

Government and industry specialists framed pressures to reinvent the training of airline pilots as a seismic shift compared with recent history as they addressed the World Aviation Training Conference and Tradeshow (WATS 2011). Atypical public concerns about the role of human performance in air transport safety mean that substantial changes have to occur almost simultaneously under time constraints, most agreed at the April 19–21 event in Orlando, Florida, U.S. The change process itself also demands concerted risk mitigation.

The effects of predicted airline industry growth on accident frequency and human resources gaps were dominant themes. “Boeing and Airbus agree that in the next two decades, we will probably [deliver] 30,000 more airplanes, virtually doubling [the fleet] we have today,” said Len Weber, chief operating officer, Training and Flight Services, Boeing Commercial Aviation Services. “For those new planes, we will need 466,000 new pilots or ... about 23,000 new pilots per year for 20 years.” Among distinctive characteristics of the multi-generational, multi-lingual,

multi-cultural and “digital native” flight crews operating these aircraft will be not only new preferred modes of learning and prior line experience with numerous airlines, but also new attitudes toward communicating safety-related information, he said.

“We could have a safer environment if we learned and shared openly information” [such as flight operational quality assurance (FOQA) data], Weber said. “Tomorrow’s pilots call that ‘social networking.’ ... They share everything, and they question why we keep anything a secret.” Boeing training

BY WAYNE ROSENKRANS | FROM ORLANDO

A Gathering Storm

Political pressures, traffic predictions and a stagnant accident rate rock the world of airline pilot preparation.



specialists so far have addressed emerging operational and safety issues by creating 17 “bolt-on” specialty courses, on topics such as high-latitude polar operations, and by expanding Internet-based training and distance-learning capabilities. Training increasingly will emphasize ensuring and measuring competence rather than reflecting flight activity, memorization or course completion, he added (Table 1, p. 37).

These courses include scenarios infused with details of real air carrier incidents from the past 10 years, requiring pilots at all levels of experience to respond correctly to challenges such as unreliable airspeed indication, wind shear and upset recovery. Despite using interactive computer-based training, simulation and digital media, the process of training in 2011 largely remains a linear, page-at-a-time method for instructors and students. “Compared to video gaming, we are still pretty far behind,” Weber said.

Unless government and industry make significant course corrections, the next 10 years could see safety losing ground despite the development of advanced air traffic management technology and evolutionary improvements in new aircraft, said Jacques Drappier, a captain and senior training adviser, now retired from Airbus.

“I want to express my deep concerns and worries about the state of safety,” Drappier said. “We are at a crossroads for the future.” Airline pilot training has improved in recent decades, and has influenced safety incrementally in positive ways, he said, yet specialists have difficulty attributing to training any safety paradigm shift like what occurred when ground proximity warning systems were introduced to mitigate controlled flight into terrain.

“Technology is not going to be the solution to reduce further the accident rate,” Drappier said. “It is clear that there will be no major step change available in the next decade” from aircraft advances. Current operating procedures and methods of training airline pilots also “clearly do not generate enough improvement” to force downward today’s accident rate, he added.

Fundamental concepts of airline pilot training have been “left relatively untouched” against

a backdrop of aviation safety advances in other areas, adds John Bent, a captain and principal of Aviation Results. “We really must improve training quality and relevance [to operations as] key to further safety improvements,” he said. “A commercial pilot license [(CPL) for first officers and second officers] is still dominant in the world, but the traditional model subjects CPL students to irrelevant instruction at the core stage of learning, the point at which they learn the deep lessons. They may miss the big messages about stall [avoidance and] recovery, upset recovery, and threat and error management. There has been poor emphasis [at this level] on modern commercial multi-crew operations.” So “reversion to the first learned [action]” remains a latent threat for them independent of flight hours, and some airlines report they must “un-train” some new pilots today before their initial indoctrination, he said.

Updated ICAO Priorities

Airline pilot training ranks as a global priority in 2011 partly through its inclusion on the list of current safety initiatives driving activities of the International Civil Aviation Organization (ICAO), said Nancy Graham, director, ICAO Air Navigation Bureau.

