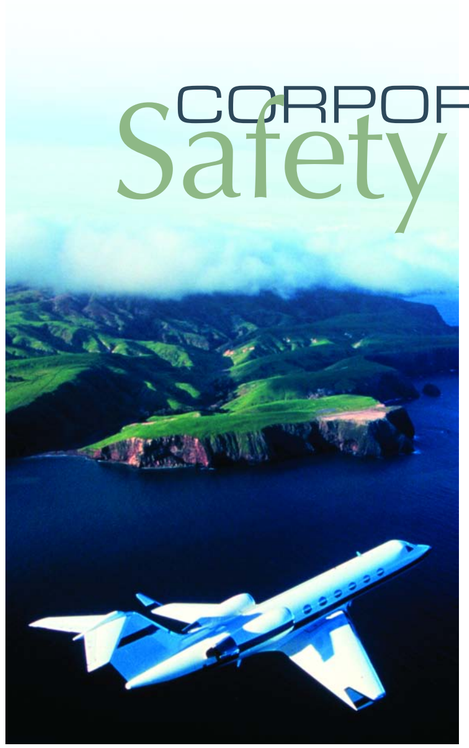

CORPORATE AVIATION Safety Seminar

Data crunching key to business aviation safety

by Harry Weisberger

As its name implies, the Corporate Aviation Safety Seminar, hosted by the Flight Safety Foundation (FSF) and NBAA, focused on the common theme of improving the safety record in the corporate aviation sector. Current hot-topic acronym programs–including FOQA (flight operations quality assurance), SMS (safety management systems), GAP (ground accident prevention) and TEM (threat and error management)–took center stage as presenters emphasized the safety improvement potential of gathering, analyzing and disseminating operational data collected from as wide a base as possible.

In addition to the new programs that are garnering attention, the agenda also included familiar topics that bear repeating, such as human factors in aircraft maintenance, dealing with in-flight smoke and fire, a fresh look at training for engine failure or shutdown and manufacturer-based training and safety programs.

For the corporate aviation sector, last year was "a pretty safe year," with long-term trends "moving in the right direction," according to Robert Matthews, analysis team leader in the FAA office of accident investigation. Matthews, an adjunct professor at the University of Maryland, concluded, "The bottom line is that corporate aviation has a good story to tell."

He noted how the FAA and NTSB define corporate aviation and business/executive operations somewhat differently but agree on the distinction that corporate uses salaried flight crews and mechanics, typically operates structured flight departments or through aircraft management providers, and has instituted formal SMS. He noted that the corporate fatal accident rate is the lowest in all of general aviation, approximating that of the air transport industry.

Matthews attributed an improved corporate mishap rate to better weather forecasting and reporting, reliable turbine engines, safety-enhancing avionics such as GPWS and TCAS, and more realistic and comprehensive simulator training. More recent contributions to safety include avionics with integrated GPS and electronic displays, automation and a fleet expanding with the addition of newer aircraft. The picture for general aviation as a whole–while positive–was less impressive because there were more VFR flight operations with fewer professional flight crews.

He said the data bears out the turbine community's safety record. He noted that 50 of the 85 fatal GA accidents last year involved piston singles, with piston twins suffering another 24. Leading accident causes in those categories were night VFR operations and attempted VFR flight in IMC (42 of the 74 accidents).

Pete Agur, managing director and founder of the VanAllen Group, also addressed the accident rate of the corporate aviation sector (again defined as flown by salaried crews), commenting that while it is encouraging, there is some room to improve.

Agur cited a study of 675 accidents in the decade between 1996 and 2005 involving fixed-wing turbine-powered aircraft, each flown by two professional pilots. He said data showed "12 incredibly stupid accident causes" while the other 663 "could have happened to any of us." Three percent of the mishaps involved aircraft colliding with ground vehicles, and isolated cases of animal strikes on the runway and a night landing on a runway only partially cleared of snow.

The largest group, 23 percent, was listed under "pilot technique" (that is, not in control). This, Agur noted, was typically a case of circumstances catching up to a marginal performer who was being "carried" by his colleagues. He broke such causal factors into two groups: procedural unintentional non-compliance (PUNC) and procedural intentional non-compliance (PINC).

