the particular aircraft he is flying. As a corporate pilot myself, we were doing recurrent every six months whether in the right or left seat.”

While Hogan can’t comment specifically about the Asiana Airlines landing accident in San Francisco, he did offer some insight. “From an insurance point of view, our thinking is simply this: make sure that you know to just fly the airplane. You can rely tremendously on highly sophisticated instrumentation, but human factors come into play. It’s a human factor that all pilots need to be able to say, with full honesty, ‘I’m familiar with that autopilot and autothrottle system.’

“Airlines are training these guys and gals as much as they can,”



Today’s airplanes, such as the CitationJet shown in this ProFlight simulator, require a modernized method of training, according to the NBAA Training Advisory Committee, which advises a movement away from repetitive, predictable training for the test in favor of training for an operator’s needs.

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Hogan emphasized. “They’re fulfilling all of the criteria. We work with every one of the airlines that we insure to make sure that all the Is are dotted and Ts are crossed, and they are. But there are always circumstances where an individual doesn’t do what he was trained to do. Some investigations have shown that. The individual didn’t manifest that character flaw until the time the accident occurred. [The cause] can be a number of different things.”

Unfortunately, in aviation, he added, “we can’t plan for every set of circumstances or what every pilot will do in a given set of circumstances that leads to an accident. But we can move in that direction, and I think the NTSB is working on this.”

Insurance providers work closely with the FAA and NTSB. “We want all our clients—large or small—to bring their crew training to the highest standard,” Hogan said. “The people we’re involved with certainly do. You’re going to have incidents, accidents—that’s the idea of insurance—and hopefully they’re not catastrophic. We’re constantly monitoring that, and we get involved with people who have high criteria and want to operate safely always.”

Hogan welcomes NBAA’s efforts to improve recurrent training for business aircraft pilots. The problem he sees is that repetitive training that doesn’t offer new and different material runs the risk of losing the attention of the trainee. “I think that’s a good focus to start

thinking about,” he said, “how we refocus the training environment so it doesn’t become as repetitive and maintains the interest of the crew.” Instead of the same old V₁ cuts, he added, “maybe we should spend more time on what the autopilot and autothrottle can do for you if you’re not familiar with that system.” But a more important issue may be “have we trained so much about so many different things, have we gotten away from just flying the airplane? The key is figuring out ways of making good pilots better, back to learning how to fly the airplane again, making recurrent training exciting.”

Working with operators around the globe, Hogan is quite aware of the variations in aviation infrastructure in many countries and cultural differences that can affect flight operations. Like many U.S. pilots, Hogan participates in grassroots general aviation, attending the annual EAA AirVenture show in Oshkosh, Wis., and flying light airplanes. “In [countries] where there isn’t a strong general aviation presence, people don’t get exposed to a lot of things that are exciting about airplanes,” he said. “In a culturally challenged environment, you might have a junior officer reticent about challenging a senior officer. I know [various groups] are looking at this in light of recent crashes, but whether it will have a great or minor impact, I don’t know.”

The bottom line, he said, “is that the safety record of the airlines is

remarkable. From a general aviation point of view, we continue to have an accident rate based upon hours flown that is fairly consistent. At the grass-roots level, there aren’t many changes [improvements in the accident rate]. At the airline level, changes have been dramatic. They are getting more sophisticated airplanes, and operators that train their crews to high standards are reaping the benefits from that.”

Could general aviation pilots learn from the way airlines operate? “Just because you have an instrument rating doesn’t mean you can fly a single-engine aircraft in IMC at night because you did it within the last 90 days,” he said. “You have currency, but how current, how safe are you? You can do it legally, but are you up to snuff? You can take on a certain number of challenges and tasks before you reach a saturation point. The biennial flight review can be more focused on that saturation point and what you should and should not do with an aircraft. That’s a good focus: understanding your limitations,” Hogan added.

Training providers CAE and SimCom also recognize that pilots are bored with the same old training and have developed new ways to make the training process more interesting and pertinent. CAE’s RealCase system uses data from incidents and accidents. Instructors present the scenarios to business aircraft pilots during classroom sessions to help facilitate a “what would you do”

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discussion, often using simulator-driven demonstrations during the RealCase classroom sessions.

SimCom uses type-specific accident data to develop lessons for each aircraft training program to help students learn how to handle real-life situations in the simulator. Instructors can modify the scenarios as new accident causes occur, or students can even ask to replicate their own custom scenarios, based on something that happened to them or a possible scenario that they are concerned about and want to prepare for.

