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# U.S. maintenance training standards poised for long-awaited major overhaul

by Sean Broderick

From composites to onboard connectivity, aircraft technology has advanced significantly in the past several decades. The required training standards used to develop mechanics in the U.S., however, have not kept pace.

But that is about to change.

The FAA is in the late stages of a major revamp of its Part 147 regulation, which sets standards for the 170 aviation maintenance technician schools (AMTSs) that supply approximately 60 percent of the industry's certified airframe and powerplant (A&P) mechanics. (The rest are trained by their employers or the military.) A parallel effort to develop Airman Certification

Standards (ACS)—a detailed list of what an A&P candidate must know and do to earn a license—might end up being integrated with the new rule. The result would be sweeping changes in how new mechanics are developed and tested.

The general consensus in the industry is that change is long overdue. The last major revision to Part 147 came in April 1970, the same year that Garrett began testing the TFE731. The changes included increasing curriculum requirements to the current 1,900-hour standard and further defining subjects, placing them in four appendices.

Aside from minor revisions in 1992, the appendices,

which cover basic curriculum requirements and list the general, airframe, and powerplant subjects that must be covered, have remain unchanged. The FAA proposed major revisions in 1994 and 1998, issuing notices of proposed rulemaking (NPRMs) that included curriculum updates, but strong resistance from industry stalled both efforts.

Meanwhile, aircraft and engine technology marched on, with once-futuristic concepts such as all-composite primary structures and Internet-connected aircraft becoming commonplace. The FAA, prompted in part by a 2003 Government Accountability Office (GAO)

report that called on the agency to update the maintenance training curriculum, established a working group to recommend changes. The working group issued its report in 2008. Seven years later, in October 2015, the FAA released another draft rule, acknowledging its late arrival and incorporating many suggestions from the working group's report.

"Since the 1992 rule changes, the industry has produced larger, state-of-the-art transport aircraft (such as the Boeing 787 and Airbus A380) that incorporate very advanced technologies and complex systems. Similar advancements in technology have also evolved in all other levels of aircraft such as general aviation aircraft and business aircraft," the FAA explained in the NPRM's preamble. "The FAA has also not updated Part 147 to account for recent advances in rotorcraft technology,

composites, unmanned aerial vehicles, glass panels, light sport aircraft, and the spread of electronics into every other aspect of aircraft.”

The FAA proposed to maintain the 1,900-hour minimum to qualify for an A&P certificate, but adopted a working group recommendation to reallocate the breakdown between disciplines. The new standards would boost general and airframe work by 50 hours each to 450 and 800, respectively, while reducing powerplant hours to 650.

“With changes in aircraft technologies increasingly emphasizing electricity, electronics, and advanced materials, the FAA concurs with the [working group] report that adding hours to the General and Airframe curriculum is appropriate,” FAA explained.

While the draft rule includes myriad changes, arguably the most significant are updating the curriculum and removing the course requirements from the appendices. The FAA’s proposal: leave the general subject headings in the rule, but list detailed course requirements in each AMTS’s operations specifications (OpsSpecs), which the agency introduced in early 2015.

The changes are aimed at helping AMTSs address a longstanding and oft-repeated complaint: mechanics are not being adequately prepared for the work they’ll do in the real world.

“Basic courses that train students to maintain and repair the body and engines of modern commercial aircraft are limited,” the GAO pointed out in its 2003 report. “The FAA requires the schools to provide instruction on the repair of aircraft made

from dope and fabric, while guidance on repairing aircraft made of composites and having sophisticated computer systems is limited. There are about 4,000 dope-and-fabric aircraft, many of them cropdusters, compared to tens of thousands of modern aircraft that transport millions of passengers and cargo in the United States.”

While many agree that even the outdated requirements give future A&Ps a solid foundation, the ramifications of not teaching more to the real world has real-world ramifications. In most cases, employers must invest significant time in newly minted A&Ps before they make positive contributions. In other cases, companies would rather train an uncertified technician.

“Today’s modern aircraft require A&P mechanics to have a different set of skills than those

being taught at aviation maintenance technician schools,” the GAO report said. “Since A&P mechanics that are newly graduated from aviation maintenance technician schools lack the skills to work on modern aircraft, officials at some major airlines said they are reluctant to hire them directly from school.”

While updating the detailed course requirements would be an important step in bridging these gaps, removing them from the rule is even more critical. The reason: changing an FAA rule, even for something as simple as updating required training subjects, is a cumbersome and time-consuming process. The more general the rule, the more flexibility the industry has in following it.