“ICAO has developed a risk management system to help focus our [state/regional] assistance resources toward reducing exposure to the highest risk of loss of life,” Graham said. “With that prioritization, we will be helping states in the developing world that require assistance to develop tailored action plans to address their safety issues.” Regarding airline pilots, this includes a special push to explicitly define and measure competencies, standardize their performance and increase professionalism as a risk reduction method.

FAA Fast Tracking

Profound changes in the national airspace system of the United States already had been expected to accelerate in the next 10 years before Public Law 111216, the *Airline Safety and Federal Aviation Administration Extension Act of 2010*, said

Boeing trains pilots in dedicated 787 simulators located in five countries.



Robert Tarter, vice president, Office of Technical Training, U.S. Federal Aviation Administration (FAA) Air Traffic Organization (ASW, 9/10, p. 12). The law, enacted in August 2010, mandates a series of interlocking revisions of airline pilot qualifications and training in the wake of the 2009 Colgan Air Bombardier Q400 accident.

Federal agencies and the industry are under unusual political pressure to synchronize reforms quickly through joint work groups (typically aviation rule making committees), implementing nine new regulations and sharing training programs. Results are being reported in stages to the U.S. Congress, the FAA and the U.S. National Transportation Safety Board, he said.

Proficiency in real-time data communication (data comm) — replacing most voice communications between air traffic controllers and flight crews with digital data messages — is one example of an objective of near-term airline pilot training motivated by the transition to the Next Generation Air Transportation System (NextGen).

“New skill sets will be required to manage this data, [and] in an era of transition to automation, both legacy and NextGen competencies will have to be maintained,” Tarter said. “I sit in on a [daily FAA headquarters] meeting where we go over all of the controller operational errors and pilot deviations from the previous day. Over 50 percent of those errors are hearback/readback errors. ... Data comm will fix a lot of the human errors and human factors [issues].”

Neither the temporary operation of legacy airspace management systems nor the final NextGen system is a great concern now to FAA officials. “The transition to the new system is what concerns me the most,” he explained. “The mixed equipment on the airplanes, mixed equipment at

the FAA as we build more systems, and the training that goes along with those will be the big [safety] issue.”

The FAA has numerous deadlines in 2011 and 2012 as a result of the new law, said Dan Jenkins, manager, FAA air carrier and Part 142 training centers, in a joint presentation with Robert Burke, aviation safety inspector. “By Aug. 2, 2013, all Part 121 airline flight crewmembers must have an airline transport pilot [ATP] certificate,” they said. “The FAA will issue the notice of proposed rulemaking [(NPRM) in mid-2011], and we anticipate the final rule by Aug. 2, 2012, turning this law into a regulation. Even if the FAA were to do nothing, the public law would take effect.”

The FAA final rule requiring safety management systems at Part 121 airlines will be issued by July 30, 2012. Work also is under way toward a final rule in 2012 to address the absence of specific ATP training requirements in current Federal Aviation Regulations.

The new law directed the FAA to introduce standards for stall avoidance and upset recovery training, and airline pilot remedial training, for which a supplemental NPRM was issued in May. The FAA similarly has convened a work group on flight simulator training to help ensure correct responses to stick-pusher, icing-induced and wind shear events. The agency is on target to assess recommendations and deliver a report on these issues to Congress on Nov. 30, 2011, Jenkins and Burke said.

Another work group already has weighed in on best practices for airline pilot training for Part 121 air carrier and Part 135 commuter and on-demand flights, including a recommendation to the FAA on substituting academic training of ATP candidates for required flight time. The FAA will report its decisions to Congress in mid-2011.

Similar work is in progress on a centralized national database for pilot selection purposes; airline management accountability for training quality; improvement of pilot professionalism (i.e., personal responsibility for adequate rest and mitigating risks of long-distance commuting); pilot mentoring; pilot professional development programs; crew communication (updated crew resource management); flight and duty time management with prescriptive rules and fatigue risk management systems; expanding line operations safety audits, FOQA, aviation safety action programs and advanced qualification programs to all U.S. airlines; and new methods of safety information exchange and cooperation among U.S. airlines.

