FAA Safety BRIEFING

May/June 2019

Your source for general aviation news and information

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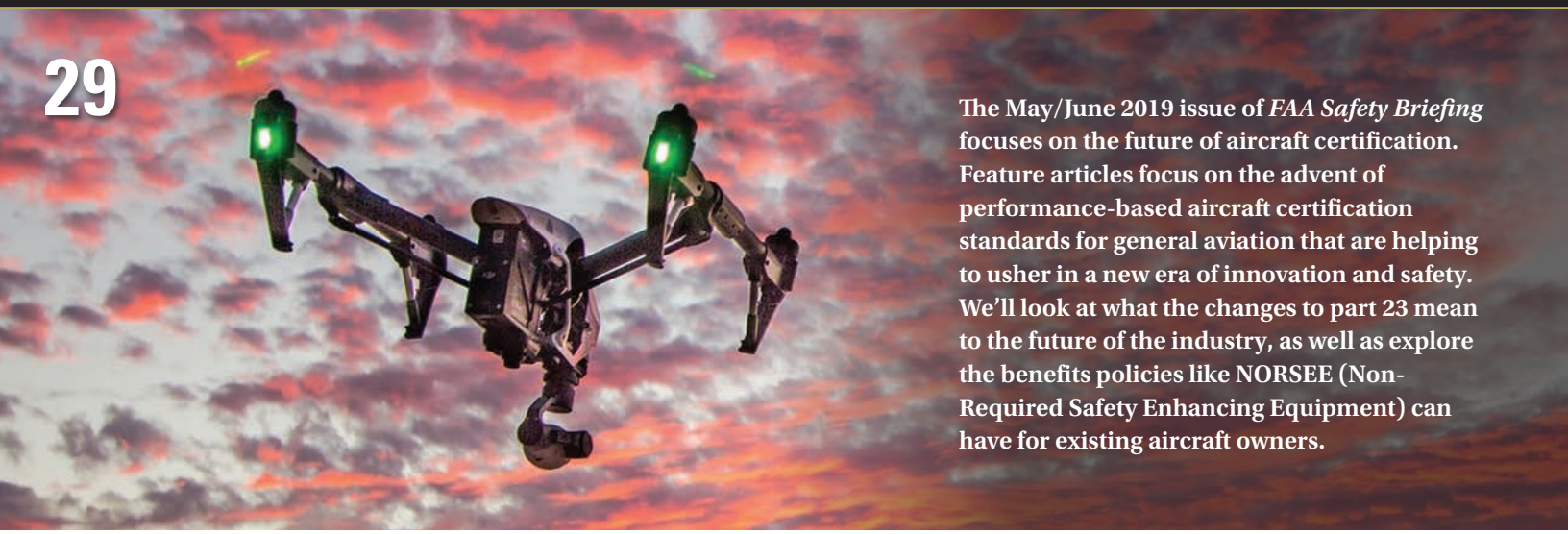


The May/June 2019 issue of *FAA Safety Briefing* focuses on the future of aircraft certification. Feature articles focus on the advent of performance-based aircraft certification standards for general aviation that are helping to usher in a new era of innovation and safety. We'll look at what the changes to part 23 mean to the future of the industry, as well as explore the benefits policies like NORSEE (Non-Required Safety Enhancing Equipment) can have for existing aircraft owners.

Cover photo courtesy of Textron Aviation

Features

Departments

RICK DOMINGO
EXECUTIVE DIRECTOR, FLIGHT STANDARDS SERVICE

Pilot's Discretion

Unleashing Creativity for Greater Safety

My aviation career has primarily been in the airworthiness part of the Flight Standards Service, which I am now privileged to lead. One of the frequently used terms in this type of work is Alternative Method of Compliance (AMOC). AMOC refers to the fact that when it comes to compliance with an Airworthiness Directive (AD), the FAA can approve a range of approaches or techniques not specified in the AD to correct an unsafe condition on an aircraft or aircraft product.

The FAA has recognized that the concept of finding alternative means to comply can apply more broadly. When it comes to safety in design, production, certification, and maintenance of aircraft, the agency historically took a highly prescriptive approach. Not only did we tell the community *what* to do, but we also had a lot to say about *how* it should be done.

Sometimes a highly prescriptive approach is both necessary and appropriate. However, the FAA has increasingly moved to an emphasis on outcomes — performance — rather than methods. There is immense creativity in the industry. To unleash that creativity and allow for the kind of innovation that advances safety as well as technology, we needed a better approach. The key, of course, was to find ways to permit AMOC — an acronym I will temporarily adjust to signify "alternative means of *creativity*" — while ensuring that such creativity never runs amok in terms of aviation safety.

Something New

You are probably familiar with the changes that occurred in the summer of 2004, when the FAA published the Light-Sport Aircraft rule. The LSA rule marked a significant departure from the prescriptive approach, because it allowed for the use of industry consensus standards in the design, production, certification, and maintenance of new aircraft. Today you can see the results of this change by visiting almost any GA airport.

In many ways, the LSA experience paved the way for the more recent overhaul of 14 CFR part 23, which is the most visible example of the FAA's philosophical shift. This rule, which took effect in August 2017, offers both a better certification process for new aircraft incorporating innovative designs and technologies. For new aircraft, the rule eliminates the historical categories (e.g., utility, aerobatic, and commuter) and replaces them with four levels of performance and risk. In addition, manufacturers can now use FAA-accepted consensus standards that provide flexibility in developing means of compliance. The migration from prescriptive standards (which can still be used) to performance-based standards makes the entire system more responsive, thus creating more incentives for industry to develop new products and technologies.

The FAA has increasingly moved to an emphasis on outcomes — performance — rather than highly prescriptive methods.

You can read more about the new part 23 in this issue, and we'll also review key points about the LSA rule.

Something Old

The FAA has also been busy finding ways to make it easier for owners to bring existing aircraft up to speed by incorporating safety enhancing equipment. Through the agency's policy on Non-Required Safety Enhancing Equipment (NORSEE), you now have an alternative path to installing a range of avionics, electronic instruments, displays, and mechanical equipment that can enhance the safety of your aircraft. It reduces equipment costs by providing flexibility to select various industry standards that suit their product, as long as it meets the FAA's minimum design requirements. We'll take a closer look in this issue.

For equipment and changes that don't qualify for NORSEE treatment, the "old" options are still available. To help those who use these options, we'll provide a guided tour of things like "337" approvals, Supplemental Type Certificates (STCs), and field approvals. These pages will also review important information on suspected unapproved parts (SUPs).

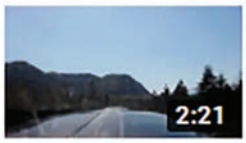
Join us, and learn more about the wide range of options you now have.

Safer Flying in 57 Seconds

The "57 Seconds to Safer Flying" is an instructional video series produced by the FAA Safety Team (FAASTeam). Each episode is created to match the current month's FAASTeam focus topic. Every topic comes from research and direction from the General Aviation Joint Steering Committee (GAJSC) to help mitigate the most common causes of general aviation accidents.

This video series introduces the topic of the month and attempts to generate an interest among airmen to research further into topics they find interesting and related to their type of flying. The intent in the brevity of each episode is to encourage more viewership into relevant safety related subjects such as a pilot or mechanic's fitness to operate, or aeronautical decision-making.

Watch all the videos on the playlist at bit.ly/57secs, and make sure to subscribe to the FAA's YouTube channel to get updates when new videos are published.

1 

Mountain Flying & High Density Altitude in 57 Seconds

Federal Aviation Administration

2 

Controlled Flight Into Terrain in 57 Seconds

Federal Aviation Administration

3 

Transition Training in 57 Seconds

Federal Aviation Administration

Most Wanted List Released

The National Transportation Safety Board (NTSB) released its 2019-2020 Most Wanted List (MWL) of Transportation Safety Improvements last February. The MWL is a tool the NTSB uses to identify the top safety improvements that can be made across all modes to prevent accidents, minimize injuries, and save lives in the future. Although general aviation was not specifically mentioned in the MWL, several listed areas are relevant to airmen, including: eliminating distractions; reducing fatigue-related accidents; improving the safety of part 135 aircraft flight operations; ending alcohol and other drug impairment in transportation; and strengthening occupant protection.

For more information on the Most Wanted List, go to ntsb.gov/safety/mwl and download their brochure. You can also check out their video at youtube/Cb1mlYHs-1g.

FAA Completes Clearance Relay Initiative

Flight Service will complete the Clearance Relay initiative on June 20 when it publishes the remaining phone numbers for pilots to obtain IFR clearances at public- and private-use airports from either the overlying Air Route Traffic Control Center (ARTCC) Flight Data Units, or an approach control facility. As part of the modernization efforts to streamline service delivery and increase efficiency, pilots now call directly to obtain or cancel an IFR clearance, reducing the risk of potential errors.

Last year, Flight Service formalized a process already in place by publishing phone numbers for 30 approach controls covering 667 public use airports, providing pilots direct contact with the controlling facility. Last fall, another 26 approach control facilities covering 226 public-use and 3,000 private-use airports had numbers published in the *Chart Supplement, US* and subscriber files.

Leidos Flight Service will provide pilots with the name of the facility to contact or the correct phone number to obtain or cancel an IFR clearance. Pilots may continue to request clearances via radio from air traffic control or Flight Service.

Beginning on June 20, you can find the phone numbers for clearance delivery in the remarks section of the entry for each airport in the *Chart Supplement, US*. This initiative does not affect pilots requesting clearances from Flight Service over Remote Communications Outlets (RCO), Ground Communications Outlets (GCO), or from locations in Alaska. For more information, visit go.usa.gov/x5wsR.

Helicopter Ops See Safety Benefits of Integrating UAS and OPA Technology

As part of its commitment to drive down the civil helicopter fatal accident rate, the United States Helicopter Safety Team (USHST.org) has issued a report identifying how unmanned aircraft systems (UAS) and optionally piloted aircraft (OPA) technology can reduce fatalities in high-risk operations.

The study by the USHST is part of a larger effort to implement data-driven safety enhancements that will slash the number of fatal helicopter accidents involving low-altitude flying, unintended flight into instrument meteorological conditions (IMC), and loss of control-inflight issues.

In 10 of 52 fatal accidents thoroughly analyzed by the USHST, the team noted that integrating new technologies developed for UAS could have mitigated the risks that emerged during the operation. Accordingly, the USHST recommends that industry and the FAA look toward opportunities to increase the use and integration of UAS and OPA to support manned operations in high-risk environments.

The full report on integrating UAS and OPA technologies, with all of the team's recommendations, can be found at USHST.org/Reports.

Drone ID Marking Change

Owners and operators of small unmanned aircraft systems (sUAS) may no longer place or write

registration numbers in an interior compartment. The rule became effective Feb. 25, 2019.

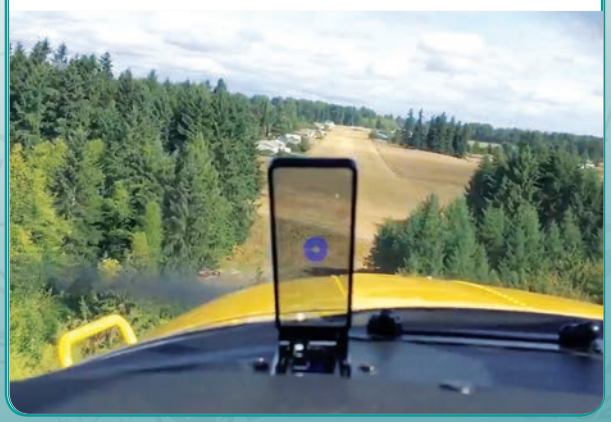
When the FAA first required registration of small drones in 2015, the agency mandated that the registration marking be readily accessible and maintained in readable condition. The rule granted some flexibility by permitting the marking to be placed in an enclosed compartment, such as a battery case, if it could be accessed without the use of tools.

Subsequently, law enforcement officials and the FAA's interagency security partners have expressed concerns about the risk a concealed explosive device

Safety Enhancement Topics

May: Mechanics for Pilots

June: Regulatory Roadblock Reduction



Please visit www.faa.gov/news/safety_briefing for more information on these and other topics.

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CONTACT INFORMATION

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might pose to first responders upon opening a compartment to find a drone's registration number. The FAA thus believes this action will enhance safety and security by allowing a person to view the unique identifier without handling the drone.

This does not alter the original acceptable methods of external marking, nor does it specify a particular external surface on which the registration number must be placed. The requirement is for the marking to be visible on inspection of the aircraft's exterior. For more details, see the regulation at go.usa.gov/xEfvh.

New AC for Part 91 Flight in RVSM Airspace

Advisory Circular (AC) 91-85B, *Authorization of Aircraft and Operators for Flight in Reduced Vertical Separation Minimum (RVSM) Airspace*, was published in January 2019. It provides airworthiness and operational authorization guidance material for operators, pilots, certificate holders, and program managers conducting 14 CFR section 91.180 and 91.706 Reduced Vertical Separation Minimum (RVSM) operations. RVSM airspace is any airspace or route between flight level (FL) 290 and 410 inclusive where aircraft are separated vertically by 1,000 feet.

This AC has been updated to include guidance on eligibility and compliance when operators seek RVSM authorization under the ADS-B Out provisions of part 91.

Download AC 91-85B at bit.ly/2C7SiO2.

FAA Survey Measures Safety and Determines Funding

The FAA's 41st annual General Aviation and part 135 Survey (GA Survey) is now underway, reporting on calendar year 2018. The GA Survey is the only source of information on the GA fleet, the number of hours flown, and the ways people use GA aircraft. Data from this survey will help determine funding for infrastructure and service needs, assess the impact of regulatory changes, and measure aviation safety. And it's not just governmental agencies that use this data; the GA industry and trade associations also rely on it for critical research and analysis. That's why we encourage everyone who is contacted to respond to the survey so that aviation activity and safety information is accurate.

For questions or additional information, please contact Tetra Tech toll-free at 1-800-826-1797 or email infoaviationsurvey@tetratech.com.

MICHAEL BERRY, M.D.
FEDERAL AIR SURGEON

Marijuana and Derivatives

What are the Aeromedical Implications?

The Federal Air Surgeon's office has received a number of inquiries about marijuana, due to the recent increase in the number of states around the country that have approved its use for medical and recreational purposes. Specifically, airmen are concerned about the safety of cannabidiol (CBD) oil use and how such use impacts an airman's medical certificate. Be aware that federal law — not state law — governs FAA medical and pilot certification.

First, we should note that commonly used terms within the context of marijuana can be confusing. The marijuana or *cannabis* plant contains more than 400 different chemicals and 60 cannabinoid compounds, all of which are absorbed when the whole leaf is smoked or ingested. The compound responsible for the euphoric, mind-altering effect is tetrahydrocannabinol (THC). Although the use of cannabis is legal for medical and/or recreational use in many states, the United States Drug Enforcement Agency (DEA) continues to classify the whole cannabis plant as a Schedule I controlled substance, which is defined as "drugs with no currently accepted medical use and a high potential for abuse." The U.S. Department of Transportation (DOT) drug test includes THC, and its presence at defined levels constitutes a positive drug test.