By listing both general topics and specific courses in Part 147, the FAA required schools to create programs that cover them, and FAA inspectors will verify this. Both industry and the FAA recognized long ago that technology was rapidly outpacing the required curriculum, but the bureaucratic hurdles of rulemaking mean easy updates are impossible. The new rule will maintain general topics, but details will be located either in the operations specifications or perhaps in an ACS incorporated into the ops specs by reference.

### Competency-based Training

The industry’s reaction to the FAA’s proposed rule, as measured in nearly 90 comments submitted on the NPRM, was generally positive. But several prominent stakeholders expressed concern that the changes—likely to set standards for decades to come—would not





provide schools enough flexibility to address the most commonly cited shortcomings.

The main objection is the FAA's continued reliance on classroom hours to judge an A&P candidate's readiness to sit for the exams.

"The antiquated hour/credit requirement puts too much emphasis on the time a student spends in a classroom seat at the expense of the skills he or she actually gains," argued the Aviation Technician Education Council (ATEC), which represents the Part 147 schools and is one of the driving forces behind the push to align training requirements to what the maintenance industry needs. "Industry is in desperate

need of a competency-based standard, free of specific hour/credit requirements, which will allow industry to transition away from seat time in favor of a structure that creates flexibility and allows students to progress as they demonstrate mastery of subject matter, regardless of time, place, or pace of learning."

Competency-based education has only recently begun to gain a foothold in aviation. In 2007, the International Air Transport Association (IATA), concerned about developing enough pilots and mechanics to keep up with global demand, launched the IATA Training and Quality Initiative. Among its points of emphasis: establishing competency-based training (CBT), or evidence-based training (EBT), frameworks.

Four years later, the International Civil Aviation Organization (ICAO) started an EBT working group. This led to the global aviation body adding the first EBT-based provisions to its standards and recommended practices, the guidelines that shape aviation regulations at the national level.

The early products, including the first EBT manual published in 2013, focused on pilot training. But maintenance is catching up.

ICAO has established an EBT standards task force, which includes a maintenance subgroup. The sub-group is developing a general competency framework for maintenance and a corresponding implementation manual and plans to have

both published in 2020.

While such guidance will be invaluable for helping regulators and organizations develop competency-based programs, U.S. industry stakeholders are hopeful that FAA's pending changes will help set a precedent.

"Requirements in the current Part 147, such as those mandating the time a student spends in a seat, dictating passing norms, requiring government approval to teach beyond set levels of instruction, imposing inflexible student/teacher ratios, demanding approval of instructor rosters, and requiring rigid adherence to static curriculum topics, are not hallmarks of a modern, competency-based system," Matt Zuccaro, president of Helicopter Association International, said about the proposed rule.

Zuccaro echoed the ATEC argument against seat-time and in favor of greater flexibility in how certificate candidates learn and are evaluated. He has allies within industry and among aviation education experts.

### Preparing the Next Generation

Integrating some CBT into the A&P training standards would do more than improve the quality of instruction. It also should make teaching more efficient—a not-so-subtle point considering the long-term demand for skilled technicians. Boeing's most recent survey projects a need for nearly 650,000 new technicians to serve the global fleet

through 2036.

Moreover, the influx of next-generation aircraft means that the future workforce will need to master an even broader set of skills and knowledge. Providing the instruction will require a new approach.

The FAA's timeline for finalizing the Part 147 rule envisioned publishing the final regulation this past June. But a steady campaign by a group of associations, led by ATEC and including the Aviation Suppliers Association and the National Air Transportation Association, has lobbied hard for a more flexible rule.

Their efforts have apparently paid off.

In September, the FAA revealed it would issue a new draft rule, or supplemental NPRM (SNPRM), rather than a final rule. The agency has not said how the new draft will differ from the 2015 version, but it has asked ATEC to survey its Part 147-school membership on two topics: developing CBT and creating additional fixed locations, such as training facilities at local high schools that would be considered extensions of the AMTSs.

"We were expecting a final rule" in 2017, ATEC executive director Crystal Maguire said in late November. "Now, we're optimistic that the [SNPRM] will be issued soon, and we're probably looking at at least two more years before a final rule is issued." ■

## Industry partnerships help schools feed workforce pipeline

As the aviation industry struggles to fill certain high-demand positions, such as mechanics, savvy educational institutions are seeing opportunities to link their students with companies that need the talent.

Hallmark University this month launches a pilot program with Lockheed Martin in which some of the San Antonio, Texas school's aviation maintenance students will be groomed to support the defense contractor's F-35 program.

