Pilot Demand Means Pressure To Adapt Training

> EVIDENCE-BASED PROGRAMS ARE KEY

> LONG-HELD ASSUMPTIONS NEED REVISITING

> DATA-DRIVEN APPROACHES MUST BE EXAMINED

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When the FAA leads flight testing of updated Boeing 737 MAX software in the coming weeks, the process will be different than past certification efforts. Instead of relying on a few flight-crew pairs from airlines the FAA regulates and perhaps a Canadian carrier or two, the pool of line pilots providing input will be much larger. It also will have participants from around the world, including some with too little flight experience to qualify as a U.S. airline first officer.

The reasoning behind the change is that, while the FAA is technically responsible only for the U.S., many of its conclusions—especially minimum training curriculum for aircraft it certifies—are adopted by other countries as the de facto global standard. This is despite variations in crew licensing requirements, training philosophies, pilot-candidate backgrounds and domestic aviation environments. The FAA's approach to validating the updated MAX flight control software is reflective of a shift that will see the

More efficient training methods are needed to keep up with airline pilot demand.

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First Officer Candidate Experience and Success Rates

TOTAL FLIGHT HOURS	COMPLETED TRAINING	AVERAGE EXTRA TRAINING SESSIONS PER PILOT
750-999	96%	0.43
1,000-1,500	94	0.98
1,501-3,000	88	1.22

Source: 2018 Pilot Source Study

agency taking steps to ensure its aircraft training decisions reflect more input from outside the U.S.

"We have held certain assumptions over the years when we certify airplanes that everyone who will be flying them has a certain level of expertise and understanding," says former FAA Administrator Randy Babbitt. "Well, that may not be the case."

As global air traffic continues to surge, industry must grapple with a pair of sizable, and seemingly conflicting, challenges. It must produce pilots fast enough to keep up with demand, while ensuring they are qualified.

In some cases, standards for becoming a commercial pilot are getting tougher, despite concerns about a shortage. The U.S. in 2013 increased the minimum number of total flight hours to qualify for an airline transport pilot (ATP) certificate and become a first officer to 1,500 from 250. There are exceptions—a former military pilot can qualify for a restricted ATP certificate with 750 hr., and a graduate of a four-year aviation degree program with 1,000 hr. can fly with an "institutional" restricted ATP, for instance—but

otherwise pilots need 1,500 hr. and an ATP to become a first officer.

The rule change was one of several aimed at improving pilot training that came out of the probe of February 2009's Colgan Air Flight 3407 accident. While neither of the pilots involved in the accident had fewer than 2,200 hr., increasing the number of hours required for an ATP reflected the FAA's view that airline pilots needed more experience.

"The rule gives first officers a stronger foundation of aeronautical knowledge and experience before they fly for an air carrier," said then-FAA Administrator Michael Huerta.

After a decade of above-average annual air traffic growth, the U.S. agency is advocating for similar changes, but on a much broader scale. At the recent International Civil Aviation Organization (ICAO) triennial meeting in Montreal, the U.S. collaborated with Canada and Singapore on an issue paper that spotlights what they call a "crossroads" in pilot development. The group urged ICAO to review global training protocols in light of growth and the increasing complexity of modern aircraft and to integrate more data-driven processes into how pilots are trained and evaluated.

"Pilot-training programs should utilize data-driven competency- or evidence-based training methods that ensure a progressive and satisfactory standard has been reached throughout training," they wrote. "Because graduates may have attained less flight time than is required for an air transport pilot certificate or its equivalent, the quality of their training and level of competence as they advance through a course must be measured to ensure they are adequately prepared for airline operations."

The U.S. shift to higher minimums for an ATP has been

lauded by some as a major safety enhancement. But a 2018 study offers arguably the most compelling evidence yet that flight hours are a poor measure of pilot competency. The study, the fourth in a series that started before the new rules and is now led by a committee of the Aviation Accreditation Board International, sought to quantify whether the rule has changed the quality of newly hired pilots. It examined training records of 9,800 pilots hired at five U.S. regional airlines: Endeavor Air, Envoy Air, PSA Airlines, Republic Airways and SkyWest Airlines, from mid-2015 through fall 2018.

The study examined each pilot's outcomes including completion of training as well as the number of extra training sessions, such as a return to the classroom or simulators, that were required during the process. It then analyzed the findings using different parameters.

Some clear trends emerge. The fewer flight hours pilots have, the more likely they are to complete the airline's training. They also need fewer extra training sessions. Pilots with 750-999 flight hours fared best in terms of fewest average extra sessions, followed by those with 1,000-1,499 hr., then full-ATP-eligible pilots with 1,500 or more hours.

The takeaway? Pilots who went through structured training such as in the military or established university flight programs fared better than those who accumulated more hours flying on their own. "Pilots with fewer than 1,500 flight hours performed better than pilots with 1,500 or more hours," says Guy Smith, an Embry-Riddle Aeronautical University professor emeritus and one of the study's leaders. "It's as simple as that."

Data from three previous versions of the study, which relied on surveys instead of direct access to training records,

confirm the trend. A set of more than 6,000 records from hires in 2005-11 covering two study periods shows each pilot needed an average of 0.52 extra sessions. Post-law hires, including the 2018 data and 6,700 records from a similar effort in 2015, each needed 1.2 extra sessions.

"All four studies have shown that flight hours are not the determinant of performance," Smith says. "We as an industry haven't defined [structured] training. What do we want those pilots to have as experience? Flying hours just say they are flying in the air."

While the U.S. is likely locked into its 1,500-hr. standard, it is pushing for broader adoption of competency-based training to enhance programs globally. ICAO's standards for a multicrew pilot license, which permit a pilot to fly as a commercial first officer, include a minimum of 240 flight hours, with no split between simulated hours and actual seat time. The ICAO paper calls for a "multipronged approach to enhancing pilot training and competency," including "training that carefully integrates the effective aspects of traditional programs with competency-based training and assessment [including evidence-based training] methods."

The paper also calls for "training programs that emphasize an understanding of the appropriate use of automation and appropriate manual flying skills"—an issue important enough to be the focus of a separate, FAA-led paper presented to ICAO.

"At a global level, if the potential for automation dependency and degradation of manual flight operations skills is not satisfactorily addressed in existing [ICAO] standards, there may be a high level of variation in the approach utilized by individual states regarding how associated risks may be addressed in regulation or guidance," says the paper, copresented by the U.S., Canada, Peru, and Trinidad and Tobago. "This variation adds an additional layer of complexity to addressing automation dependency to include maintaining and enhancing proficient manual flight operations skills worldwide."

The paper calls on ICAO to lead a global assessment of "automation dependency" and manual flightpath management capability through a representative survey and develop recommendations that address any gaps.

Developing competent pilots efficiently requires more than revamped standards—it means finding better tools. Training giant FlightSafety International has recently unveiled a product with the potential to bring a seismic shift to outcome-based training. The company teamed up with IBM to develop FlightSmart, which uses analytics to break down a pilot's flight training performance and automatically deliver feedback on what needs work.

Developed for a public-sector launch customer focused on increasing pilot throughput, the system measures performance against a notional baseline. It can be used in everything from computer-based training to full-motion simulators, and it can track complete pilot life cycles. FlightSmart's artificial intelligence means it will take what it has learned and use it both to guide individual pilots and make longer-term, big-picture projections.

"Our goal is more than evaluating pilot performance," says Matt Littrell, FlightSafety's product director for artificial intelligence and adaptive learning. "We want to project future performance, prescribe needs to master skills, and predict similar outlooks for other pilots." ✪