More recently, interest has grown in other compounds derived from the cannabis plant that may have positive health benefits, but without the mind-altering features of THC. One such compound being widely marketed is CBD oil. In 2018, the FDA announced the approval of Epidiolex (cannabidiol), purified pharmaceutical grade CBD extract from the cannabis plant, for the treatment of seizures associated with two rare and severe forms of epilepsy. As a FDA approved medication, it is subject to strict quality control. In other words, you know what you are getting. Commercially available CBD, by contrast, is not regulated and may be contaminated with a variety of substances, most significantly, THC. Product labels are often inaccurate. Although most CBD products claim to have under 0.3-percent THC, they could contain high enough levels of THC to make a drug test positive. Use of CBD oil is not accepted as an affirmative defense against a positive drug test.

Furthermore, despite legalization in some states, it remains uncertain whether marijuana has therapeutic benefits that outweigh its health risks. There is evidence that marijuana adversely affects brain function both acutely and chronically, especially in younger individuals. It is generally agreed that currently available marijuana products are more potent than those used in older research, which casts doubt on the reliability of that research. We need to understand much more before considering the use of marijuana and its derivatives for airman certificate holders. Please also be aware that no special issuances have been granted for conditions treated with medical marijuana.

We need to understand much more before considering the use of marijuana and its derivatives for airman certificate holders.

Dr. Michael Berry received an M.D. from the University of Texas Southwestern Medical School, and an M.S. in Preventive Medicine from Ohio State University. He is certified by the American Board of Preventive Medicine in Aerospace Medicine. He served as an FAA Senior Aviation Medical Examiner and Vice-President of Preventive and Aerospace Medicine Consultants for 25 years before joining the FAA. He also served as both a U.S. Air Force and NASA flight surgeon.

For More Information:

National Cancer Institute
go.usa.gov/xEzFc

U.S. FDA – Warning Letters and Test Results for CBD-related Products
go.usa.gov/xEzFb

PENNY GIOVANETTI, D.O.

Arthritis

Arthritis is an ailment encompassing nearly 100 types of joint disease. It affects over 50 million Americans of all ages. In general, arthritis-related diseases are characterized by joint pain and stiffness and, depending on the type, may also include swelling, redness, and later deformity. The disease process can involve any joint including the spine, but certain types are more common in small joints, while others target large joints. The four major types are:

- osteoarthritis
- inflammatory arthritis (most commonly rheumatoid and psoriatic)
- infectious
- metabolic (e.g., gout)

Osteoarthritis is the most common type and is sometimes called degenerative joint disease. This is the arthritis of aging and its prevalence increases sharply after age 50. Other risk factors include obesity, prior trauma, and genetics. The actual cause is not known, but the disease involves many biochemical and structural changes within the joint thought to be a result of abnormal mechanics and low-grade inflammation. There is no cure, so treatments focus on controlling pain, minimizing joint damage, and maximizing motion and overall function. They may include exercise, weight loss, physical therapy, counter-irritant creams such as menthol, topical or oral anti-inflammatory drugs, acetaminophen, joint injections, and sometimes surgery.

Most airmen with mild or moderate arthritis of any type may qualify for an unrestricted medical certificate.

Inflammatory arthritis is actually an autoimmune disease caused by your body's immune system attacking its own tissues, resulting in severe inflammation. This disease can impact many other organs, as well as joints. The actual cause of inflammatory arthritis is unknown, but it is thought to result from environmental triggers in a genetically susceptible individual. It is more common in women and is not age related. Treatment goals and therapy are similar to osteoarthritis; however, there is a whole class of drugs, called disease modifying anti-rheumatic drugs (DMARDs), available to treat this form of arthritis.

Infectious arthritis may be caused by a variety of organisms, but is usually an acute process, and often responsive to antibiotics.

Metabolic arthritis results from irritating substances such as uric acid crystals creating inflammation in the joint. The best prevention is to treat the underlying cause.

Frequently Asked Questions

Is it possible to get a medical certificate if I suffer from arthritis?

Yes, most airmen with mild or moderate arthritis of any type may qualify for an unrestricted medical certificate. Specific criteria for Conditions AMEs Can Issue (CACI) are published in the online AME Guide. The FAA can consider Special issuance for those who don't meet CACI criteria.

What does the FAA consider in granting special issuance?

The key factors are whether the disease is stable on an acceptable treatment regimen, pain is controlled, and there is adequate mobility.

Are there any treatments or medications for arthritis that are disqualifying?

The FAA accepts most commonly used medications. However, use of opioid medications such as hydrocodone and oxycodone for pain control are disqualifying for routine use and have associated no-fly times for episodic use.

Penny Giovanetti, D.O., received a bachelor's degree from Stanford, a master's in Environmental Health and Preventive Medicine from the University of Iowa and doctorate from Des Moines University. She completed a 27-year career as an Air Force flight surgeon. She is board certified in aerospace medicine, occupational medicine and physical medicine/rehabilitation. She is also a Fellow of the Aerospace Medical Association and a private pilot.

SUSAN PARSON

You Have Choices

A Guided Tour of Options for Aircraft Certification

When it comes to GA airplanes, having choices wasn't always the case.

At the time I started learning to fly in the early 1990s, the typical flight school fleet offered a choice between an *old* GA airplane and an *older* one. Nobody was making new GA airplanes for the training and recreational/personal aviation market, because the combination of product liability concerns and the high cost of certification created too many barriers.

GARA Starts the Growth

Things started to change after passage of the 1994 General Aviation Revitalization Act, a landmark piece of legislation that paved the way for Cessna and other manufacturers to restart production of small general aviation aircraft. Four years later, new versions of the venerable Cessna C172 *Skyhawk* began to appear. (Note: To honor the pilot who most ardently championed GARA, the first 100 new *Skyhawks* bore the letters "ES" at the end of the tail number. For more on this backstory, see the Jan/Feb 2010 issue of this magazine at go.usa.gov/xEx6N.)

The introduction of "clean sheet" airframe designs from new companies like Cirrus and Diamond soon followed, along with the advent of "glass cockpit" avionics and highly capable autopilots for GA airplanes.

Light-Sport Launches Expansion

Implementation of the Sport Pilot/Light-Sport Aircraft rules in the summer of 2004 marked yet another watershed in the expansion of available aircraft choices. We all learned about "ASTM consensus standards," and added acronyms like S-LSA (Special Light Sport Aircraft) and E-LSA (Experimental Light Sport Aircraft) to the aviation lexicon. We also learned to recognize and appreciate the incredible diversity these aircraft brought to the formerly forlorn fleet of aircraft for GA training and personal flying.

But wait — there's more. The safety and technological advances these new designs brought to both airframes and avionics helped drive several more recent developments.

After extensive consultation and collaboration between government and industry through the General Aviation Joint Steering Committee, in 2014 the FAA simplified the design approval requirements for installing angle of attack (AOA) indicators into GA aircraft cockpits. The success of this initiative led the FAA to expand this approach to a broader range of equipment.

Published in July 2016, the FAA's Non-Required Safety Enhancing Equipment (NORSEE) policy includes avionics, electronic instruments, displays, and mechanical equipment for 14 CFR parts 23, 27, and 29 aircraft. Equipment approved as NORSEE can enhance overall situational awareness and provide a range of information such as data, other than the aircraft primary system; independent warning, cautionary, or advisory indications; and additional occupant safety protection. Examples of NORSEE equipment include traffic advisory systems, terrain awareness and warning systems; attitude indicators; fire extinguishing systems; and autopilot or stability augmentation systems.

The Big One — Part 23 Reform

The next, and most recent, change in the aircraft certification landscape took place in August 2017, when the final rule overhauling airworthiness standards for general aviation airplanes took effect. With this rule, a substantial overhaul of 14 CFR part 23, the FAA intends to enable faster installation of innovative, safety-enhancing technologies into small airplanes, while reducing costs for the aviation industry. The performance-based standards approach in this rule recognizes that there is more than one way to deliver on safety, and it offers a way for industry and the FAA to collaborate on new and existing technologies and to keep pace with evolving aviation designs and concepts.

A Guided Tour

The number of options now available to aircraft owners (and potential owners) can be bewildering, so this issue of *FAA Safety Briefing* aims to offer a guided tour of this exciting landscape. In addition to taking a closer look at some of the topics described above, we will also review the more traditional areas (e.g., supplemental type certificates, field approvals) that may still be necessary in some cases. We invite you to join us on this journey!

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JAMES WILLIAMS

The Quiet Revolution

What Part 23 Changes Mean for You

The eFlyer (formerly Sun Flyer) is a project that is enabled by the revised part 23.

Photo courtesy of Bye Aerospace

Even the most rapid revolutions that seem to explode on the scene require years and sometimes decades of groundwork to take off. The Internet is probably the most rapidly spreading world change in recent memory, but even that took decades of foundation building. Setting aside all of the basic computing technology that needed to be in place for the Internet to exist, economic and infrastructure conditions also had to be met. Those included a robust communications backbone, enough PCs in homes and offices to create an audience, and enough capital to roll out the original Internet Service Providers. It was also essential to have a regulatory environment that would allow it. Only then did the "overnight revolution" succeed.

The aircraft certification world has been in the midst of such a revolution for the last few years. The FAA's role in this revolution includes a significant modification to 14 CFR part 23 (Airworthiness Standards for Normal Category Airplanes), which covers airplanes weighing 19,000 lbs. or less and having 19 or fewer passenger seats. It includes the lower end of the commuter airplane world, but it is predominantly a general aviation (GA) rule. While the original part 23 may not have had the same standards as part 25, which covers transport category airplanes, the two share a similarly prescriptive process and mindset. This process became increasingly frustrating to many GA manufacturers. It also made innovation more difficult, as the procedures and processes were not adaptable for changing technology. But change was happening.

Change Was in the Air

A quiet revolution has been taking place in the FAA for some time on many fronts. You may have heard about it without even realizing it. These changes were gradually introduced into programs like Performance Based Navigation (PBN), Airman Certification Standards (ACS), the Compliance Program, and the focus of this article, the new part 23. The common thread is that these changes shift the focus from the process to the outcome.

In part 23, the old rule was very focused on how the manufacturer gets to the outcome of a safe

airplane. The regulation codified prescriptive design requirements, which meant that any deviation from that approach required a cumbersome approval process. These rules were introduced in the 1960s, and the ways we designed airplanes, at least GA ones, were fairly well established. Deviations from the norm were relatively rare. However, that changed as it became increasingly obvious to GA manufacturers (and pilots) that there were other (and better) ways of meeting the end goal: a safe airplane. However, the fact that all of the requirements were set forth in the regulation required manufacturers to either comply or request an exemption. It was also necessary for every manufacturer to do this for every certificate.

The big change in part 23 was the removal of the prescriptive requirements that had previously been at the heart of the rule. The FAA replaced them with desired, end-state criteria. This approach puts the emphasis on the airplane's or system's safety performance, not on how well it does in a series of predefined tests.

So now that we have these performance-based metrics, how do we ensure that they are met? That brings me to the other half of the new part 23, Means of Compliance (MOC).

MOCing It Up

Instead of having regulations with very specific methods of compliance, the new part 23 allows MOCs based on consensus standards. The FAA, industry, and other stakeholders worked together to develop MOCs that are *a* way — but not the *only* way — to demonstrate compliance with the regulation. Each element will have one or more MOCs for the applicant to use. If, for example, none of the previously approved MOCs work in your application, you can propose a new one. This flexibility allows for faster integration of new methods or technologies while still allowing for proper safety oversight.

Let's have a look at some real-world applications of these changes.

Game Changer

"The part 23 rewrite announcement was a complete game-changer for eFlyer," said George Bye, CEO of Bye Aerospace. "We implemented an ambitious business plan, began raising investment capital, and set out to identify the best supply chain partners for this unique, all-electric flight training airplane opportunity."

If you're a frequent reader, you might recall that a previous article (*Ride the Lightning*, Nov/Dec 2018, page 18), featured Bye Aerospace's eFlyer as a certification project to watch on the electric propulsion front. Bye's first airplane, the *eFlyer 2*, is a two-seater targeted at the training market. The airplane has a cruising speed of 135 knots and a 3.5 hour maximum endurance with VFR and reserve. Bye Aerospace is also developing a four-seat version, the *eFlyer 4*, with a 150-knot cruising speed and a four-hour endurance.

The big change in part 23 was the removal of the prescriptive requirements that had previously been at the heart of the rule. The FAA replaced them with desired, end-state criteria.

"The new regulation provides for a streamlined certification process, reducing cost and schedule to achieve certification and transition to production," Bye explained. "Bye Aerospace is extremely pleased and grateful that the FAA had the insight and willingness to embrace the possibilities and the likelihood that electric propulsion truly is the future of aviation," said Bye. "Our opinion of the change is positive."

Streamlining the Approval Process

Aircraft manufacturers aren't the only ones to reap the benefits of a revised part 23. "The part 23 rewrite and the associated ASTM consensus standards have greatly benefitted Garmin, resulting in a more streamlined and safety-focused perspective," explained Phil Straub, Garmin's Executive Vice President and Managing Director of Aviation. "This has allowed Garmin to bring cost-effective, safety-

Photo courtesy of Piper Aircraft, Inc.

Photos courtesy of Garmin

Garmin GFC 500 Autopilot

enhancing technologies to a segment of the market that has expressed interest in low-cost solutions," Straub continued. "Based on the demand and popularity of these products, such as the G5 electronic flight instrument and the GFC 500 autopilot, our customers have benefitted tremendously from the part 23 rewrite."

According to Straub, the most valuable aspect of the rule change is the replacement of prescriptive requirements with standards more proportional to the actual risk involved with light airplanes. "For example, requirements such as those related to HIRF [high-intensity radiated field] and lightning, and which affect light GA very differently than transport category aircraft, have been revised to focus on safety objectives. This further streamlines the approval and certification process for Garmin."

Straub also explained that the rewrite opens great opportunity. "As I've shared by our example, the industry is already benefiting," he said. "The full benefit will take time, particularly for aircraft manufacturers to create aircraft designs that raise the safety bar by complying with regulations in innovative ways that were previously discouraged."

Garmin is only one prominent example of how this change can enable innovation, improve cost, and more importantly, enhance safety.

Improving Situational Awareness

One of the more interesting concepts that the new part 23 enhanced is EZ Fly. EZ Fly is an exciting program to improve GA safety by leveraging technology to create an intuitive user interface that reduces pilot workload. To translate that into a less academic parlance, the idea is to use increased automation to move the pilot's limited attention away from immediate mechanical tasks and toward overall management of the flight. This approach could dramatically improve situational awareness and provide more mental bandwidth for aeronautical decision-making.

The EZ Fly concept combines a number of components including sensors, control laws, displays, and a simplified pilot interface with full envelope protection. One of the key concepts is Advanced Flight Control Systems (AFCS). AFCS are more than just fly-by-wire (FBW) systems. AFCS blend aircraft stabilization (such as stability augmentation) with basic aircraft control. But accomplishing that goal requires researching a number of supporting technologies and making them economically viable for GA. This is a joint effort by the FAA, NASA, academia, and industry and is no small task. The expected outcome is not a discrete system or set of components, but a MOC that would allow manufacturers to use these systems in future projects.

EZ Fly is also part of a larger effort called Simplified Vehicle Operations (SVO). SVO has an end goal of fully automated flight operations, which has great potential to address key safety issues such as Loss of Control. But there are a number of challenges between where we are today and that goal. EZ Fly may offer a step toward that end state. Part 23 is an important enabler of not only this research and development, but also the technology's eventual integration into finished products.