"We've sent an instructor to Lockheed Martin on two different occasions for training," explained Jay Gregson, Hallmark's provost. "We prepared a special classroom here, and they provided their curriculum for this piece so we can teach a more advanced class."

The goal is to provide a pipeline where students are learning both fundamental skills and gaining knowledge that will allow them to jump right into a job with Lockheed. "It helps them with their onboarding process, which has been a chokepoint," Gregson said.

A request from Textron Aviation to fill one local service-center position sowed the seeds of another blossoming program.

"We sent over 10 candidates, and [the Textron representative] said, 'I want every one of these students.' He had only one position, but he knew he had other Textron service centers around the country that needed help, and some of our kids were from those areas."

Working with Textron's Cessna subsidiary in Wichita, Hallmark and the company set up a paid internship program that provides four soon-to-be-graduating students with a job for four months. Upon graduation, they can be matched with Cessna service centers that have openings.

### Recruiting Talent

Hallmark's aviation department is hardly alone in forging workforce pipelines with employers in need. A 2013 study by the Government Accountability Office (GAO) found that nearly half of 15 companies interviewed—a mix of airlines, repair stations, and aircraft manufacturers—"developed and leveraged relationships with local schools as a means to recruit workers," the report said. In one case, a company that does not have access to a local aviation maintenance school turned to an automobile technician program, hiring

graduates trained in painting and certain machining—and supplemented their education with aviation-specific instruction.

For small technical colleges, connecting with companies outside of their regions can be daunting. At the same time, a company in need of a few good mechanics but without a local school to feed it—such as the company that turned to the automotive technicians—faces its own workforce-development challenges. Capitalizing on such opportunities is what the Wichita-based nonprofit Talent Solutions Coalition (TSC) focuses on.

Launched in late 2016, TSC traces its roots to a Wichita Area Technical College National

and relieving the stresses of finding and filling jobs.

### Retaining Talent

Yet another challenge that the industry is battling is keeping the technical candidates it has. The last two annual surveys by the Aviation Technical Education Council (ATEC) show that 20 to 25 percent of graduates from certified aviation maintenance schools ultimately pursue work in other fields. Most take their technical skills and apply them in settings that are more predictable with comparable pay, such as repairing amusement park rides.

"When a roller coaster breaks down, you



Center for Aviation Training project backed by the U.S. Dept. of Labor that sought to standardize aviation manufacturing training curricula. During the project, participants identified a need to connect talent pools to employers.

TSC solicits detailed, often proprietary staffing projects from its "clients," which could range from aircraft manufacturers to repair stations. It then works with aviation technician schools—its suppliers—to set up tailored workforce-development pipelines, including some customized instruction and even recruitment of students to fill the pipelines. In a perfect scenario, students from around the country have jobs lined up with eager employers, serving both sides' needs

know right where it is, and you don't have to travel all night to get there. That's not true with airplanes," lamented one aviation recruiter.

School-to-job pipelines are one way that aviation can combat this trend.

"The loss of qualified technicians to competing industries is a significant concern for airlines, business aviation operators, and aviation maintenance providers," said Ryan Goertzen, Spartan College of Aeronautics and Technology's chief aviation and academic officer and ATEC's president. "[These surveys] show that there is a significant low-hanging-fruit opportunity to help bridge the gap between our industry's schools and its employers." **S.B.**



# Working group creating A&P guidelines

by Sean Broderrick

The FAA has barely touched its maintenance training standards since the Nixon Administration, but the years-long delay in updating the outdated instructional requirements may end up being perfectly timed to dovetail with a separate, but closely related, effort.

The agency in 2011 launched an initiative that led to the Airman Certification System Working Group (ACSWG), tasking it to recommend updated

standards for training and testing pilots. In December 2015, the FAA expanded ACSWG's scope to cover mechanics, which led to the creation of a dedicated maintenance working group. Its mission: develop consensus on the minimum knowledge and skill requirements that a certificated airframe and powerplant (A&P) mechanic should have.

The requirements will be published in a document, the Aircraft Maintenance

Technician Airman Certification Standards (ACS), that will replace Practical Test Standards (PTS) and become the basis for the oral, written, and practical exams that an A&P candidate must pass to earn a certificate. The group has produced several draft versions that incorporate input from a variety of sources.

"We started with the PTS and layered in recommendations made by an aviation rulemaking advisory council (ARAC)

working group tasked to update the FAA Part 147 rules that dictate A&P school curriculum," explained Crystal Maguire, executive director of the Aviation Technician Education Council (ATEC) and a maintenance working group member. "We've also gone through guidance materials and received feedback from both industry and the schools. The ACS would essentially be curriculum requirements, so we updated the PTS to reflect what the ARAC working group thought was important to teach future mechanics."