Final Ideas

FAA Administrator Michael Huerta, in a speech at the Training Roundtable held last November, announced the formation of the Air Carrier Training Steering Group. Huerta asked industry stakeholders to participate in the group. "This group is composed of industry and government representatives who

will study training issues and advocate for voluntary adoption of the best practices that we have identified together," he explained. "We want to identify additional areas for improvement in training and make voluntary efforts to address them. We live in a world today where we cannot regulate every aspect of safety."

On January 27, Huerta met with general aviation groups to promote a similar effort for the non-airline segment. "Improving general aviation safety is a top priority for the FAA and industry," he said. "The general aviation fatal accident rate has flattened over the past six years and there were 259 fatal accidents in 2013, at a cost of 449 lives. We're also working with industry on a prototype program to use de-identified GA operations data in the Aviation Safety Information Analysis and Sharing [ASIAS] program to help identify risks before they become accidents."

For retired airline pilot and author Barry Schiff, the bottom line is that "there is a difference between a pilot and an aviator. An aviator has a sense of what's going on; it stems from his early experience. Now, especially in foreign countries, they're starting to train in sophisticated airplanes with glass cockpits. Whatever happened to looking at checkpoints on the ground and flying by attitude? That's what is missing from a lot of pilots."

Schiff, however, isn't so sure that this means there will be more fatal accidents. "The record globally is pretty hard to beat." So he isn't sure that training is the problem or the answer. "The problem is that when an accident does occur, we get really upset about it and thinking about how it could have been prevented, if the pilot had been more of an aviator and more in tune with the airplane. But how many accidents would have occurred for other reasons? I'm not so sure there are answers." ■

Upset Training Targets Loss-of-Control Accidents

There are many more opportunities now than in previous years for pilots to learn how to prevent and recover from an in-flight upset or loss of control, ranging from simulator-based programs to in-flight practice in jets, and even one program offering training in business jets. Loss of control remains a significant accident cause in all segments of aviation.

“Loss of control is now the leading cause of passenger deaths worldwide,” said Bill Korner, chairman and CEO of Mojave, Calif.-based Flight Research, which teaches pilots in Sabreliners as well as an Aermacchi MB-326 Impala single-engine military jet trainer. “The reason we use those aircraft,” he said, “is because they respond and feel the same way as the aircraft that our customers fly.”

Flight Research recently started working with five major insurance underwriters that cover about 90 percent of business jets. The underwriters agree to provide a premium discount for customers who alternate between simulator-based recurrent training and upset training, every other year. “We think that’s acknowledgment by the insurance companies that the kind of program we’re using is important to safety of flight,” he said. The cost of alternating between traditional simulator training and Flight Research’s upset training comes out about the same as simulator training every year, Korner said.

The Flight Research training begins in one of three Sabreliners (a 40, 60 and 65) that the company operates. The student practices various unusual attitudes, including accelerated two-g stalls at nose-high attitudes, low-air-speed recoveries, nose-low recoveries



Aviation Performance Solutions conducts its in-airplane upset prevention and recovery training in an Extra 300.

at high airspeed and 35-degree bank angles and stick-shaker go-arounds to simulate microburst-induced wind shear conditions. “We show it can fly on the shaker,” Korner explained, “and you have five to seven knots of leeway. We have them fly around and they can control it and get maximum performance by doing that.”

The instructor also places pilots in scenarios based on real accidents, such as the Air France Flight 447 stall into the ocean. The instructor puts the Sabre into a departure stall at high altitude, then keeps it stalled and allows the jet to develop a high sink rate, then shows the student how to recover. “A lot of pilots come to us and they’ve never done a full departure stall,” he said. “As soon as you unload the wing [reduce angle of attack], it’s out of it. You don’t have excess power at high altitude. The only way you can control it is to unload the wing and then you’re flying the aircraft again. The 447 guys didn’t do that. They sank from 38,000 feet to the ocean in about 3.5 minutes; in spite of the fact that the stall warning went off [many times], the copilot insisted on keeping it at a high angle of attack and stalled all the way to the ocean.” Flight Research

also replicates the Colgan Flight 3407 scenario, where the autopilot shuts off as the airplane is stalling.

The next step is to put pilots into the Impala to fly more challenging maneuvers, such as 70-degree banks to fully inverted in various configurations. “The Impala is not so much for teaching upset recovery,” Korner said, “but gives confidence that they can handle the aircraft [in a variety of severe unusual attitudes].