The Flight Path

The foundation has been firmly laid. The regulations are now in place to facilitate the future. Research is underway to enable introduction of technology. As noted, it will take time for the benefits to work their way to the average pilot. Rest assured, though, that the creativity unleashed in this quiet revolution will likely lead to solutions nobody saw coming. We may not know exactly what that tomorrow will look like — but that's part of the excitement. Stay tuned!

James Williams is FAA Safety Briefing*'s associate editor and photo editor. He is also a pilot and ground instructor.*

JOHN CROFT

Seeing NORSEE Benefits

How This Innovative FAA Safety Enhancement Program Is Performing

Photo courtesy of Garmin

When Rosen Sunvisor Systems displayed its wares at the annual Sun 'N Fun International Fly-In and Expo in April, a new product with an unusual identifier on the label — NORSEE — was on sale. NORSEE refers to the FAA policy statement for Non-Required Safety Enhancing Equipment, part of the required labeling for Rosen's new visor for the Piper Navajo.

I Can See Clearly Now

The Navajo visor is Rosen's first NORSEE product and, based on the company's experience so far, it is the likely forerunner of many similar products. The Oregon-based company is a household name in visors for aircraft, with certified products available for most U.S.-made general aviation aircraft, as well as all Boeing commercial jetliners.

Three years after NORSEE's debut, the *FAA Safety Briefing* magazine team caught up with the FAA officials overseeing NORSEE and two manufacturers who are now using the streamlined process to see how the program is progressing. We found success in certain key areas. We also discovered that the FAA is learning a great deal about how to improve the nascent program, which allows non-traditional aviation companies to produce non-essential safety products for certified aircraft. As of the end of February 2019, the FAA had issued about a dozen approvals for safety equipment ranging from USB panel-mounted chargers to iPad mounts to a multi-function display.

About a half-dozen other projects are in the pipeline at any given time, according to John Raspanti, an aerospace engineer in the Chicago Aircraft Certification Office (ACO). The Chicago ACO is currently the focal point for all NORSEE applications. As program manager of NORSEE, Raspanti reviews and disseminates the information to the appropriate FAA lines of business.

Launched in 2016, NORSEE allows a streamlined approval process for certain non-essential equipment that can enhance the safety of general aviation fixed-wing and rotary-wing aircraft. Included are traffic and terrain advisory systems, attitude indicators, weather advisories, crashworthiness improvements and stability augmentation systems.

NORSEE evolved from an earlier policy (AIR100-14-110-PM01) which uses ASTM standards (F3011-13), to make it easier for manufacturers to gain approval for angle-of-attack systems. It is designed to enable a lower-cost, faster route to the type certificated (TC) aircraft market for a broad range of safety equipment that historically have required Technical Standard Orders (TSO) to approve the product and supplemental type certification (STC) to install it. Anthony Vilante, an FAA aerospace engineer in the Certification Procedures Branch, wrote both policies, which were designed to streamline the approval process for owners to install lower cost, non-certified safety equipment.

Liberty University's School of Aeronautics began installing Alpha Systems Eagle angle of attack (AOA) indicators in its flight training fleet starting in 2012 under the predecessor policy to NORSEE.

Companies applying for NORSEE approval can select various industry standards, such as ASTM, that suit their product as long as the equipment meets minimum design requirements established by the FAA. Applicants may also utilize applicable portions of existing FAA Advisory Circulars and TSO standards. The applicant's paperwork includes manufacturing and quality control information as well as safety analyses proving that the product will not affect primary systems on the aircraft. After the Chicago ACO reviews and finds the application and the supporting documents acceptable, it sends the applicant a letter of approval that provides instructions on their responsibilities as the design approval holder, including how they must maintain quality control of the product. How the product gets installed is up to the manufacturer (per installation instructions approved by the FAA) and the buyer and, in some cases, the buyer's airframe and powerplant mechanic. The installer is responsible for following the installation instructions, which may require a calibration or pull-test, for example.

NORSEE approval is based on the premise that it offers safety benefits that outweigh the potential risks of devices with a minor failure effect.

"We always say that if you can turn a screwdriver, you can install most of our STC'd sun visors," said Gary Hanson, field engineer for Rosen Sunvisor Systems. "If you're not comfortable, have a mechanic do it, with a logbook entry." Even though owners can install the visors themselves, Hanson recommended that they have their mechanic review the installation and fill out a Form 337 (Major Repair and Alteration) to more thoroughly document the history of changes made to the aircraft. "It can help if you sell (the aircraft)," said Hanson.

Opening the Door

Vilante said NORSEE has opened the door for low-cost safety enhancing equipment to enter the general aviation market, in part from manufacturers who have not previously built certified equipment through the rigorous FAA processes. He added that going forward, NORSEE will be the "umbrella that catches all safety-enhancing add-ons that do not fit into the field approval, STC, Parts Manufacturer Approval or type certificate areas."

That unfamiliarity has added to the workload. Raspanti, who runs the NORSEE program part-time, has spent a good deal of his time helping new applicants, about half of whom have never worked with the FAA, through the process.

Vilante said most of the applications received have been for "relatively generic" safety equipment, like carbon monoxide detectors and outside air temperature gauges, equipment that normally would cost a little more to purchase and install. Some complex applications — like multi-axis autopilots which use servos to control primary flight controls — were considered a major change to type design that require an STC, and therefore did not qualify as NORSEE. Others did not address the primary goal, boosting safety. "NORSEE approval is based on the premise that it offers safety benefits that outweigh the potential risks of devices with a minor failure effect," said Vilante, adding that any failures of the equipment should not result in a reduction in safety.

As the intricacy in operation, functionality, and installation increases, the potential safety risks stemming from the failure of integrated and complex systems also increases and the FAA has to focus more intently on the relationship between safety benefits and potential risks. As a result, more complex equipment generally requires more time and resources to evaluate.

In the avionics area, some applications have pushed the limits of the NORSEE policy. Devices approved so far include small, multi-function gauges that provide information on attitude, angle-of-attack, G loads, and other information.

Is It Working?

Manufacturers who have tried the new process said it can drastically cut the cost and effort to get a product to market, and in some cases, the time it takes to get to market.

"Our first approval took one and a half months from start to finish," said Rosen's Hanson of the company's NORSEE applications. "STCs typically take one and a half to two years to complete."

Along with the reduced approval time, the NORSEE certification itself is less expensive. "An STC costs a couple of thousand dollars to process, primarily because we're required to use FAA designees to perform and review analyses," said Hanson. Manufacturing costs are equivalent to the company's certified products as all parts are made the same way. Will Rosen be able to pass lower costs along to customers? "We don't know yet," said Hanson.

What is certain is that Rosen has more NORSEE applications in the pipeline. "We have another one in right now and we plan to do two more in the next three months or so," he said. "I have high hopes that NORSEE is going to be a good way for us to go," said Hanson, "because we have fairly simple products that pilots love and want."

Jeff Bethel, owner and founder of avionics company, AeroVonics, said the cost of creating and getting a product to market will be about 90-percent less for NORSEE than for the traditional STC route, although he could not say the same about the time it takes to complete the process. AeroVonics, which gained NORSEE approval for its multifunction display in October 2018, has arguably the most complex device approved under the policy to date. The AV-20 provides angle-of-attack, G-meter, attitude, airspeed, and other information on a 2-inch display.

As the complexity of a NORSEE component increases, the review and approval time also increases. The time to complete a NORSEE approval is also dependent on the applicant's previous knowledge and experience with FAA certification processes. Each NORSEE project requires one-on-one help and guidance to develop the NORSEE documentation. "There is a learning curve, but after the applicant has demonstrated the ability to provide the required documentation needed for NORSEE, we expect the approval times to decrease," Raspanti said.

The AV-20 provides angle of attack, G-meter, attitude, airspeed, and other information on a 2-inch display.

"For Rosen Sun Visors, we worked together on the NORSEE documents for the initial approval." If future NORSEE applications mirror the same format, Raspanti said he expects approvals for similar sun visors on other aircraft to achieve more timely approvals.

One improvement that has been implemented is the help and guidance provided by Raspanti to inexperienced NORSEE applicants. "It was apparent they needed help in preparing the letters, design standards, and installation documentation for a NORSEE device," he said. We provide guidance to help those applicants with little to no engineering experience develop NORSEE documentation that will be acceptable to the FAA.

"What John is doing is building a basis for a general template to go along with these approvals," said Vilante. "He's developing a common denominator on what everyone should have in their data package. The approvals will occur on a case-by-case basis."

The NORSEE policy envisions other ACO branches "eventually" joining the program so that applicants can apply through their local offices. For now, though, everything is being routed through the Chicago ACO branch to ensure consistency in evaluating the applications and to develop a documentation process that will mature "as we get more exposure to various NORSEE products coming to the market," said Vilante.

John Croft is an FAA certified flight instructor and a writer/editor in the NextGen Updates and Messaging Branch. Croft uses ADS-B in the Piper Archer he co-owns with two other pilots, and he regularly flies a small team of FAA communicators to talk to pilots and other stakeholders about ADS-B.

Learn More

FAA's NORSEE Approval List
faa.gov/aircraft/air_cert/design_approvals/norsee

NORSEE Policy Statement (PS-AIR-21.8-1602)
go.usa.gov/xEGg7

Checklist

SUSAN PARSON

A Strategy of (and for) Innovation

"Moving with the times is an important idea for strategy today." — Denise Morrison

"Innovation requires an experimental mindset." — Denise Morrison

Recently-retired Campbell's Soup CEO Denise Morrison may have been thinking about soup when she uttered these words, but they certainly apply to aviation. As anyone in the GA community can attest, aviation does not — indeed cannot — stand still, and every segment of the industry has repeatedly proven that innovation comes from willingness to experiment.

When it comes to many things, including the design, production, and certification of aircraft, the FAA has not historically had a reputation for things like innovation or willingness to experiment. On the contrary — the traditional certification process for part 23 seemed designed to do anything BUT move with the times. There are good reasons for caution. The agency has a significant responsibility, and there ARE designs and ideas that quite literally shouldn't fly.

Times and mindsets have changed. The FAA has made significant strides toward moving ahead with the times and being more open to "alternative means of compliance" for integrity of design and production. This mindset is consistent with the FAA's broader emphasis on risk-based decision-making, as well as on the determination to avoid stifling industry's ability to be creative and innovative.

The "mission statement" for this particular *FAA Safety Briefing* column is to help develop awareness of FAA activities and resources relevant to the general aviation community. In that spirit, let's take a look at some of the GA-related certification material you can find — at no cost, of course — on the FAA's website.

General Aviation Fleet Modernization Efforts: Review and download this handy one-pager (go.usa.gov/xE84M) for a visual overview of the FAA Aircraft Certification Service's focus areas for both retrofit of the existing fleet and future R&D efforts, such as advanced "refuse to crash" autopilots and future automation. Topics in the retrofit category include propulsion enhancements, advanced flight displays, autopilot and envelope protection systems, engine monitoring systems, fuel gauge systems, ADS-B In/Out, attitude indicators, angle of attack indicators, and non-required safety enhancing equipment (NORSEE).

Non-Required Safety Enhancing Equipment (NORSEE) Policy: We will cover NORSEE in greater detail elsewhere in this issue, but take a look at the NORSEE policy statement (go.usa.gov/xE82C) for a description of the purpose and overall applicability. You will also want to review the approved equipment page (go.usa.gov/xE822), which is updated on a regular basis to list specific items covered under the NORSEE policy.

General Aviation Fuel: Avgas is the only remaining lead-containing transportation fuel. There are increasing concerns about lead emissions from small aircraft. To help "get the lead out," the FAA is supporting the research of alternate fuels at its William J. Hughes Technical Center in Atlantic City. We are working with the aircraft and engine manufacturers, fuel producers, the EPA and industry associations to overcome technical and logistical challenges to developing and deploying a new, unleaded fuel. faa.gov/about/initiatives/avgas.

Part 23 Reform: You can read the full text of the revised Airworthiness Standards for Normal, Utility, Acrobatic, and Commuter Category Airplanes at go.usa.gov/xE82Z, but for a quick summary, the FAA's webpage (go.usa.gov/xE82K) provides a broad overview, and you will find additional information elsewhere in this issue. The part 23 reform is important because its flexible, forward-looking use of performance-based standards recognizes multiple avenues to safety in aircraft design and production.

AIR Transformation Impact: In 2017, both the FAA Flight Standards Service and the FAA Aircraft Certification Service (AIR) implemented changes in organizational structure and culture (go.usa.gov/xE829). We have previously described the Flight Standards (FS) changes in some detail (adobe.ly/2xL0cZC). The AIR Transformation is a comprehensive change in the way AIR does business. The traditional focus is on compliance, which defines the expected level of safety. The AIR Transformation is a conscious decision to shift emphasis to up front planning, development of performance-based standards and means of compliance, and a robust, risk-based systems oversight program.

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JENNIFER CARON

The Transformation of Certification

Adopting Consensus Standards for Light-Sport Aircraft

"I look for the consensus because the consensus drives the policy into new places."
— Catherine Ashton.

Catherine Ashton's quote speaks directly to the spirit of the time — 2002 — when the FAA made the decision to use industry-developed consensus standards for the design, manufacture, airworthiness certification, and maintenance of a new, and emerging category of light-sport aircraft.

Back then, manufacturers of single-seat, lightweight ultralight vehicles were creating larger, heavier, and faster two-seater ultralights at a rapid pace. With two seats and affordable, innovative designs, these heavy ultralights were all the rage, and consumers were clamoring to buy and fly these exciting creations that required neither aircraft nor pilot certifications.

But these new ultralights were caught between two worlds; they were too heavy to operate as ultralight vehicles under part 103 (often referred to as "fat ultralights") and impractical to certify under part 23. Not only was part 23 certification impractical for the fixed wing designs, vehicles such as powered parachutes, weight-shift control, and gyroplanes were not airplanes as defined by part 1, and were therefore ineligible for certification under part 23. In effect, they were not airworthy for sport or recreational flight.

The Un-Certified Dimension

There were no standards in place to regulate the design and manufacturing of these "fat-ultralights," and pilots were flying them without any training, certification, or maintenance safeguards to follow. Coupled with an increasing number of accidents and incidents, the FAA faced a growing safety concern.

To borrow from Catherine Ashton's quote — it was time to *drive the policy into new places!*

The New Location for Certification

Enter consensus standards. In 2004, the FAA published a new rule that created the Light-Sport Aircraft (LSA) category. This rule not only created a new classification for what were previously considered heavy ultralights, but it also introduced, for the very first time, the use of industry-developed consensus standards acceptable to the FAA to address aircraft design, production, airworthiness, and maintenance for Special (S-LSA), and Experimental (E-LSA) kit built aircraft. Note: *Amateur-built aircraft, and amateur-builts that meet the definition of an LSA, do not require compliance with consensus standards. Instead, amateur-built aircraft receive experimental airworthiness certificates. E-LSA kit built aircraft are different in that they are only produced to the standard, but they must be assembled by the builder according to the assembly instructions.*

E-LSA kit-builts also cannot be used for compensation or hire (including flight training), because to qualify for an experimental certificate, there must first have been an S-LSA version of that same make and model.