Agur pointed out that only 1 percent of the 675 accidents resulted from factors beyond the crew's control, while 11 percent were maintenance PINC or PUNC, and more than 70 percent were directly crew-based. Overall, 80 percent contained at least one PINC or PUNC.

"This is not as good as even the regional airlines," he said, identifying as a challenge what he said are "thousands [of pilots] flying professionally and under-performing. We can do dramatically better. No doubt the accident rate per 100,000 hours is very good, but can it be better? Yes. If we cut PINCs and PUNCs we can reduce the corporate accident rate by 40 percent." He added that widespread adoption of SMS protocols to the rapid fleet penetration of new-generation piston aircraft such as the Cirrus SR20/22.

"It is clearly established," he noted, that each new generation of aircraft "starts at a lower accident rate than the aircraft it replaces. But there is a relatively steep learning curve. The good news is that we're seeing a relatively short period before stabilizing at a low accident rate." He cited "some pretty promising characteristics" for the emerging VLJs, noting the Eclipse 500's designed resistance to accept stall spins and total absence of a single-engine VMC. *–H.W.*

Safety Challenges Ahead

Of concern for the immediate future of corporate and business aviation, said the FAA's Robert Matthews, is that "data shows a shrinking pipeline of qualified pilots" as well as maintainers. At the same time, he said, the industry faces the new issue of very light jets (VLJs) beginning this year to enter the market in quantity. "The issue is not so much the aircraft as the pilots, their experience and proficiency, and single-pilot operation." He predicted that VLJs used in air-taxi operations will have a major impact, similar

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Pilot technique–or lack thereof–accounts for a large percentage of corporate aviation accidents.

offers great promise for reaching that goal.

Speakers at the event focused on the potential of safety systems to address the risks inherent in flying. Ray Rohr and Terry Kelly of the International Business Aviation Council discussed tools for developing and implementing efficient SMS design, noting that accident analysis is integral to the development of such a program. They summarized SMS as a set of procedures to keep errors from propagating into an incident or accident, "a systematic and comprehensive process to identify and negate or eliminate possible failure modes."

The FSF is developing a process for threat and error management for business aviation, according to Peter Stein, base manager and chief pilot for Johnson Controls, and Durwood Heinrich, director of aviation and chief pilot for PetSmart. They analyzed the March 2001 Gulfstream III accident at Aspen, Colo., which they said might not have happened if a TEM program had been in place to "modify the conditions leading to error." Stein and Heinrich said a "flexible, intuitive and practical" threat and error management system will soon be available on CD from the FSF.

Richard Healing, senior partner in the firm of R3 Consulting, presented a case for comprehensive data collection, analysis and dissemination as the foundation of corporate FOQA (C-FOQA) to improve safety. He noted that data analysis points to the need to improve approach and landing accident numbers, while chiding the mainstream media for its "fixation on the type of accident involved, while having no clue about the cause." According to Healing, sensationalist media coverage of air accidents so greatly influences public perception of the aviation industry that "anybody's crash is everybody's crash."

Room for Improvement

He added that "the media notwithstanding," the corporate accident record is "nearly perfect" thanks to a basic perceptual shift made possible by the ability to collect and process vast amounts of operational data. Healing said rapid advances in digital data capture and processing by the mid-1990s ushered the beginning of FOQA as it is known today. At the heart of a process making it possible to take "the right kind of managed risks" is the latest generation of flight data recorders (FDRs), which are smaller, lighter and capable of much wider data collection. These digital FDRs, which Healing likened to "a cop in the room," encourage flight crews to adhere to procedures.

As an example, he noted, a North Sea helicopter operation achieved a 75-percent reduction in accidents and procedural violations after FDRs were installed. Today, he added, the process is greatly enhanced through integration of FDRs with onboard automatic data collection systems such as HUMS and FADEC.

Healing provided another example of data-assisted FOQA producing a data-driven solution. At California's John Wayne Orange County Airport (SNA), recordings of jet transport pitch attitudes when analyzed showed numerous near tail strikes due to the extreme pitch angles needed to comply with the takeoff noise abatement procedure at SNA. This data analysis resulted in a change in the SNA procedure for takeoffs to the south. "There's tons of data out there. We must let the high-speed computer do the work," said Healing. He concluded that information sharing made possible by a much greater ability to collect and analyze operational data, thus building a much larger database, will help the segment reach its goal of zero crashes.