“Approximately 60 percent of the students have never been in a fully developed stall in a jet or beyond a 60-degree bank,” he said, “yet they have thousands of hours. Aviation today is very safe, but the pilots who were flying Colgan 3407 and Air France 447 and American Airlines 587 [crashed in Belle Harbor, N.Y., in 2001 after overuse of rudder in response to wake turbulence] thought they were going to have a safe day to fly and hit a condition they weren’t expecting and handled it wrong.”

New APS Bases

Aviation Performance Solutions (APS), which combines upset prevention and recovery training in aerobatic airplanes with sessions in CAE

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full-motion jet simulators, recently expanded to two new locations in addition to its headquarters in Mesa, Ariz. The other U.S. location is at Arlington airport in the Dallas area, while the European base is at Seppe Airport in The Netherlands, about halfway between Amsterdam and Brussels. The U.S. facilities use Extra 300s for in-airplane training, while two Slingsby T-67As are based at the Seppe location. APS also has been using a leased A-4 Skyhawk for high-altitude, high-Mach upset recovery training for pilots who have already completed the core APS program. APS clients can also take advantage of insurance training credit opportunities through underwriter Swiss Re Corporate Solutions when participating in the APS-CAE Advanced Training Program.

For APS, the purpose of the training is not to critique an individual pilot's experience in the program but rather to give that pilot new tools and experience, according to APS president BJ Ransbury. "They walk away with dramatically increased chances to prevent an accident," he said. "That's the biggest surprise; they come through with the concept of recovery [from unusual attitudes] and leave with the ability to prevent them. If you can see it coming, you can make better decisions."

The concept of startle and surprise is important, too, to make sure students are prepared to handle the upset if it is unexpected. APS doesn't introduce the surprise factor until the third in-airplane lesson on the second day. "If you introduce it early, you can destroy confidence," he said. By teaching students how to handle the upset beforehand, they have the discipline to contain the startle factor when the upset happens, he said. "The initial reaction of not reacting

is better at first," Ransbury said. He finds that this element is better done in the airplane because in a simulator the pilot expects most maneuvers. "Being surprised in the real world is better than in the simulator. The fidelity of the surprise makes a big difference in its value."

Corporate flight departments that send pilots regularly to APS do so every three to five years, Ransbury said. The Dallas location is ideal, he added, because recurrent training at CAE's Dallas/Fort Worth International Airport facility can be combined with APS training in Arlington, saving travel time.

Upset Training Options

There are plenty of other upset training opportunities, including Stallion 51's L-39 program in Kissimmee, Fla., and the program offered by Environmental Tectonics in Southampton, Pa. The Environmental Tectonics program uses a Gyrolab GL-2000 single-seat centrifuge-based motion platform, which can sustain g forces while yawing, pitching and rolling 360 degrees. The GL-2000 is equipped with glass displays, rudder pedals and control yoke with a stick-shaker and a visual display. The device is used for upset prevention and recovery training, high angle-of-attack maneuvering, mishap re-creation and investigation, wake vortex upsets and inverted upset training.

Another training provider recently joined the upset-training

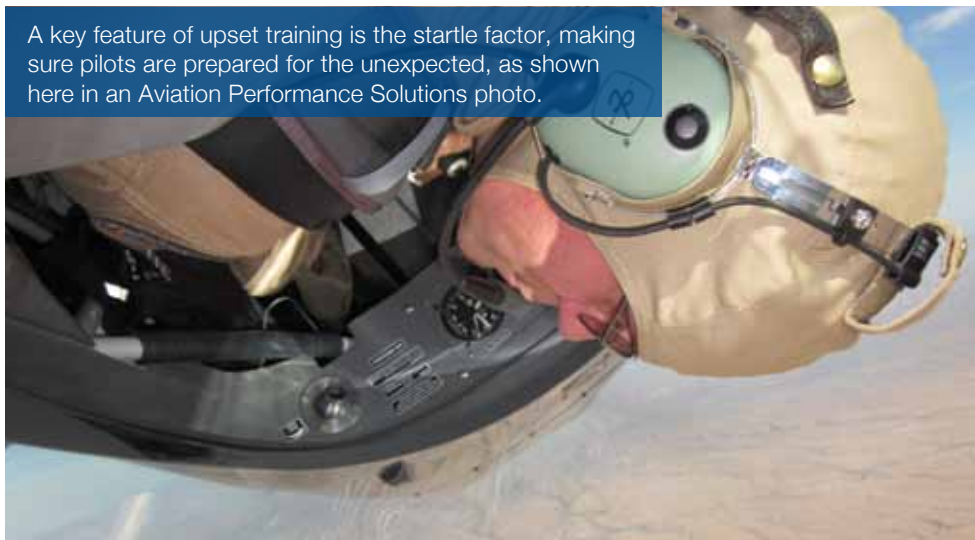
league: Loft, based at Carlsbad Airport north of San Diego. Loft is an FAA-approved Part 142 training provider that specializes in Cessna Citation 500 and 525 training, in both Loft's airplanes (500 and 525) and Loft's simulators (525).