The FAA moved to the use of consensus standards not only to leverage existing industry experience, but also to provide a less costly and less restrictive means for certification, increase the level of safety of these aircraft, close gaps in previous regulations, and create a means to accommodate new aircraft designs.

Applying consensus standards to the process creates flexibility, improves process efficiency, reduces cost for the manufacturer and consumer, and enhances safety. In fact, some would argue that the success of the LSA rule inspired the recent rewrite of part 23 to use consensus standards as well.

Sounds great, right? But what exactly are these consensus standards? How do they work? Do they really save money? And how does their use enhance safety?

A Sense of Consensus

In a nutshell, industry-developed consensus standards set the guidelines for a product. They've been around for a long time, and are widely used today in almost all U.S. industries.

If you've ever owned a mechanical tool set with SAE and metric tools, then you're already familiar with consensus standards. SAE International (formerly the Society of Automotive Engineers), develops technical standards for tools, equipment, and even horsepower ratings for the automotive industry.

In the aviation industry, Congress and the Office of Management and Budget (OMB) mandated the use of consensus standards. OMB Circular A-119 directed agencies "to use voluntary consensus standards, in lieu of government-unique standards, … to eliminate the government's cost in developing standards, to decrease the cost of goods, and to promote efficiency and economic competition through the harmonization of standards."

To facilitate the development of standards for S-LSA and E-LSA kit aircraft, the industry chose ASTM International (formerly, American Society for Testing and Materials), a not-for-profit organization that is one of the largest voluntary standards developing organizations in the world.

The Creation of Consensus

ASTM serves as a forum for technical committees that develop and maintain standards. The technical committees are comprised of experts and industry members that work together on a consensus basis to develop these standards.

Technical Committee F37 on Light-Sport Aircraft established the first set of consensus standards for the 2004 LSA rule. Today, we recognize the F37 Committee as the standards developing body for S-LSA and E-LSA kit aircraft. Approximately 175 volunteers, including stakeholders, FAA representatives, and consumers meet twice a year to develop and maintain standards in design, performance, quality acceptance testing, and safety monitoring.

The FAA moved to the use of consensus standards not only to leverage existing industry experience, but also to provide a less costly and less restrictive means for certification, increase the level of safety of these aircraft, close gaps in previous regulations, and create a means to accommodate new aircraft designs.

A Standard is Born

The committee reviews the proposed standards it develops and then takes a vote for approval. Any negative votes require written settlement, with final approval of all draft standards by consensus, i.e., general agreement. And, voila! A new or revised set of standards is created and ready for publishing.

To Accept or Not

Despite the committee's consensus, and approval by the standards body, these approved consensus standards are not ready for use by the light-sport aircraft industry for airworthiness certification. In fact, all ASTM-approved consensus standards are voluntary. It's up to the FAA to make the final decision to accept or not accept the approved standards for airworthiness certification of light-sport aircraft. Here's how that works.

The F37 Committee submits all the approved, new, and revised LSA consensus standards to FAA subject matter experts for review.

Whenever a new consensus standard comes out that applies to LSA, or there's a revision to an existing standard, the FAA has to review it. The FAA has the option to accept, or not accept, any ASTM approved consensus standard received from the F37 Committee.

Additionally, the FAA does not *approve* consensus standards. They are *accepted* or *not accepted*. Here's why.

If you look at the difference between aircraft that are designed under FAA type certificates (TCs) and production certificates (PCs), and LSAs, the

answer is clear. Aircraft type-certificated to part 23 must meet FAA-specific design and testing requirements. These aircraft must then meet FAA-specific quality and production requirements under part 21 to be eligible for airworthiness certification. Since they must comply with these FAA regulations, they are FAA-approved aircraft. LSAs, on the other hand, are built to industry-consensus standards. LSAs are eligible for an airworthiness certificate based on the manufacturer's statement of compliance to *industry standards*, without the FAA's issuance of a TC and PC. Without FAA-specific requirements for issuance of TCs and PCs for LSAs, the FAA will only *accept*, and not approve, the industry-specific standards.

A Standard is Adopted

The FAA identifies the FAA-accepted consensus standards in the Federal Register by an FAA notice of availability (NOA). The NOA includes the effective date for the new or revised standards to be used for new manufactured aircraft and the end date for using the existing ones. It also includes a 30-day request for comments from the public. Any comments received are coordinated with the F37 Committee for consideration in future standards revisions. The FAA adopts the new and revised standards as acceptable for airworthiness certification and mandatory for manufacturers to follow.

Applying consensus standards to the process creates flexibility, improves process efficiency, reduces cost for the manufacturer and consumer, and enhances safety.

Consensus Standards in Action

An LSA manufacturer must use the current, FAA-accepted consensus standards to design and manufacture its new aircraft. Existing aircraft are maintained to the consensus standards effective on their date of manufacture. To see a list of the latest FAA-accepted standards, and information on previously accepted standards, visit faa.gov/aircraft/gen_av/light_sport.

Manufacturers are responsible for their finished products and are required to sign a statement of compliance for each LSA aircraft and kit they produce. This statement of compliance designates that the aircraft complies with all FAA-accepted, and applicable LSA standards. FAA Designated Airworthiness Representatives inspect the aircraft to verify it is in a condition for safe operation and that the manufacturer certifies that it does in fact meet the standards.

To comply with the regulations, LSA manufacturers must: design the aircraft to meet the consensus standard; document the required maintenance and inspection procedures along with the aircraft's flight training supplement; maintain a quality assurance system that meets the consensus standard; and have a process in place to monitor and correct safety-of-flight issues. Ultimately, the certification and continuing airworthiness of an LSA aircraft is the manufacturer's responsibility.

Consensus Standards and You

Airworthiness certification of LSAs by consensus standards provides a number of benefits for the flying public. A major benefit is the cost savings passed along to the consumer. Airworthiness certification is less costly and less restrictive than the FAA-standard airworthiness process, providing LSA manufacturers greater flexibility with their designs and more freedom to develop cost-effective technologies. In addition, manufacturers can test the compliance of their products against these standards themselves, which saves money and time.

Another plus is that as the LSA industry continues to develop new designs and models, airworthiness certification by consensus provides living guidance that embraces change and allows manufacturers to bring new products to the market much faster. That's great news for the LSA enthusiast.

Best of all, with consensus standards new safety-enhancing technology is cheaper to introduce, and it gets to market faster. That makes LSAs safer for you, and for everyone in the airspace.

Jennifer Caron is an assistant editor for FAA Safety Briefing. *She is a certified technical writer-editor in aviation safety and flight standards.*

Learn More

To see the new or revised consensus standards up for public comment, visit www.federalregister.gov **and search consensus standards, light-sport.**

For more on the F37 Light-Sport Technical Committee, visit www.astm.org/COMMITTEE/F37.htm.

PAUL CIANCIOLO

Legally Aloft

Review of Aircraft Certificates

Photos: left-courtesy of Piprer Aircraft, right-courtesy of Cirrus Duluth

Understanding the basics of aircraft certification can help you make sound decisions affecting the airworthiness and operation of the aircraft you own or rent. To help explain this, let's take a look at the FAA's role in how aircraft are designed, produced, and maintained.

Type Certificates

A type certificate is a necessary step along the path to producing and selling aircraft to the public. It serves as FAA approval of an aircraft type design, which includes the aircraft's airworthiness and operating limitations.

To obtain this certification, a company must show that the aircraft design complies with FAA standards. These standards lay the groundwork for safe handling qualities, structural integrity, systems reliability, and other characteristics that many of us take for granted in the aircraft we fly. One of the key ways a company shows compliance with the airworthiness standards is through testing, such as on-ground wing structural tests or inflight spin tests. The FAA's role is to examine the type design, as well as oversee and verify the tests that demonstrate a product complies with FAA standards.

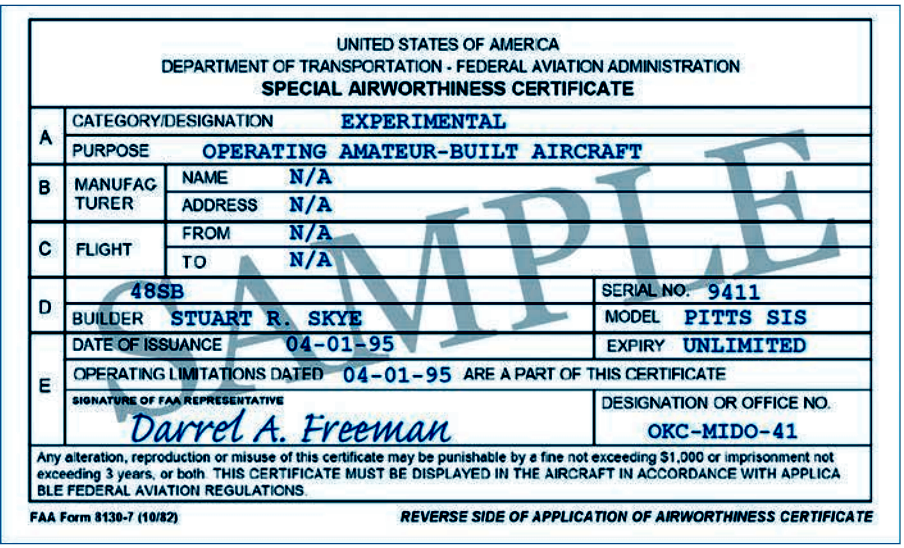
If you want to add new technology, modify, or change the design of a type-certificated aircraft, you need a supplemental type certificate (STC) issued. Obtaining an STC typically requires a great deal of work for both the applicant and the FAA, especially for new technology that has not previously been approved on a type-certificated aircraft. All of this work is for a good reason. When you carry out an approved modification on your aircraft, you expect it to be safe and compliant with appropriate airworthiness standards.

Once the FAA determines that the applicant has demonstrated compliance with the airworthiness standards, including any special conditions issued specifically for the project, the FAA issues an STC. The FAA can also issue special conditions when it determines that the airworthiness regulations do not contain adequate or appropriate safety standards because of a novel or unusual design feature, such as an inflatable airbag system on multiple-place and single-place side-facing seats (i.e., seats positioned in the airplane with the occupant facing 90 degrees to the direction of airplane travel).

When it comes to determining if an aircraft is airworthy, the PIC is always the final decision-maker.

Production Certificates

If a company wants to consistently reproduce a type-certificated aircraft that it manufactures for sale to the public, then the FAA must issue a production certificate. The intent of production certification is to ensure that each product conforms to its type design and is in a condition for safe operation. The FAA conducts ongoing audits and evaluations to make sure the company's production system continues to meet standards.



UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION - FEDERAL AVIATION ADMINISTRATION
SPECIAL AIRWORTHINESS CERTIFICATE

A	CATEGORY/DESIGNATION	EXPERIMENTAL	
	PURPOSE	OPERATING AMATEUR-BUILT AIRCRAFT	
B	MANUFACTURER	NAME N/A	
		ADDRESS N/A	
C	FLIGHT	FROM N/A	
		TO N/A	
D	48SB		SERIAL NO. 9411
	BUILDER STUART R. SKYE		MODEL PITTS SIS
E	DATE OF ISSUANCE 04-01-95		EXPIRY UNLIMITED
	OPERATING LIMITATIONS DATED 04-01-95 ARE A PART OF THIS CERTIFICATE		
	SIGNATURE OF FAA REPRESENTATIVE Darrel A. Freeman		DESIGNATION OR OFFICE NO. OKC-MIDO-41

Any alteration, reproduction or misuse of this certificate may be punishable by a fine not exceeding $1,000 or imprisonment not exceeding 3 years, or both. THIS CERTIFICATE MUST BE DISPLAYED IN THE AIRCRAFT IN ACCORDANCE WITH APPLICABLE FEDERAL AVIATION REGULATIONS.

FAA Form 8130-7 (10/82) REVERSE SIDE OF APPLICATION OF AIRWORTHINESS CERTIFICATE

SAMPLE

A parts manufacturer approval (PMA) is a combined design and production approval for modification and replacement parts. It allows a manufacturer to produce and sell these parts for installation on type-certificated aircraft.

Airworthiness Certificates

During preflight, checking that the aircraft has an appropriate and current airworthiness certificate displayed onboard is the pilot's responsibility. Many factors can affect the condition of the airworthiness certificate after issuance, and it is the pilot's responsibility to determine that an aircraft is airworthy before flight. Two things you'll want to verify is that an aircraft must always:

Safe design and construction are only part of the picture when it comes to safe aircraft. You can help keep your aircraft airworthy — safe and in conformance with its type design — by maintaining and operating it according to its airworthiness and operating limitations.

1. conform to its type certificate along with any approved changes to the type design, and
2. be in a condition for safe operation.

Not all airworthiness certificates are the same. Let's have a look at the different kinds you may encounter.

There are two different classifications of FAA airworthiness certificates: *standard airworthiness certificates* (allowing seven categories of operation), and *special airworthiness certificates* (with eight specialized categories).

A standard airworthiness certificate (FAA form 8100-2 displayed in the aircraft) is the FAA's official authorization allowing for the operation of type-certificated aircraft in the following categories: normal, utility, acrobatic, commuter, transport, manned free balloon, or a special class. The certificate remains valid as long as the aircraft meets its approved type design; is in a condition for safe operation; and maintenance, preventive maintenance, and alterations are performed in accordance with Title 14 Code of Federal Regulations (14 CFR) parts 21, 43, and 91.

A special airworthiness certificate (FAA Form 8130-7) is the FAA's authorization for the operation of aircraft in specialized categories as outlined in 14 CFR section 21.175. These eight categories are: primary (e.g., personal use aircraft), restricted (e.g., agricultural, forest/wildlife conservation, aerial survey, or patrol), multiple (restricted plus one or more other categories except primary), limited, light-sport (e.g., for special light-sport aircraft made in accordance with consensus standards), experimental (e.g., research and development; crew training; exhibition; air racing; demonstrating compliance with regulations; operating amateur-built, primary kit-built, or experimental light-sport aircraft), special flight permit, and provisional. For more details about each of these categories, see go.usa.gov/xEGs2.

An experimental certificate for research and development, showing compliance with regulations, crew training, or market surveys is effective for one year after the date of issue or renewal unless the FAA prescribes a shorter period. The duration of an experimental certificate issued for operating amateur-built aircraft, exhibition, air-racing, operating primary kit-built aircraft, or operating light-sport aircraft is unlimited, unless the FAA establishes a specific period for good cause.

Safe design and construction are only part of the picture when it comes to safe aircraft. You can help keep your aircraft airworthy — safe and in conformance with its type design — by maintaining and operating it according to its airworthiness and operating limitations.

Repairs and Alterations

Two actions that can affect conformance with the type certificate of an aircraft are repairs and alterations, which are defined as follows:

A "repair" is an action taken to return an aircraft to its current type design, and therefore to an airworthy status. Typical repairs include replacing defective parts, such as a vacuum pump; or making approved sheet metal repairs, such as repairing damage from a bird or deer strike.

An "alteration" is any action that changes or modifies the original type design. For example, an

alteration might involve installation of an engine or propeller not included in the type design.

When a repair or an alteration affects the aircraft's weight and balance, structural strength, performance, powerplant operation, or flight characteristics or operations, it is deemed to be a "major" repair or alteration.