Two Airline Proposals

Against this background, two airlines floated proposals at WATS 2011 as “blue sky thinking” intended to stimulate comments and collaboration. For Cathay Pacific Airways, the more than six years of industry research, development and testing that enabled ICAO to establish a multi-crew pilot license (MPL; ASW, 6/08, p. 41) standard did not produce a license that fits into this airline’s ultra-long-range (ULR) operations. Nevertheless, elements of MPL could be adapted to existing ab initio training of “second officer cruise pilots” if a variant of MPL were approved.

“Airlines in Asia and Europe have been putting low-hour pilots safely into large airliner cockpits for a considerable period of time using conventional ab initio training schemes,” said Alan Wilson, a captain and manager, flying training, for Cathay Pacific. “In Asia and Europe, it is also quite common that the training program is funded [by sponsors so that each pilot] will exit with [minimal or] no financial burden. This makes motivation quite high.”

Cathay Pacific has found that concentrated training of ab initio pilots enables the pilots to become qualified ULR second officers in 15 to 20 months compared with several years for collegiate programs, is compatible with airline economic cycles and allows pilots to complete a related college degree while flying for the airline. Each new graduate's restricted type rating is valid only in the cruise phase above 20,000 ft as a member of an augmented crew that also has one captain, one captain-qualified first officer and one other first officer.

The company proposed restructuring this program to incorporate more elements of the MPL, with the idea of seeking regulatory approval of a "cruise copilot MPL" that could meet the current demands for improvements in safety built around core competencies in airline pilot training, and also enable the company to "deploy new training devices appropriate to the phase of training."

"Let us [all] assure that when we bring the new generation of pilots into our operations, we only teach and test relevant knowledge," Wilson said.

A Delta Air Lines official called on the FAA, U.S. airlines and other stakeholders to join in a discussion of the company's preliminary thinking about the country's "gathering storm" of safety and pilot-supply issues. Arnie Kraby, a captain and manager, pilot selection, at the airline, suggested that while the MPL itself typically has not been embraced as a solution by U.S. airlines, its best features are adaptable to the imminent safety-focused reform of training.

"My remarks are just conceptual in nature," Kraby said, introducing Delta's civilian airline pilot training program. "This would be the civilian equivalent of military pilot training ... sponsored by all people who have a stake in the air transportation industry." Key elements include outreach to young students, preference for high quality college education as a positive factor in career-long performance of airline pilots, a required period of employment as a flight instructor in a higher education setting, guaranteed interviews with participating regional and major airlines at defined career stages, a three-year delayed start of student loan repayment, and cancellation of up to 50 percent of program-sponsored student loans (5 percent for each year worked at a sponsoring airline) for fulfilling program obligations.

Leveraging Technology to Optimize Safety Benefits of Flight Crew Training		
International Focus	Key Ideas	Safety Benefits
Redesigning Pilot Selection Criteria	Heightened industry focus aims for empirically sound aptitude testing and encourages airlines to have adequate candidate-selection skills and resources.	Pilot knowledge, skills and attitudes required for threat and error management in airline operations gain acceptance across cultures.
Multi-Crew Pilot License (MPL)	Since a global standard took effect in November 2006, scenario-based ab initio simulator training to become a first officer in one type of transport airplane influences the concentration on crew learning elsewhere.	Accreditation of MPL instructors encourages a better-defined competency framework worldwide, recognizes inherent threats in managing automation and manual flying, and builds interpersonal skills.
Evidence-Based Training	The core training concept identifies essential skills for global adoption, drops outdated practices and more effectively adjusts training over time in light of risks revealed by shared data.	The concept streamlines content to match current operations and risks, ensuring training elements with strong human factors awareness, practical use and continuous pilot assessment.
Instructor and Evaluator Qualification	Government and industry aim to standardize their qualifications and calibrate how they work for consistent inter-rater reliability.	Ongoing efforts bridge gaps that emerge between training and the risks experienced in line operations.
Standardizing Flight Simulation Training Devices	More frequently updated design and performance data provide a global reference on current requirements and optimal uses.	Standards better reflect pressing challenges of automation systems and flight operation procedures, such as mitigation of loss of control.
<p>Note: Since 2009, ITQI participants have worked to redirect government and industry attention to universally acceptable ways to continuously link competency-based training with measurable risk-reduction outcomes.</p> <p>Source: Jacques Drappier (Airbus) and International Air Transport Association Training and Qualification Initiative (ITQI)</p>		

Table 1