The company added an Aero Vodochody L-39 to its fleet earlier this year and uses it for one- and two-day upset training courses, taught by company founder Richard Sears. "We received our letter of deviation authority from the FAA because of [the L-39's] experimental status," he said. "It reviewed our program and agreed we were going to make a good contribution to the community."

Loft chose the L-39, Sears said, "because it weighs the same and acts the same as the Citation 500 and 525. The delay in power [when adding thrust] and energy management is almost identical." And the L-39's aerobatic capabilities allow students to practice maneuvers that would be impossible in the Citations.

Loft's one- and two-day courses in the L-39 begin with a morning of ground school followed by an hour in the L-39. Students in the two-day course fly another hour on the second day. Sears uses the L-39, which is equipped with an autopilot, to re-create accident scenarios such as autopilot stalls. "The FAA is making a serious push these days for different types of stall recovery as they relate to recent accidents." —M.T.

A key feature of upset training is the startle factor, making sure pilots are prepared for the unexpected, as shown here in an Aviation Performance Solutions photo.



Some recent accidents:

- When a highly experienced flight crew has trouble landing a Boeing 777 on a day when the weather is ideal (Asiana Airlines Flight 214, July 6, 2013, San Francisco), this raises questions about what might have been missing in the pilots' ongoing training regimen. That the pilot flying expressed concern about having to fly a visual approach into San Francisco in optimal weather conditions while also being confused about the airplane's autothrottle system adds to those questions and brings up issues of how well cockpit crews are trained to work together in a culture where deference to seniors remains an important factor.
- The crash of a Challenger 601-3R during a second attempt to land on Runway 15 at Aspen Airport on January 5 served as a reminder that there might be areas of training that could be bolstered for business jet pilots. The airport's ASOS broadcast: "one-minute data at the time of the accident reported the wind at 333 degrees true at 14 knots gusting to 17 knots," according to the NTSB preliminary report. Before the first landing attempt, controllers reported to the Challenger pilots 19-knot winds gusting to 25 knots from 290 degrees. The Challenger's tailwind limitation is 10 knots. Former Skywest pilot Josh Ritter, interviewed in the Boldmethod blog, outlined the airline's training process for Aspen operations: "For initial qualification, Ritter completed two days of simulator training on the approach into Aspen, plus a minimum of two observations from the jump seat during actual approaches. To complete the training, he flew with a check airman for his first two approaches into Aspen. Every twelve months during recurrent training, Ritter completed an extra simulator ride into Aspen." Did the Challenger crew receive any similar training?
- A U.S.-registered Cessna Citation 501S/P crashed on approach to Trier-Fohren Airport in Germany on January 12, killing all four occupants. The weather was reported as quarter-mile visibility and indefinite ceiling 100 feet in freezing fog. We don't know why the flight crew didn't choose to fly a missed approach and head for the alternate airport, but perhaps the final report will shed more light on this accident.
- There were four fatal accidents involving Beechcraft Premiers last year (one in France, three in the U.S., all non-commercial operations). On February 20 a Premier crashed during an attempted go-around at Thomson-McDuffie County Airport in Georgia; the two pilots survived. On March 4 a Premier stalled and crashed after takeoff from Annemasse Airport in France. On March 17 a Premier crashed after a reported loss of power, after bouncing off the runway at South Bend Regional Airport in Indiana during an attempt to land. A Premier crashed on December 17 after taking off from Fulton County Airport in Atlanta; the pilot reported a problem and was returning to the airport when a wing struck a tree.
- Two privately operated Cessna Citations crashed last year. A CitationJet 525A landing at Santa Monica Airport in California on September 29 hit a hangar and caught fire after touching down on Runway 21. On October 18, a Citation 500 crashed near Darby, Kan. Crews of other jets reported icing in the area, and the Citation's last altitude shown by FlightAware was 15,200 feet.
- A Learjet 60 crashed short of the runway on May 5 in Valencia, Venezuela. No other information is currently available. On November 19, a Mexican-registered Learjet 35A air ambulance crashed into the ocean after departing from Fort Lauderdale International Airport then attempting to return.