Anyone who performs required maintenance and inspections, preventative maintenance, repairs, or alterations must document their work. The pilot is responsible for ensuing repairs have been appropriately documented before operating the aircraft. You should be able to locate the entries for required maintenance, inspections, and preventive maintenance in the aircraft's maintenance records. For anything that qualifies as a major repair or major alteration, the aircraft maintenance records require a completed FAA Form 337.

A field approval is one of the means used by the FAA to approve technical data used to accomplish a major repair or major alteration. It is an approval through an authorized FAA Aviation Safety Inspector (airworthiness) of technical data and/or installations used to accomplish a major repair or major alteration. This type of approval may be accomplished for one-time approval, and the inspector approves the repair or alteration by signing block 3 of FAA Form 337.

Return to the Sky

The FAA's Aircraft Certification Service is responsible for overseeing the design, production, and original airworthiness certification of civil aircraft and related products. Maintenance personnel approve the aircraft for return to service, but it is the pilot-in-command (PIC) who actually returns the aircraft to service by flying it. When it comes to determining if an aircraft is airworthy, the PIC is always the final decision-maker.

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Learn More

FAA's Aircraft Certification Page
faa.gov/aircraft/air_cert

JAMES P. NIEHOFF

Be a "Part" of Improving Aviation Safety

Even standard parts like these bolts can be easily counterfeited. Inspect using industry standards to ensure conformity.

A Look at Suspected Unapproved Parts

The reality of unscrupulous people trying to dupe unsuspecting mechanics, owners, and/or operators into buying unapproved aircraft parts is very real, and the GA community needs to remain staunchly aware of these practices. Adding to this concern is the confusion when it comes to understanding the differences that exist among aeronautical parts. Despite a repeated history of lessons learned, the FAA continues to confront this issue and remains committed to advocating the importance of using approved parts.

Part and Parcel

To better understand the issue, let's start by explaining how aircraft parts are classified. There are three main categories: approved parts, unapproved parts, and suspected unapproved parts.

Approved parts: A part can be called "approved" if it has been produced in accordance with one of the following: type certificate (TC), supplemental type certificate (STC), parts manufacturing approval (PMA), technical standard order (TSO), owner produced parts, standard parts, or other process approved by the Administrator.

Unapproved parts: These are parts that we know were not produced in accordance with any of the approved methods previously listed. These would include automotive parts, hardware store bolts, etc.

Suspected Unapproved Parts (SUPs): These parts resemble approved aircraft parts, but they were not produced in accordance with an approved method. This can also include parts that may have been approved but can no longer be traced to that approved method.

For some additional context into the issues with SUPs, let's expand on the acceptable methods used to deem a part "approved."

Seal of Approval

Type Certificate (TC): An aircraft manufacturer receives a TC from the FAA when it demonstrates that its newly designed aircraft meets all of the current aircraft certification rules. The FAA will issue a production certificate (PC) to a manufacturer when its established production demonstrates that each aircraft produced conforms to its TC, or type design. All parts and pieces associated with that aircraft are "FAA Approved." Certification of aircraft by the FAA ensures that commercial and general aviation aircraft meet the highest safety standards, from initial design to retirement.

Supplemental Type Certificate (STC): An STC is a TC issued when an applicant has received FAA approval to modify an aeronautical product from its original design. The STC, which incorporates the related TC by reference, approves not only the modification, but also how that modification affects the original design. In other words, to modify an aircraft from its original type design, you will need an STC. Think floats, wing extensions, short takeoff and landing (STOL) kits, engine conversions, etc.

Parts Manufacturer Approval (PMA): A PMA is a combined design and production approval for modification and replacement articles. It allows a manufacturer to produce and sell these articles for installation on type certificated products. FAA Orders 8110.42 and 8120.22 prescribe the approval procedures for FAA personnel and guides applicants in the approval process. An Approved Model Listing (AML), which should accompany a PMA, lists all of the aircraft on which that part is approved for use. The AML is your installation approval.

Technical Standard Order (TSO): A TSO is a minimum performance standard for specific materials, parts, and appliances used on civil aircraft. A TSO authorization is authorization to manufacture a material, part, or appliance to a TSO standard. Receiving a TSO authorization is both a design and production approval. However, receiving a TSO authorization is not an approval to install and use the article in the aircraft. Rather, it just means that the article meets the specific TSO, and it authorizes the applicant to manufacture it. There are many current published TSOs. Think seat belts, life vests, emergency locator transmitters, airspeed indicators, etc.

Owner-produced parts: This is a subject all on its own, so I won't cover it in detail here. The FAA does make provisions in the regulations for aircraft owners to produce parts for installation on their own aircraft. However, you cannot produce in surplus and sell any parts made in this manner to other owners. This action would require a PMA or other FAA approval. See 14 CFR section 21.9(a) (5) & (6) and Advisory Circular (AC) 20-62E for additional information. There is also an article on owner-produced parts from the Jul/Aug 2002 issue of this magazine available here: https://adobe.ly/2Y2eB1j.

Standard Parts: When you hear this term, you might be inclined to think of something simple, like regular nuts and bolts. In fact, other types of parts, as well as materials used to produce aviation parts, may fall under the "standard part" category. A standard part is a part or material that conforms to an established industry or U.S. government-published specification. The FAA bases the acceptance of a standard part as an approved part on the certification standards used to design and produce that part (usually an independent established set of specifications and criteria.) Think Air Force/Navy (AN), Military Standard (MS), National Aerospace Standard (NAS), Society of Automotive Engineers (SAE), etc., to include nuts, bolts, hoses, plumbing lines and fittings, sheet metal, rivets, etc.

Any other process approved by the Administrator: The bottom line here is that there should be a paper trail showing a connection to that FAA approval. Think field approval, etc.

Terms to Know

Now that you have a better idea of the different types of aeronautical parts and what makes them officially "approved," let's talk about how to identify and report a SUP. The differences can be subtle.

To help with the FAA's ability to investigate as well as educate the aviation community on SUPs, the agency formed a SUP Program Office in 1995. The FAA's Flight Standards Service (FS) assumed initial responsibility for the program, but in 2012 it was transferred to the Aircraft Certification Service (AIR). Today, the FAA's Office of Audit and Evaluation processes all FAA Hotline complaints (more on that later) and forwards all SUP related reports to focal points in both AIR and FS for evaluation. These individuals then work together to properly classify the report and assign it for investigation, as determined by the details of the case.

The reality of unscrupulous people trying to dupe unsuspecting mechanics, owners, and/or operators into buying unapproved aircraft parts is very real, so the GA community needs to remain staunchly aware of these practices.

From the perspective of the SUP office, there seems to be a lot of confusion regarding SUPs. That's understandable, because it is a nuanced issue. It also uses terminology that overlaps into other aspects of the aviation industry, making it hard to differentiate among those terms.

Here are a few, real-world examples that illustrate some of this confusion:

Use of Known Unapproved Parts: We received a report that identified the use of grade 8 hardware store bolts in place of approved standard aircraft hardware. This error was obvious and easy to spot; the reporter spelled out the issue and included numerous photos to document the error. The

Sign Up For Unapproved Parts Notifications!

To receive an email alert when new FAA UPNs are posted to the FAA Suspected Unapproved Parts UPN webpage:

- Go to this website: bit.ly/2Wrvbpo
- Enter an email address and click on Submit

You are now subscribed to receive FAA UPN alerts through GovDelivery.

intentional use of known unapproved parts in place of approved aircraft parts is a case of "improper maintenance" and is not a SUP case. Ultimately, we assigned this case to the local Flight Standards District Office (FSDO) for investigation.

Quality Escape: This term means that a production certificate holder makes an error and ships a part that does not conform to the type design. There may be a variety of reasons for this occurrence. For example, there may have been a missed step in the part's manufacturing process, which was then missed by quality control. This is not a SUP case, but it gets immediate attention from the FAA's Aircraft Certification personnel to identify and fix the problem.

As an aircraft owner, operator, or mechanic, you play an important role in ensuring the integrity of aeronautical products, especially when it comes to determining the quality, eligibility, and traceability of aircraft parts.

Approved Parts Installed in Unapproved Places: This is another instance of "improper maintenance" rather than a SUP case. When you install an approved part in the wrong place, it does not lose its classification as an approved part if it has not lost traceability to its approved roots.

Counterfeit Parts: These are unapproved parts manufactured and sold without FAA approval. You should report them to the FAA as a SUP. There may be obvious, or not so obvious, visual clues to help you spot these parts. The FAA aggressively investigates these cases and works closely with the Office of Inspector General (OIG) and law enforcement officials to ensure proper adjudication. There are cases of this nature that have resulted in significant civil penalties and/or jail time for those involved.

Play Your Part

As an aircraft owner, operator, or mechanic, you play an important role in ensuring the integrity of aeronautical products, especially when it comes to determining the quality, eligibility, and traceability of aircraft parts. One tool you can use to report any instances of SUP is the FAA's Hotline Program (hotline.faa.gov). The hotline is a national reporting system established to receive reports of potential unapproved parts entering the aviation system primarily at the supply and repair level of aircraft maintenance. You can also report SUP via mail, and the SUP Report form is available at faa.gov/aircraft/safety/programs/sups. Please note that you can no longer report a SUP by phone.

If the SUP office receives a hotline report that is ultimately classified as something other than a SUP, please don't think it gets ignored or discarded. Instead, the SUP focal points evaluate each report, make the appropriate classification change, and recommend assignment to the appropriate FAA office. The FAA investigates all cases.

An excellent resource for dealing with a potential SUP case is FAA Advisory Circular (AC) 21-29, *Detecting and Reporting Suspected Unapproved Parts* (see Learn More at the end of this article for a link). This AC provides detailed guidance on how to identify unapproved parts, as well as prevent the procurement, acceptance, and installation of such parts.

It is important for all airmen to remain vigilant on this issue. If you identify a SUP, we are here to support you. So please send us a report.

James Niehoff is an FAA aviation safety inspector and the SUP Focal Point with the Aircraft Maintenance Division's Special Programs Branch.

Learn More

Advisory Circular 21-29, *Detecting and Reporting Suspected Unapproved Parts*
go.usa.gov/xEzM3

Advisory Circular 20-62, *Eligibility, Quality, and Identification of Aeronautical Replacement Parts*
go.usa.gov/xEzMY

ROLL of HONOR 2018

Wright Brothers *Master Pilot Award*

The FAA's most prestigious award for pilots is the Wright Brothers Master Pilot Award. It is named in honor of the first U.S. pilots, the Wright brothers, to recognize pilots who have demonstrated professionalism, skill, and aviation expertise by maintaining safe operations for 50 or more years. In 2018, we recognized the following master pilots. For more about the award, go to faasafety.gov/content/MasterPilot.

Sherman Bear	AK
John Carricaburu	AK
Norman Lee	AK
Kenneth Nestler	AK
Michael Pannone	AK
Myles Thomas	AK
George Walters	AK
Herbert Valencia	AL
Ronald Bauman	AR
Paul Guiley, Jr	AR
Larry Imel	AR
William Keener	AR
Donald Kephart	AR
Randall Willis	AR
Ralph Aguirre	AZ
Brian Beulen	AZ
Robert Brock	AZ
Douglas Burke	AZ
Patricia Forbes	AZ
David Forbes	AZ
Richard Frazier	AZ
Albert Gardner	AZ
Wayne Green	AZ
Robert Hansen	AZ
Rory Hansen	AZ
Michael Hewitt	AZ
Earl Huffmaster	AZ
Richard Kendall	AZ
Lawrence Minch	AZ
Blair Parker	AZ
William Rapley, Jr	AZ
Alan Roberts	AZ
William Schuchter	AZ
Larry Stoffers	AZ
Rich Tichacek	AZ
William Winslow, Jr	AZ
Stergios Rapis	CA
Ronald Allen	CA
Willis Allen	CA
Douglas Avazian	CA
John Barnes	CA
James Brannan	CA
Thomas Buscemi, Jr	CA
Wayne Bush	CA
George Cawthra	CA
Michael Church	CA
Martin Coda	CA
Edward Cohn	CA
Billy Davis	CA
James Deitschman	CA
Andre Dressler	CA
John Eddy, III	CA
Rick Emerian	CA
Ernie Ganas	CA
Wallace Goltry	CA
Warren Goyer	CA
Raymond Hanna	CA
J. Elmore Heitman	CA
Robert Hitchcock, II	CA
Hervey Hodgson	CA
Terence Honikman	CA
Charles Hosmer	CA
Richard Jordan	CA
Orin Koukol	CA
Jerry McKneely	CA
Randall McKnelly	CA
Edward Miyamoto	CA
Robert Morgan	CA
Stephen Parker	CA
Gene Ratkowski	CA
Brian Rennie	CA
Gary Richards	CA
Daniel Rihn	CA
J. Norman Sanders	CA
Thomas Schulz	CA
Peter Schutte	CA
Robert Scott	CA
Brett Stephens	CA
Donald Terry	CA
Robert Tomlinson	CA
Harry Walker	CA
Guy Watson	CA
Bruce Witmer	CA
Randy Zahn	CA
Andrew Gambardella, Jr	CO
Ronald Gerber	CO
Richard Janitell	CO
Frank Niehus	CO
Bruce Oaster	CO
Chester Peek	CO
Tracy Perry	CO
Paul Sciera	CO
Terrence Terrill	CO
Joseph Tumminaro	CO
James Turnbull	CO
James Van Namee	CO
John Ackerman	CT
Charles Couture	CT
Joseph Gauthier	CT
Roy Parkinson	CT
Sandy Sanderson	CT
Paul Sayther	DE
James Britton	FL
Jeffrey Abrams	FL
Bussey Allsup	FL
Melvin Anderman	FL
Walter Bates	FL
Russell Boteilho	FL
James Britton	FL
Anton Castrillo	FL
James Cianci	FL
William Clarke	FL
Larry Collins	FL
Larry Connor	FL
Edward Cox	FL
Peter Culhane	FL
Gordon Czelusta	FL
James Davenport	FL
Samuel Dawson	FL
David Dechant	FL
Roger Dibble	FL
William Duncan	FL
Stephen Emme	FL
Robert Farrar	FL
Diane Fisher	FL
William Franklin	FL
John Fuller	FL
Robert Gandt	FL
Joseph Grashorn	FL
Dennis Haber	FL
Richard Hensch	FL
Luther Hipps, Jr	FL
Jens Hoyt	FL
Robert Iba	FL
William Jabour	FL
Richard Kendel	FL
David Kozeruba	FL
Ralph Loewinger	FL
Stephen Martin	FL
Charles McConkey	FL
Terry Meek	FL
William Merkin	Fl
Roy Miller	FL
Michael Mitchell	FL
James Morehead	FL
Volker Mulling	FL
John Murray	FL
Arthur Paige	FL
James Piccoli	FL
Lawrence Ploucha	FL
Richard Porter	FL
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James Renfro	FL
Sherrell Roberts	FL
William Royal, Sr	FL
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Harry Ruhsam	FL
Arthur Saluk	FL
John Scholl	FL
Thomas Sheehan, Jr	FL
Richard Sheppard	FL
Harry Squires	FL
John Stott	FL
Raymond Ulrich	FL
Thomas Vanderheyden	FL
Eugene Walsh	FL
John Wilson	FL
Edward Wilson	FL
William Zollinger	FL
John Brooke	GA
Henry Cicci	GA
Danny Cox	GA
Vernon Darley, II	GA
Terrance Dorondo	GA
Andrew Dotson	GA
Paul Ellis	GA
Ernest Epps	GA
Joe Harrelson	GA
Robert Lindley, Jr	GA
Robert Maione	GA
Clifford Manning	GA
Clifford Padgett	GA
Jesse Payton	GA
Carleton Roberson	GA
Larry Short	GA
David Swanson	GA
James Butterfield	IA
William Fitch	IA
Nicholas Hildreth	IA
Carl Johnson	IA
Michael Anderson	ID
James Eyre, Sr	ID
Laurence Hettinger	ID
Robert Hoff	ID
John Hook	ID
Johnny Stewart	ID
Bruce Whittig	ID
Edward Ban	IL
Walter Cwian	IL
Dean Del Bene	IL
John Friling	IL
Gene Gear	IL
Richard Hansen	IL
John Humphrey	IL
Jon Jefferies	IL
Richard Larson	IL
Robert Luman, Jr	IL
John Magon	IL
Robert Mark	IL
Robert McDaniel	IL
John McHugh	IL
Peter McVay	IL
Mark Pasqualino	IL
Edward Quedens	IL
Elmer Rullman, III	IL
Edwin Simon	IL
Dennis Smalley	IL
Edwin Thomas	IL
Ronald Thompsen	IL
Richard Tichy	IL
Simon Vancina	IL