Jeffrey Sands, director of flight operations, finance and administration for Altria Corporate Service, followed Healing with examples of how the widespread systematic gathering and use of operational data is the key to a successful FOQA program. Sands, one of five recipients of 2007 FSF President's Citation awards, offered details about how his organization has implemented a C-FOQA program and its initial results. He said that a key element of a comprehensive SMS is to identify risk, mitigate risk and–if not eliminate risk–at least to measure and quantify it while spotlighting isolated and systemic trends. To enable the program, Sands said, requires onboard quick-access data recorders and high-speed computer capacity to process data.

As an example of how this process resulted in improved, safer crew performance for Altria, Sands described the analysis of two event categories: unstable approaches and exceedances.

In the unstable approach case, data was collected to examine approach speeds, aircraft configuration and to derive unstable approach rates. The analysis phase addressed the questions: "What are we seeing?" and "Is it accurate?" The product, Sands reported, is greater pilot awareness, which in turn tends to reinforce adherence to standard operating procedures. "FOQA at Altria has increased waveoffs from unstable approaches from 3 to 17 percent. It needs to get better, but we are measuring improvement over time."

Sands noted that at the start of the C-FOQA program VFE exceedances were causing excessive flap system component wear. Recording each event by N number, the data collection process provided a detailed account of each event, including autothrottle status. Result: VFE exceedances eliminated. Other flight operations events addressed through FOQA included excessive bank angles (greater than 45 degrees), high takeoff rotation rate and altitude deviations/excursions. Sands' conclusion: "Awareness brings improvements." He called FOQA a potentially valuable prediction tool that could become "The Holy Grail of safety."

NTSB member Debbie Hersman offered an updated view of the current corporate accident picture, with emphasis on runway incursions hazards. A post-presentation questioner asked Hersman why there is not the same media emphasis on highway and boating fatalities, which are far more numerous than those in civil aviation. She answered, "I have expressed great concern about this. I think it comes down to the media thinking that the aircraft accident is sexier."

'Batting Practice' Sim Rides?

NetJets captains Patrick Veillette and Eric Wickfield presented their findings regarding recent engine failure data, revealing several common misconceptions among crews about the prevalence of failures and shutdowns in specific flight regimes and the relationship of those misconceptions to current training practices. "Is it time to re-think our training?" they asked.

Veillette posed the question, "Why are experienced pilots making fundamental errors? He cited an industry study showing incorrect aircrew responses to power loss 75 percent of the time. Results included shutting down an operative engine and/or loss of aircraft control. He noted FAA data revealing that 43 of 74 rejected takeoff accidents began after the aircraft had exceeded V1.

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This, he said, suggests a widely misunderstood definition of V1. Contrary to popular belief, he added, most turbine engine failures occur during cruise flight, yet simulator check rides continue to emphasize the "V1 cut" and aborted takeoff, with much less attention to inflight engine events such as compressor stall. Veillette likened the typical sim ride to "batting practice," with no surprises. "Is it adequate?" he asked.

Wickfield stated as fact that "The number of [turbine] engine failures is decreasing but we're seeing an increase in crew errors in dealing with engine problems. Crews are misinterpreting problems and responding improperly. Why?" He noted, "In the piston days, engine failure was almost routine. First officers got to see the captain actually handle the problem. This is not the case today. Now, a pilot's first experience with compressor stall is usually in the airplane. It needs to be addressed in the classroom and simulator." ❑

Addressing In-flight Fire

Speaking on the issue of in-flight smoke and fire, its history, current risks and recommended mitigations, John Cox, president of Safety Operating Systems, began by noting, "The history of in-flight airline smoke and fire occurrences leads to the conclusion that opening a cockpit window to vent smoke is a very bad idea."

Spotlighting a potential smoke and fire source, Cox cited a Mitre study of 81 large transport aircraft that found an average of 40 wiring anomalies per airplane. He added that wiring errors in STC installations have also been found to be widespread, with numerous examples of improperly sized wire and the wrong connectors. *–H.W.*

In the past it has been difficult to gather sufficient data about corporate aviation flying because most corporate operators have small fleets. The development of C-FOQA changes that; participating operators can share information, allowing them more quickly to gather sufficient data to make useful assessments about their flying and how to enhance safety.