FAA: Less Time in Sims Loggable for IFR Rating

Unexpectedly at the beginning of the year, the FAA said it is reducing the number of hours in approved flight training devices that can be logged toward earning the instrument rating. The new policy, which took effect last month, would, in most cases, halve the simulator time loggable for the instrument rating to 10 hours from 20. The new rule could have a more significant impact on Part 141 flight schools, which will be allowed to conduct only 10 percent of the 35-hour course time on flight training devices.

The decision raised the ire of AOPA and other organizations, such as the National Association of Flight Instructors (NAFI) and the Society of Aviation and Flight Educators, which see the newly formulated

policy as detrimental to the aviation industry. “Simulators are a low-cost way for students to experience a wide range of flying conditions they might not otherwise experience during their training,” said David Oord, AOPA’s manager of regulatory affairs. “Regardless of how airmen are trained, they must be evaluated during the practical exam to ensure they possess the correct knowledge, skills and risk management needed for a certificate or rating.”

Establishing a Uniform Procedure

The FAA sees the proposed rule bringing some control to a disorganized system that for more than 30 years has granted letters of authorization (LOA) to manufacturers of ground trainers, personal computer-based

training devices and basic and advanced aviation training devices. Over the years, the methods of authorizing and/or approving the various devices have changed, with approvals at times issued by local FSDOs, individual safety inspectors and FAA headquarters itself, many on an ad hoc basis and without expiration dates.

In 2008 the FAA issued Advisory Circular 61-136, which sought to establish standards that apply to the approval process for basic and advanced aviation training devices, with information and guidance for the manufacturers as well as those who intend to use such devices for pilot training or certification. Since the introduction of AC 61-136, all approvals of flight training devices (FTD) below Level 4 have been channeled through the FAA’s general aviation



Under a new policy pilots can log only 10 hours—as opposed to the de facto 20—toward the instrument rating in simulators such as these Redbird devices.

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and commercial division, and the agency is now attempting to bring all outstanding LOAs in line.

“The FAA doesn’t know how many LOAs it issued,” Oord told **AIN**. “[The regulators] don’t know where all those devices are located, they don’t know exactly what those LOAs provided for or what kind of training they could be used for; none of them had an expiration date and some of the manufacturers are no longer in business.”

While training requirements under FAR 61.65 already specify that only 10 hours of aviation training device time can be logged toward the earning of an instrument rating, over the past several years the FAA, in contradiction to its own rule, has issued LOAs increasing allowable time in specific simulators to 20 hours. According to the new policy, which went into effect on February 3, the agency has determined that it “may not use LOAs as a means to exceed express limits that have been placed in the regulations through notice and comment rulemaking.”

While Oord said he has no problem with the FAA’s motivation to “clean up” the LOA landscape, he argues

that the change could have deleterious effects on instrument training since use of the devices allows instructors to expose students quickly to a wide range of situations more safely than they can be performed in an aircraft.

After January 1 next year, all LOAs for training devices issued before Aug. 23, 2013, will be terminated unless the manufacturer has successfully reapplied for a new LOA from the FAA. Such reissued LOAs will come with a two-year expiration date. Oord remains concerned about whether the FAA has the resources to complete all such requests by that deadline. For Part 141 flight schools, satisfying the policy effectively means that each will have to reapply for certification as they revamp their curriculum. “That’s going to be a huge lift by the FAA, [an agency that is] already pretty strapped for resources,” Oord said.

In the meantime, the economic effects will be twofold, according to Phillip Poynor, vice president of government and industry relations with NAFI. “The customer will have to do a minimum of 10 hours more training for the IFR rating in an airplane rather than the previously allowed training

device. If the school is currently charging \$150 an hour for training in aircraft, then the rating is going to cost the student at least \$1,500 more,” he told **AIN**, adding the price discrepancy for Part 141 training customers will be even greater, since loggable time in a flight training device is limited to just 10 percent, or 3.5 hours.

The second economic impact will be felt by the manufacturers of advanced aviation training devices such as Redbird Flight Simulations or Elite Simulation Solutions, which could see sales decline with the reduced demand for their products.

Several aviation groups are currently petitioning the FAA to institute changes to FAR 61.65 under expedited rulemaking.

Of course, schools can continue using simulators for training that isn’t loggable, but students might balk at paying for this extra training, even though it could be beneficial.

Redbird’s own flight training school in San Marcos, Texas, allows students to use simulators as much as they want and with no additional charge because Redbird charges a flat rate for its pilot training programs. —C.E.