ROLL of HONOR

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John Bizal	IN
Geral Calvert	IN
Conrad Gerdes	IN
James Hacker, Sr	IN
John Haynes	IN
Roger Kneeland	IN
George Mock	IN
John Schofield	IN
James Spore	IN
Francis Tucker	IN
Ronald Walker	IN
John Wesley	IN

Dennis Chesnut	KS
Thomas Deutsch	KS
William Gross	KS
Marvin Hesket	KS
Jay Johnson	KS
Earl King	KS
Robert Mika	KS
George Rhoades, II	KS
Rex Russell	KS
Francis Stringer	KS
John Wittenborn	KS

Alan Davis	KY
Robert Dearing	KY
Peyton Hoge, IV	KY
Marcus Norton	KY
Robert Poe	KY
John Uhl	KY

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Alan Malone	LA
Craig Mays	LA
Palmer Sullins, Jr	LA
John Torrance	LA
Sammy Whatley	LA

Nina Anderson	MA
William Arsenault	MA
Robert Gould	MA
David Lithgow	MA

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Richard Clarke	MD
John Cutcher	MD
Richard Garrity	MD
John Kostyk	MD
Gary Marville	MD
Joseph Oswald	MD
Terrell Otis	MD
Frank Phillips, Jr	MD
Raymond Stinchcomb, Jr	MD

John Gobel	ME

Charles Blaylock	MI
Robert Buttleman	MI
William Clark	MI
Philip Coulson	MI
Thomas Dancey	MI
Lawrence Froede	MI
Peter Greenfield	MI
Adrian Hakari	MI
Sherwood Harrington	MI
Barry Kadans	MI
Keith Kobet	MI
Fred Layne	MI
Charles Lee	MI
Robert Lutz	MI
Bijan Moazami	MI
Charles Opie	MI
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George Opie	MI
Milton Ovie, III	MI
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Dennis Peterson	MI
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David Rosebraugh	MI
Nihl Storey	MI
John Swantek	MI
Daniel Unger	MI
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Richard Von Maur	MI
Monte Zerbe	MI

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Richard Cross	MN
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Robert Jondahl	MN
David Kneeland	MN
Robert Lund	MN
Loren Morey	MN
Paul Satran	MN
Robert Swenson	MN
Duane Wething	MN
Robert Wiplinger	MN

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Larry Alsup	MO
David Bradley	MO
Ronald Brown	MO
John Brown	MO
Joseph DeBettencourt	MO
Samuel Dyer	MO
Larry Freiheit	MO
James Gatschet	MO
James Glass	MO
Esther Grupenhagen	MO
Richard Horowitz	MO
William Humphrey, Jr	MO
Don Jacobs	MO
Lee Lane	MO
Thomas Loftin	MO
Ralph McClurg	MO
Elmer Myers	MO
Gayle Myers	MO
Johnny Preston	MO
Ron Rodgers	MO
Bernard Schweiger	MO
Steven Struyk	MO
Charles Williams	MO
James Williams	MO
Richard Williams	MO

George Cricenti	MS
William McDonough, Jr	MS
Robert McEachern	MS

Frank Hale	MT
John Hutchison	MT
William Lepper	MT
Jeffrey Morrison	MT
Charles Rogers	MT
Steven Tostenrud	MT

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David Bonivtch	NC
Anthony Bruno	NC
Wilbur Chronister	NC
John Collins	NC
Harald Fiedler	NC
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Bruce Mowery, Jr	NC
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John Oys	NC
Charles Pflum	NC
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Evan Smith	NC
Dennis Yates	NC

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Lynn Larson	ND
William Little	ND
Ray Thompson	ND

Lyle Bender	NE
Reece Peterson	NE
Michael Sides	NE

John Belletete	NH
Norman Ellard	NH
Jesse Elliott	NH

Joseph Kollar	NJ
Leonard Levy	NJ
Harold Olson	NJ
John Pacitti	NJ
Norman Schenck	NJ
William Spych, Jr	NJ
Joseph Tordella	NJ

Robert Adams	NM
Teddy Adams	NM
Alfred Castillo	NM
Billy D'Spain	NM
John Grosso	NM
Johnny Oakley	NM
Kenneth Oden	NM
James Robins	NM

Johnny Burke	NV
James Carragher	NV
David De Leuil	NV
Perry DiLoreto	NV
Michael Moore	NV
Lee Salz	NV

Moses Acee	NY
Larry Ciszak	NY
Stephen Cohn	NY
Lawrence Coon	NY
Stanley Edwards	NY
Ronald Fast	NY
J.C. Follender-Birns	NY
Richard Giannotti	NY
Albert Larmann, Jr	NY
James Lawliss	NY
Michael Scott	NY
John Weidman	NY
John Word	NY
Alexander Zawaski, Jr	NY
Lawrence Zingesser	NY

Myron Ashcraft	OH
James Frederick	OH
John Held	OH
Lanny Jines	OH
William Leff	OH
Michael Reed	OH
Kenneth Rider	OH
Philip Talbott	OH
Lee Thiel	OH
Patricia Wagner	OH

Alan Glad	OK
Michael Harris	OK
William Hartsell	OK
Arturo Hernandez	OK
Mark Jacobs	OK
James Seignious	OK
Leroy Wall	OK

George DeMartini	OR
Dallas Enger	OR
John Glenn	OR
Bruce Gustafson	OR
Fred Leonetti	OR
John Lynch, IV	OR
Penn Stohr	OR

Alfred Bennett, Jr	PA
Douglas Braun	PA
Richard Buffington	PA
Thomas Johnston, Jr	PA
Harold Kulp	PA
Nils Mantzoros	PA
James Mehling	PA
Harold Ryan	PA
Michael Stephan	PA
David Stouffer	PA
Carl Tookey	PA
John Toomey	PA
Edward Wolfe	PA

Harold Burg	SC
Dale Eisenman	SC
Richard Hegenberger	SC
Walter Johnson	SC
Homer Keisler	SC
Robert Sleigher	SC
David Stanton	SC
Lional Ward	SC
Jeffrey Warren	SC
James Wilson	SC

Billy Davis	SD
James Huls	SD
Kenneth Thomson	SD

Raymond Axley	TN

Lee Bridges	TN
Kenneth Chapline	TN
Bruce Cheever, II	TN
Chuck Clapper	TN
Stephen Dee	TN
James Eng	TN
Edward Hasch, Jr	TN
Robert Herrick	TN
Virgil Jackson	TN
Robert Joles	TN
William Lardent	TN
Robert Lau	TN
Emery Lewis	TN
Eugene May	TN
Donald McDonald	TN
Dennis Miller	TN
Peter Neff	TN
Lonnie Phillips	TN
Linwood Stevenson	TN
Henry Williamson, Jr	TN

George Arbuckle	TX
Mel Asberry	TX
James Averett	TX
David Badal	TX
Wm. Dave Baker, Sr	TX
Jack Ballard	TX
Stephen Barati	TX
Barbara Baron	TX
John Boatright	TX
Dan Brouse	TX
Jack Brouse	TX
George Brown	TX
James Buick	TX
Ronald Burton	TX
Buddy Candelario	TX
Patrick Cannon	TX
C. Paul Carter	TX
Jerry Chipman	TX
Richard Clark	TX
Roger Clayton	TX
James Cross	TX
Richard Crowe	TX
Mark Danielson	TX
John Davis	TX
Daniel Dill	TX
Robert Dowgialo	TX
Charles Edwards	TX
Philip Feuge	TX
David Fields	TX
Joseph Fooshee, III	TX
Harry Fowler	TX
Richard Gordon	TX
Patrick Gray	TX
David Guggemos	TX
Michael Hance	TX
Gary Harber	TX
William Hartman	TX
Durwood Heinrich	TX
Reginald Higgins	TX
Frank Hinds	TX
Stephen Humphrey	TX
James Hurst	TX
Harry Johnson, III	TX
James Kelley	TX
John Kennedy	TX
Earl Koester, II	TX
Leo Lemoine	TX
Harold LeSage, Jr	TX
Rufus Lewis	TX
Bennie Lueders	TX
Louis Lust	TX
Jon McCoy	TX
William McNease	TX
Michael Mills	TX
Mike Mohler	TX
Carol Morris	TX
Robert Moudy, III	TX
David Murray	TX
Roger Neumann	TX
William Newell	TX
Ronald O'Dea	TX
Fred Oberlender	TX
John Oliver	TX
Robert Owsley	TX
David Pace	TX
David Palmer	TX
Gerard Pearson	TX
Kenneth Peck	TX
Ann Pelleegreno	TX
John Peroyea, II	TX
Harold Phillips	TX
Robert Poland	TX
James Porter	TX
John Pulls	TX
Jack Ramsey	TX
Deborah Rihn-Harvey	TX
Duncan Rowland	TX
Patricia Schroeder	TX
William Sears	TX
Charles Seefluth	TX
David Smith	TX
William Smith, II	TX
Robert Snowden	TX
Gregory Squires	TX
Thomas Stanley	TX
Paul Tekell	TX
Robert Tekell	TX
Dana Thomason	TX
Virgil Thompson	TX
Howard Tobin	TX
William Vorderbruggen	TX
David Wagner	TX
Frank Walley, III	TX
Meredith Whillock	TX
Johnnie Whitaker	TX
Lee Wilkinson	TX
Stephen Wright	TX

Frederick Baugh	UT
Archie Francis	UT
Stephen Guenard	UT
William Holbrook	UT
Bryan Neville	UT
Gary Silver	UT
Philip Smart	UT

Lee Anthony	VA
Percy Bullard	VA
John Burch	VA
Ralph Dilullo	VA
Charles Luddeke	VA
Albert Michaels	VA
Roy Murray	VA
Richard Otis	VA
Nicholas Sabatini	VA
Dennis Sparks	VA
Robert Starer	VA
Merle Starer	VA
Charles Walker	VA
Fred Wimberly	VA

Robert Burley	VT

Edward Arness	WA
Arthur Browning	WA
Joseph Chizmadia	WA
Douglas Cole	WA
Mark Conlin	WA
Harry Cook	WA
William Dickinson	WA
Timothy Dold	WA
James Doyle	WA
William Gould	WA
Jeffrey Hamilton	WA
William Houston	WA
Scott Jarvis	WA
Michael Latta	WA
Nicholas Libby	WA
James McClellan	WA
Richard Morey	WA
Fred Quarnstrom	WA
Robert Roetcisoender	WA
Louis Sherry	WA
Dixon Smith	WA
Ronald Talcott	WA
Max Tyler	WA
David Varnam	WA
Roy Wheat, Jr	WA
Dean Winner	WA

Jeffrey Anderson	WI
William Blank	WI
Glenn Butts	WI
Albert Flora	WI
Carl Greene	WI
Donald Heath	WI
Earl Heyrman	WI
John Holmgreen	WI
Willism Menzel	WI
Lawrence Stys	WI
Paul Thompson	WI
Guy Wood	WI
Michael Woods	WI

Roger Hartley	WV
Barclay Rogers	WV

Robert Eisele	WY

Charles Taylor *Master Mechanic Award*

The FAA's most prestigious award for aircraft mechanics is the Charles Taylor Master Mechanic Award and recognizes the lifetime accomplishments of senior mechanics. It is named in honor of the first aviation mechanic in powered flight, Charles Taylor, who served as the Wright brothers' mechanic and is credited with designing and building the engine for their first successful aircraft. In 2018, we recognized the following master mechanics. For more about the award, go to faasafety.gov/content/MasterMechanic.

Bruce Moroney	AK
Stephen Sustarich	AK
Jack Clark	AL
Norman Faith, Jr	AR
Ed Thibedeau	AR
Douglas Burke	AZ
Charles Criminale	AZ
Thomas Dickerson	AZ
Edward Dzielski	AZ
Robert Eglinton	AZ
David Forbes	AZ
Robert Klingelsmith	AZ
Joseph Sottile, Jr	AZ
Larry Stewart	AZ
George Voss	AZ
Volker Berlin	CA
Frank Bucci	CA
Jeronimo Gil	CA
Charles Mayhew, Jr	CA
Thomas Sanders	CA
Nathan Schumacher	CA
Thomas Stubbs	CA
Harry Walker	CA
William Willoughby, Jr	CA
Charles Apel	CO
Raymond Burnham	CO
William Phillips	CO
Thomas Palshaw	CT
Melvin Anderman	FL
Edwin Aviles	FL
John Bains	FL
Greg Bast	FL
William Bivens	FL
Charles Bleiberg	FL
Donald Block	FL
Thomas Carroll	FL
Robert Cernuda	FL
Joe Chandler	FL
Douglas Elder	FL
Gabriel Francin	FL
Gary Hebert	FL
Michael Mellott	
Jerry Oakley	FL
Joseph Raia	FL
Edgar Reid	FL
Thomas Renfro	FL
James Renfro	FL
William Schink	FL
Lawrence Stencel	FL
James Stone, Jr	FL
James Wallis	FL
Wayne White	FL
Robert Whitehurst, Jr	FL
John Wilson	FL
James Alexis	GA
Joseph Allen	GA
Ramon Alvarez	GA
Gene Daub	GA
Denver Davis	GA
William Jackson	GA
Allen Littlefield, Jr	GA
Michael Luff	GA
James Mitchell	GA
Edward Orloff	GA
Edward Pilszak	GA
Larry Short	GA
John Wright	GA
Leighton Kahele	GU
Gary Bohlken	IA
Keith Roof	IA
Michael Anderson	ID
John Miller	ID
Bruce Whittig	ID
Walter Cwian	IL
Daniel Feeney	IL
Paul Greenwood, III	IL
Charles Leister	IL
Richard White	IL
Darrell Wilson	IL
David Bucknell	IN
R. Tom Hodgson	IN
Wayne Bormann	KS
Wesley Lumry, Jr	KS
James Rierson	KS
Francis Stringer	KS
Kenneth O' Hara	KY
Robert Orlove	KY
Wesley Goodman, Jr	LA
Louis Mashburn, Jr	LA
Gary Pecquet	LA
Philip Caruso	MA
John Gagliardi	MA
Robert Gould	MA
Clarence Barrett	MD
Joseph Toskes	MD
Daniel Jockett	ME
Leard Wylie	MI
Abraham Williams, Jr	MI
Richard Steinke	MN
Wayne Trom	MN
Forrest Frazier	MO
Kevin Hales	MO
Paul Jamerson	MO
Joseph Kramer	MO
Theodore Matthiesen	MO
Thomas Peterson	MO
Joseph Tebo	MO
Gerard Wagner	MO
Thomas Winters	MO
Bernard Schweiger	MO
Lawrence Haupt	MS
Bobby Meadows	MS
Eugene Rigaud	MS
Matthew Converse	MT
James Bailey	NC
Charles Bradsher	NC
Wilbur Chronister	NC
William Cook	NC
William Little	ND
Robert Tooker, Jr	NE
Arthur Fullan	NJ
Kirk Jaeger	NJ
Jamie Martinez	NJ
Gilbert Aragon	NM
George Davis	NV
Michael Levine	NV
Robert Southerland	NV
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Joseph Caso	NY
William Judge	NY
John Liccini, Jr	NY
Thomas Norden	NY
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William Schmidt	OH
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Gary Hoyle	PA
Robert Lee	PA
Thomas Martin	PA
Alexander Robenski	PA
Homer Keisler	SC
Peter Semetis	SC
Richard Battles	TN
Dennis Clarity	TN
Billy Cox	TN
Gerald Damewood	TN
Michael Smith	TN
Manuel Arcizo	TX
Thomas Bass	TX
Jack Brouse	TX
David Burke	TX
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David Wise	TX
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Raymond Cox	WA
Edward Pinkham	WI
Mike Gray	WV