The current draft ACS combines general, airframe, and

powerplant topics into a single document—a change from the PTS, which are in three separate publications. Another major change: the ACS will also guide the written A&P exam. Right now, there is no standard for the written questions in FAA’s test bank, which several industry observers say has led to too many outdated or inadequate questions being included on exams.

“The goal of the airman certification process is to ensure the applicant possesses the knowledge, ability to manage risks, and basic skills consistent with the privileges of the certificate or rating being exercised,” the draft ACS’s introduction explains. “The Airman Certification Standards (ACS) concept forms a more comprehensive standard for what an applicant must know, consider, and do for the safe conduct and successful completion of each subject to be tested on the knowledge exam and oral and practical tests.”

### Objective-based Structure

The draft document’s structure is straightforward. Each of the 40 subjects has an associated objective, along with listed knowledge, risk management, and skills that support the objective. For example, the “non-metallic structures” subject includes “composite structure repair methods, techniques, and practices” as a knowledge element, “incorrect measuring and mixing of materials associated with composite construction” as a risk element candidates must know,

and “perform lay-up for a repair to a composite panel, including preparation for vacuum bagging, using a manufacturer’s repair manual” as a skill. Each of these is given codes that can be referenced to connect the concepts to relevant guidance.

If feedback from the pilot community’s early ACS experience is any indication, the approach will lead to a more relevant A&P testing process.

“The first ACS was initiated as an effort to fix the pilot knowledge tests; exam questions were often outdated, irrelevant, and trickier than meaningful. Test preparation became an exercise in memorizing correct answers,” the FAA explained in a recent issue of its “Designated Mechanic Examiner Tips” internal newsletter. “Since the private, instrument, commercial, and remote pilot ACS went into effect, an ACS Exam Review Board (AEB) comprised of diverse FAA subject-matter experts and a designated industry member has reviewed every active question in the pilot knowledge test bank. Questions that do not align with the new standards have been edited or archived. As a result, designated pilot examiners report better-prepared applicants and more efficient practical tests.”

The ACS working group is seeking industry input on the draft document. But the next version won’t be released until after the group uses it to help review, or “board,” the existing bank of A&P written-test questions.

“The purpose of the review is to remove, replace or revise outdated or incorrect questions,” Maguire explained.

The FAA’s target for publishing the ACS is 2020.

### Training Rule Revamp

The FAA’s timing combined with the recently extended timeline for its long-awaited Part 147 maintenance training rule revamp has created an opportunity to blend the two efforts. While the intent was always to link the ACS with Part 147’s content, the ACSWG is urging the FAA to go several steps further. In a formal request to the agency’s Aircraft Maintenance Division, the working group has asked the agency to remove “any reference to curriculum requirements or subject areas from Part 147,” and reference the ACS in each school’s operations specifications.

“The inclusion of required curriculum or subject headings in Part 147 creates a separate, inflexible, and inconsistent standard that training organizations will be forced to reconcile for decades to come,” the ACSWG argued in a letter. “Utilizing the AMT ACS as the basis for curriculum ensures that the agency can enforce [Part 147 schools’] adherence to the standard, requires schools to adjust their curriculum as mechanic knowledge and skill requirements evolve, and utilizes less government resources to maintain and update separate training specifications.”

The industry’s goal is to turn the ACS into an adaptable document

that is regularly reviewed and changed when appropriate.

“The working group will periodically review and update the AMT ACS to ensure it is in line with mechanic knowledge and skill requirements as technology evolves,” the letter explains. “The working group would therefore be the vehicle to ensure that training and testing keeps up with ever-evolving safety considerations.”

The FAA was poised to publish an updated draft of its proposed Part 147 rule as 2017 came to a close. Given the typical rule-making process, a final rule isn’t likely before 2020.

“The timing is perfect,” ATEC’s Maguire said. “Ideally, [the new Part 147] is going to remove all of the curriculum requirements. The ACS should drive training and testing.”

Even if the ACS remains at arm’s length from the new Part 147 rule, it will play a major role in setting education standards for future A&Ps. Should those lobbying for a tighter integration into the new rule convince FAA that their position makes sense, the ACS’s relevance will grow even larger. This makes involvement in its development crucial.

“If industry is concerned about the quality of its maintenance technician workforce, this is the time to get involved to determine what the minimum skill and knowledge requirements of a new mechanic should be,” Maguire said. “We put it in the ACS and thereafter it will be tested in the oral, written, and the practical.” ■