Drone Debrief

TOM HOFFMANN

A Light Shines in the Darkness

How Performance-Based Regulations Help Shed Light on the Potential for Night UAS Ops

Throughout this issue, we highlight the benefits of integrating performance- and risk-based standards for aircraft certification and the revolutionary impact this approach promises for enabling greater innovation and safety for general aviation. What you may not know is that this performance-based regulatory philosophy is also part and parcel of the framework used for small unmanned aircraft system (sUAS) rulemaking and its integration into the National Airspace System (NAS).

Take the recent (February) Notice of Proposed Rulemaking (NPRM) that calls for relaxing the prohibition on operations over people and at night under certain conditions. In both cases, the FAA carefully evaluated the risks involved with these types of operations and determined mitigation techniques that would ensure safety to surrounding aircraft, people, and property, while not inhibiting innovation. This scalable approach to rulemaking was made possible thanks to the performance-based philosophy already "baked in" to the original 2016 part 107 rule that enabled the commercial application of sUAS.

When the FAA first conceptualized part 107, the agency had the foresight to move away from a prescriptive regulatory environment because of the unpredictable and break-neck speed of innovation in the UAS industry. Instead, the FAA took more of a technology-neutral stance, realizing that technology will likely evolve well before the ink dries on any given regulation. As a result, part 107's performance-based foundation had the added benefit of enabling the agency's incremental and risk-based approach toward addressing the needs for increased operational flexibility and expanded activities.

When it comes to considering what new, routine activities should be permitted under 107, night operations is the clear frontrunner. Since the rule first took effect, the FAA has received over 10,000 non-airspace waiver requests for nighttime operations. In evaluating these requests, the FAA considered the most critical factors to ensuring safety at night to be anti-collision lighting and operator knowledge. Accordingly, the FAA is proposing to incorporate

both these factors as conditions in order to fly routine sUAS operations at night.

As proposed, the UAS operator seeking to fly in the dark would first need to complete knowledge testing or training that includes the risks and mitigation techniques related to night operations. This training would focus on both night physiology and night illusions. Secondly, the operator would need to ensure his or her sUAS has an anti-collision light illuminated and visible for at least three statute miles. The FAA believes that when combined with the existing operational provisions of part 107, these additional requirements will provide a layered approach to safety sufficient to address the additional risk of night operations. In the spirit of true performance-based rulemaking, you'll notice that the FAA is not prescribing specific lighting requirements; it only requires the lights be seen for three miles. The FAA states in the NPRM that prescriptive design criteria for lights would burden both the manufacturers and operators and force them into tradeoffs between weight and power supply.

The proposal to permit routine operations over people uses a similar performance-based framework, but with a bit more complexity and nuance in how it addresses risk. The proposal calls for the use of three categories of permissible operations over people based on the risk they present. Since they pose a low risk of injury, Category 1 operations (0.55 lbs. or less) would not have any additional restrictions beyond what part 107 already requires. Category 2 operations involve sUAS more than 0.55 lbs., but are not solely weight-based. They allow for operations over people provided a crash would not cause an injury beyond a certain severity threshold. This gives manufacturers the flexibility to design a sUAS in any way, provided it meets that threshold. Category 3 operations would allow for a higher possible injury threshold than Category 2, but would limit an individual's injury risk through operational limitations (e.g., no operations over an open-air assembly of people).

The final amendment included in this NPRM considers the growing demand and volume of UAS operations. Seeking to create more flexibility for the Remote Pilot community, the FAA has included a provision enabling Remote Pilots to stay current by taking training online, rather than re-testing in person every two years. This ensures they have the most up-to-date information from the Agency, and puts the focus on the knowledge instead of the test.

The proposed performance-based framework in this NPRM has the potential to enable far-reaching benefits for operators and enhance operations such as emergency response efforts, newsgathering, aerial surveying, and photography. In addition, the use of sUAS during sporting and cultural events could afford enhanced viewer experience, more dynamic visuals, and greater accuracy. By leveraging performance-based requirements that help meet its safety goals and at the same time invigorates industry development, the FAA intends for this rule to be an important step in further integrating sUAS operations into the NAS.

Tom Hoffmann is the managing editor of FAA Safety Briefing. *He is a commercial pilot and holds an A&P certificate.*

JENNIFER CARON

Repairing or Re-webbing Aircraft Seat Belts

Use the Appropriate Materials and Data

Have you heard of the domino effect? It occurs when you make a change to just one thing in an integrated system, and that one change touches and affects every aspect of the entire system, setting off a chain reaction much like a cascade of falling dominos.

Aircraft seat belts are an example of one domino that can affect the entire chain of components in an aircraft seat assembly. If you are repairing aircraft seat belts, you must use materials and data specified for the particular seat assembly subject to the installation.

Re-webbing a seat belt on a dynamic seating system poses unique challenges. Historically, seat certification and subsequent modifications have only involved static structural requirements. However, in the late 1980s, the FAA issued a series of regulations aimed at improving the survivability of aircraft crashes. This effort resulted in stringent design and performance requirements for seat belts used in dynamic seating systems. These dynamic seat regulations, found in 14 CFR parts 23, 25, 27, and 29 (commonly referred to as 2X.562) introduced new dynamic loading and occupant injury criteria for dynamic aircraft seating. With this new regulation, parts of the seats, such as TSO seat belts, were no longer approved separately. In a nutshell, 2X.562 created an integrated seating system evaluation method and imposed requirements on the seating system as a whole.

Dynamic seats require demonstration of protection for the pilot and/or passenger (such as head injury criterion, lumbar load, femur load, and restraint loading) when the seats are subjected to dynamic emergency landing conditions (vertical and horizontal deceleration). Manufacturers must assess the performance of the seats under those conditions, and the required dynamic tests for the seating system as a whole include the seat restraints.

Any changes to the restraint webbing material, manufacturing process, stitching, or hardware modifications may affect the entire seating system, including the dynamic loading of the structure, and the loads transferred to the pilot or passenger.

For example, changing the weave pattern of identical webbing material may alter the stiffness, strength and dynamic performance of the seating system, which in turn may impact compliance with protection requirements such as head injury criteria, occupant restraint load limits, and retention of the pilot or passenger.

If you are repairing aircraft seat belts, you must use materials and data specified for the particular seat assembly subject to the installation.

The bottom line: For proper installation of a seat belt on a dynamic seat assembly, you have to ensure that the proper testing and/or analysis show that the specific requirements for that dynamic seat assembly have been met, and support the repair data you used.

As with any domino effect, repairing or re-webbing aircraft seat belts can affect the entire chain of components in an aircraft seat assembly. Always ensure that any repair of seat belts uses the specified materials and data for that particular seat assembly receiving the installation.

Jennifer Caron is an assistant editor for FAA Safety Briefing. *She is a certified technical writer-editor in aviation safety and flight standards.*

Learn More

Read the Advisory Circular, AC 21-25B, Approval of Modified Seating Systems Initially Approved Under a Technical Standard Order (TSO) at
go.usa.gov/xEzHm

Check out the Information for Operators (InFO) 17004 on Seat Belt Repairs and Alterations at
go.usa.gov/xEQwK

You can find the NTSB Safety Alert to Check Your Seatbelt Restraints at
go.usa.gov/xEzHV

TOM HOFFMANN

The Art of Survival

Crashworthiness Study Highlights Need for Occupant Safety Features

Anyone who has ever had the unfortunate experience of being in a car accident knows that their vehicle's many built-in safety features, such as air bags, seat belt pre-tensioners, and head restraints, likely played an important role in increasing your chances of survival. Like most vehicle owners, you probably take for granted that these required safety features are there when you need them, without you having to purchase and install them on your own. For many aircraft owners, however, improving a cockpit's crashworthiness is not as straightforward. While existing airworthiness standards do address occupant safety when aircraft are manufactured, even for older aircraft, the pathways for enhancing crash survival with new technology have traditionally been difficult and costly. But change is on its way.

The use of performance-based regulatory requirements introduced in the 2017 part 23 rewrite for aircraft certification standards allows for increased flexibility when it comes to safety equipment, especially with regard to accident survivability.

The use of performance-based regulatory requirements introduced in the 2017 part 23 rewrite for aircraft certification standards allows for increased flexibility when it comes to safety equipment, especially with regard to accident survivability. In fact, last year the FAA approved a generic airbag installation using part 23 (Amendment 23-64) methods that could be installed in many types of airplanes. Using performance-based requirements and a more generic design allowed the manufacturer to reduce the cost to consumers and facilitate an increased number of installations.

This new policy philosophy is what led the General Aviation Joint Steering Committee (GAJSC) to form a working group and perform a deep-dive study into crashworthiness and survivability factors for GA aircraft. The group consisted of 16 subject matter experts from government, industry, and academia. Their goal was to develop intervention strategies that could lead to safety enhancing recommendations and ultimately form the basis for new consensus standards. If successful, these standards could provide a path to reduce serious injuries and save countless lives.

The study looked at 20 fatal, but survivable accidents (i.e., at least one person survived). The group categorized the accidents according to energy level of the crash (high or low) and descent angle (horizontal or vertical). Members carefully reviewed NTSB accident reports, wreckage diagrams, photographs, and

autopsy reports when available. Their examination of the accident data also focused on what went wrong during the flight with an emphasis on how the whole airplane plays into crashworthiness (e.g., noting when shoulder harnesses did not hold, or when seats did not remain bolted to the floor.)

After reviewing each of the accidents, the group developed the following four categories of recommendations, which considered both forward fit and retrofit solution sets:

- Pilot and Occupant Restraints
- Maintain Survivable Volume
- Impact Energy Management
- Prevent Post-Crash Fire

The first of these categories, restraint systems, particularly upper torso restraints, showed the greatest potential for improved survivability, as well as being the most affordable solution for the retrofit market. In fact, a separate study in Alaska showed that adding 4- or 5-point seatbelts and helmets could save 60-percent of the lives involved in an aircraft accident in that region.

"Four- and five-point restraints more widely distribute the loads, tend to keep the occupant in the right place for the restraint to work, and limit side to side motion," says aerospace engineer Robert Stegeman with the FAA's Policy and Innovation Division and member of the crashworthiness working group. "These restraints, by far, offer the best bang for your buck in upgrading your odds in crashworthiness," adds Stegeman. If your aircraft was built before 1987 and lacks this safety enhancement, Stegeman suggests checking with your original equipment manufacturer (OEM) or your local type club for ways to get shoulder harnesses in your airplane.

The working group also noted the existence of other restraint solutions that can lead to increased survivability: inflatables, pre-tensioners, load limiters, and more robust restraints overall. "Inflatable restraints take normal restraints to a new level, allowing an extreme forward impact to be more survivable," says Stegeman. Since aviation inflatable solutions are almost always integrated into a restraint system, it's possible to kill two birds with one stone.

When it comes to seeking out ideas for enhancing cockpit safety, Stegeman suggests checking with type clubs and the open market to see what others have used. "If you have an idea that requires more modification than AC 43-13-2B (*Acceptable Methods, Techniques, and Practices — Aircraft Alterations*) allows, talk to your FSDO inspector. If necessary, they can collaborate with the local Aircraft Certification Office. The FAA is open to reasonable ideas that don't otherwise compromise the airplane structure and don't make a crash situation worse — like having a poorly attached shoulder belt reel break loose in a crash." Also, be sure your restraints are installed using the appropriate materials and data and are properly inspected and maintained. See the FAA's Information for Operators (InFO) 17004 at go.usa.gov/xEQwK or this issue's Nuts, Bolts, and Electrons department for more details.

In its final report, the working group also pointed to the need for pathways to connect aircraft owners with technologies used in other industries and, where possible, to accept non-aviation specifications to speed the adoption of life-saving equipment. This approach could prove particularly important down the road with regard to lateral safety requirements, an area not currently covered in aviation regulations but which, according to the study, holds great promise in reducing fatal injuries. The focus now, however, is on restraint systems and mitigating forward impact injuries with practical innovation.

When it comes to seeking out ideas for enhancing cockpit safety, check with type clubs and the open market to see what others have used.

ASTM International's F44 General Aviation Committee is now considering the working group's recommendations as possible candidates for new, globally accepted consensus standards. This outcome would be a game-changer for operators and manufacturers. Not only would it spur innovation and increase the flexibility for compliance to new crashworthiness solutions, but it would also play an important role in minimizing cost. That would be a lifesaver in more ways than one. Stay tuned for more!

Tom Hoffmann is the managing editor of FAA Safety Briefing. *He is a commercial pilot and holds an A&P certificate.*

Learn More

GAJSC Final Report on Crashworthiness/Survivability for GA
go.usa.gov/xEQMU

FAASTeam Fact Sheet on GA Survival
bit.ly/2xOV2MU

GENE TRAINOR

Don't Let Safety Go Down to the Wire

The FAA is urging pilots to step up their vigilance for wires and unexpected terrain after a rash of fatal accidents occurred last October and November among U.S.-registered helicopters.

The news comes at a time when the FAA Rotorcraft Standards Branch has for years, under its Non-Required Safety Enhancing Equipment (NORSEE) policy, been certifying and streamlining the process for installing safety equipment to prevent accidents, including wire and terrain detection equipment.

Seven accidents during October-November were particularly deadly, with 15 people losing their lives. This ranks as the third highest October-November fatal accident total on record in 37 years. The 11 deaths in November set a record for that month.

Some of the fatal accidents are still under investigation, but the following descriptions set the stage for how several of the accidents occurred:

October 30: Workers were stringing fiber optic lines along existing power lines in New York State when a helicopter became entangled in the lines and crashed. A fire ensued. Two people died, and two were seriously injured.

November 2: Workers were involved in utility line work in Arkansas when a helicopter hit a utility pole and crashed. One person died, two suffered minor injuries.

November 16: A law enforcement flight from Columbus, Georgia, to Clanton, Alabama, ended tragically when a helicopter struck power lines and fell into the Coosa River in Alabama. Two people died.

And it's not just wires and poles that present problems. A just-married couple and their pilot died November 4 when their helicopter flew at night from Uvalde, Texas en route to San Antonio. The helicopter collided with a 1,450-foot hill about five miles from the ranch.

As you well know, helicopter pilots often face unexpected weather changes, unplanned workloads, and dangerous terrains and environments.

To help address safety concerns for helicopter pilots, the FAA's Rotorcraft Standards Branch issued its NORSEE policy in 2013 after consulting with industry. NORSEE allows operators and manufacturers to install safety equipment through a streamlined and less expensive FAA approval process. The policy seeks to strike a balance between risk and safety through a "common-sense" approach.

Wire detection systems are not required, so by definition they fall under the NORSEE policy. Options include:

Power line detection systems: These systems sense the electromagnetic fields surrounding power lines and alert pilots through sound and light. The drawback is that these systems only detect active power lines. They do not detect guy wires, some telephone lines, or inactive power lines.

Laser systems: These systems can scan a helicopter's surroundings for objects and obstructions. They warn pilots about wires through sound and light.

Wire cutting devices (cutters): Cutters placed on the helicopter's roof and bottom cut through wires if a collision should occur, preventing an accident.

Helicopter Terrain Awareness and Warning System (HTAWS): These systems calculate a helicopter's altitude, speed, and location, and warn pilots through visual dashboard displays and computerized voice or auditory warnings if the helicopter is at risk of colliding into terrain or an object. Some of these data-based systems help warn pilots about wires and power lines. Helicopter Air Ambulance (HAA) operations under part 135 are required to have HTAWS along with other safety systems that are covered under NORSEE for other helicopters.

Even the best pilots face unexpected situations and can be distracted. Be proactive and thorough in your planning and consider the safety-enhancing benefits of NORSEE equipment; it may just be a life-saver.

Here are some safety tips based on a 2008 FAA wire-strike safety study:

- Avoid cruising below 750 feet above ground level when the operation does not require it. The higher you fly, the less likely you will strike wires.
- Review aeronautical charts and conduct reconnaissance flights at higher altitudes before conducting low-altitude operations.

Gene Trainor is a technical writer and editor for the Rotorcraft Standards Branch in Fort Worth, Texas. He previously worked as a newspaper reporter and editor.

Flight Forum

Here's a fantastic lessons-learned account from our new GA Safety Facebook Page! Check it out at facebook.com/groups/GASafety.

If you're not a member, we encourage you to join in on the discussions and post relevant GA content that makes the National Airspace System (NAS) safer.

Mark recalls the following scenario and posted it to our GA Safety Facebook page:

Rental C-172, two young daughters, 9 and 12. I had flown this aircraft within the last two weeks, and I was taking my girls for a ride. While I did my preflight inspection, my older daughter helped by untying the aircraft, I reached the passenger door, and I had to go to the truck to retrieve my younger daughter's headset. On my return, I was looking straight at the aircraft, and since it was untied, in my mind I had completed the preflight.

We got in, I checked the flight controls while taxiing and everything moved freely, but once we got airborne, the elevator was jammed [some bird meshing, not noticed on preflight, had jammed the elevator]. The most important thing to remember here is the airplane was flying just fine, and elevator trim was all I needed to manage pitch. I flew to an airport with a longer runway and did a no-flap landing, which minimized trim changes.

Lessons learned: distractions are hazardous on the ground and in the aircraft. If you are interrupted during your preflight or preflight checks, start over.

The FAA recommends that pilots develop and use a personal, consistent preflight inspection routine to include the use of a written, or electronic, preflight checklist. If you don't have your own written checklist, ask the rental company for one. Never work from memory. In this way, you can ensure that you do not skip or misevaluate the items you're checking. Take a look at the article, "Is My Aircraft Right for Flight," in the Jan/Feb 2017 issue of FAA Safety Briefing Magazine (adobe.ly/2iePJ4p) where editor Jennifer Caron discusses the importance of preflight prep.

More takeaways from Mark: If you can physically see your flight controls, visually make sure they move in their correct positions. Checking flight controls while moving is not recommended. The pilot in command is always responsible for the safety and operation of the aircraft. When confronted with situations in flight, don't panic — keep flying the airplane and calmly sort it out.

So there you have it. I share this story in the hope it benefits others. Constructive comments are always welcome.

— Mark

Hi Mark, thank you for sharing. I think if all pilots are honest, we have all done something we wish we could do over. The brave ones share their story to help the rest of us learn — I commend you, and I am glad everyone was okay.

— Chris

Q: Do the regulations mandate ADS-B Out only, beginning January 2020?

A: Yes, only ADS-B Out will be mandated, and only within certain airspace. Title 14 CFR section 91.225, at go.usa.gov/xEQpb, defines the airspace within which these requirements apply.

Let us hear from you! Send your comments, suggestions, and questions to SafetyBriefing@faa.gov or use a smartphone QR reader to go "VFR-direct" to our mailbox. You can also reach us on Twitter @FAASafetyBrief or on Facebook facebook.com/FAA.

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SUSAN PARSON

Tradition and Innovation

"Without tradition, art is a flock of sheep without a shepherd. Without innovation, it is a corpse."
— Winston Churchill

The distressingly unprecedented events of early 2019 gave me an equally unprecedented opportunity for reading. Among other tomes, I worked my way through several books by British author and journalist Tom Standage. A science and technology writer, Standage's oeuvre includes several history books, such as "Writing on the Wall: Social Media — The First 2,000 Years," "A History of the World in Six Glasses," "An Edible History of Humanity," and "The Victorian Internet," which is a history of the telegraph.

As the book titles suggest, Standage uses unusual themes as an innovative, engaging, and downright entertaining prism for reviewing certain aspects of world history. Given the focus topic of this issue of *FAA Safety Briefing*, I was particularly struck by points Standage makes in addressing the not-so-new aspects of social media and the now-defunct telegraph industry. Even lacking the guidance of the deft parallels that Standage draws, you can't read either book without realizing that some things in the cycle of change and innovation truly never change. On the one hand, human beings seem wired to create and innovate, to find better ways of living and working and doing just about everything. On the other hand, human beings seem equally wired to resist changes — to stick to traditions and stubbornly cling to the "we've always done it this way" mentality.

On the one hand, human beings seem wired to create and innovate. On the other hand, human beings seem equally wired to resist changes — to stubbornly cling to the "we've *always* done it this way" mentality.

A Perpetual Balancing Act

The Winston Churchill quote about art neatly frames the never-ending challenge of correctly balancing tradition and innovation. You could substitute the word "aviation" for "art" and find that the sentiment still works. The safety that we take for granted in modern aviation is a product of both tradition and innovation. In this context, "tradition" would include the body of rules, regulations, policies, and procedures. Such "traditions" have been derived and developed in part from what we learned in investigating the painful mistakes and tragic accidents of our aviation forebears. But what we now incorporate in our view of "tradition" is also the product of scientific research, learning, and innovations that improved aviation even as they overturned less efficient (or less safe) ways of doing things.

As you have read in these pages, the FAA has been, and continues to be, deeply immersed in finding the right balance for aviation safety. The stakes are high, because — as the popular cliché goes — aviation is terribly unforgiving of carelessness, incapacity, or neglect. So there is a long and mostly understandable tendency to stick to methods that have been tested, tried, and proven to produce safe outcomes.

Policies like NORSEE and the performance-based approach of the revised part 23 rules recognize, though, that achieving a higher level of safety can also require forging a new path. Sticking to prescriptive rules and rigid policies for design, production, and retrofit can have unintended adverse impacts on safety. So I am proud of the way my FAA colleagues are working with our aviation community partners to re-balance the equation, so as to ensure that the industry we love will thrive in the safest possible way. We may not always get it right, but we do have the right mindset to keep striving for the best and safest possible outcomes.

Susan Parson (susan.parson@faa.gov) is editor of FAA Safety Briefing *and a Special Assistant in the FAA's Flight Standards Service. She is an active general aviation pilot and flight instructor.*

GENE TRAINOR

FAA Faces

Earl Lawrence

Executive Director, Aircraft Certification Service

With the appointment of Earl Lawrence as the Executive Director of the FAA's Aircraft Certification Office (AIR), the GA community has one of its own at the helm.

Lawrence has 35 years of experience flying and maintaining small aircraft. He holds a commercial multi-engine pilot certificate, as well as an airframe and powerplant mechanic certificate with an inspection authorization.

He draws his love of aviation from his experience as a child of the 1960s, when he watched in awe as the astronauts landed on the moon. Since then, Lawrence has been fascinated by the aviation industry, and his love for the skies has never ceased.

Before being named AIR's Executive Director in 2018, Lawrence was the Executive Director of the Unmanned Aircraft Systems (UAS) Integration Office. His FAA career also includes managing the FAA's Small Airplane Directorate from 2010 to 2015.

In his current role as Executive Director of the Aircraft Certification Service, Lawrence oversees the team that certifies that aircraft and aviation products comply with FAA safety standards; assists with accident investigations; monitors the aviation manufacturing businesses; and sets policies and standards to help keep the flying public safe.

A key focus area for Lawrence is to continue and expand collaboration with pilots, mechanics, technicians, and indeed all those who are on the front lines of the industry. Lawrence believes that these are the individuals who best know how to maintain and improve safety.

He calls pilots and mechanics the "doers" of the aviation field, and recognizes that they are the ones who are most at risk if an accident should happen. Lawrence champions a sense of collaboration in the aviation community and, as he puts it, he looks to "leverage the wisdom and knowledge of the doers in aviation."

"This is all about the people, and safety to me is personal," explains Lawrence. Over the years, he has lost friends and colleagues to accidents. For that reason, he wants to continue to improve FAA efforts to get safety equipment installed on helicopters and small airplanes. "We want to enable quicker introduction of new technology that enhances safety even more," he says.

Lawrence is well aware that the challenge he and his team face is how to balance the need for safety without making FAA requirements so rigorous that installing safety equipment becomes too burdensome or costly.

"For small aircraft, the level of scrutiny required for airliners can make the cost of installing safety equipment beyond what most people in general aviation can afford," Lawrence explains. To reduce the burden and cost, the agency has therefore streamlined the approval process to allow installation of Non-Required Safety Enhancing Equipment (NORSEE), such as systems that warn pilots about approaching terrain or objects.

In his role as Executive Director, Lawrence looks forward to continuing the involvement of pilot and mechanic associations in FAA rulemaking committees, encouraging pilots and mechanics to comment on FAA safety efforts, and inviting pilot and mechanic leaders and experts to participate in FAA safety forums and conferences. If you want to offer your views, you can comment to the FAA directly at www.faa.gov/contact.

Gene Trainor is a technical writer and editor for the Rotorcraft Standards Branch in Fort Worth, Texas. He previously worked as a newspaper reporter and editor.

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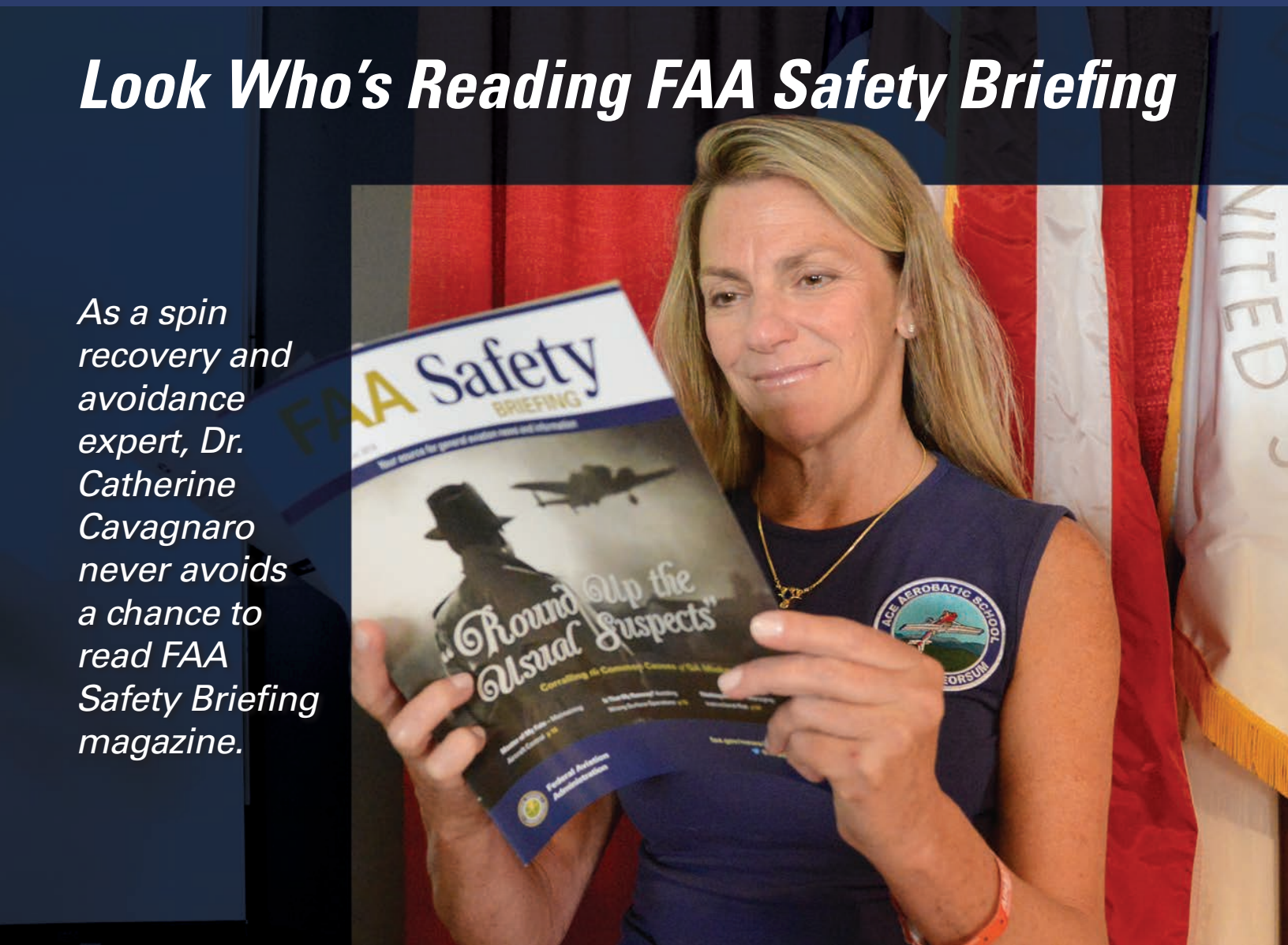

As a spin recovery and avoidance expert, Dr. Catherine Cavagnaro never avoids a chance to read FAA Safety Briefing magazine.