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FAA Certification: A Profound Commitment to Safety

Boeing has been designing and manufacturing airplanes for nearly 100 years and designing and manufacturing commercial jets for more than 50 years. Boeing's most recent new airplane, the 787 Dreamliner, builds upon that accumulated innovation, learning, and expertise. It also represents more than half a century of working with the expert regulators of commercial airplane safety in the United States.

Boeing has worked with the Federal Aviation Administration (FAA) since U.S. President Calvin Coolidge signed the Air Commerce Act of 1926 authorizing the U.S. government to establish airways and navigation standards, issue airworthiness certificates, license pilots and investigate aircraft incidents.

The Boeing-FAA relationship is built on respect, trust and a common purpose: ensuring the safety and efficiency of the global air transportation system, and most important, the safety of the people who depend on it.



Airplane certification basics

Certification, required by Title 14 of the Code of Federal Regulations (CFR) Part 21, is the process used by airplane manufacturers, such as Boeing, and the FAA to ensure airplane safety. An airplane cannot enter service unless a manufacturer has demonstrated that an airplane complies with applicable airworthiness regulations and the FAA agrees they've been met.

Conceptually, achieving FAA certification is a simple process – apply to the FAA, understand the rules, develop a plan to meet the regulations, demonstrate compliance and receive certification. But in reality, the process is much more complex.

Four FAA certificates are required before operators can introduce new models into their fleets and begin commercial flights:

- Type (14 CFR Parts 21, 25, 26, 34, 36) – ensures that the airplane complies with regulations.
- Production (14 CFR Part 21) – ensures the integrity of production and quality

systems and facilities and that production can be replicated.

- Airworthiness (14 CFR Part 21) – validates the airplane’s design (structure, systems and redundancies).
- Operating (14 CFR Part 121) – ensures that the airline has the systems and infrastructure to operate, maintain and fly.

Just when the certification process begins depends on the kind of airplane program or action under consideration. For a development program – or new model – the process begins during the product development stage when engineers are defining performance, systems, physical and structural requirements. When changes need to be made to an airplane model currently in production, certification begins with the change request or change authorization. When customers or Boeing requests changes to an existing model, the process begins when the request is submitted to the FAA.

At a high level, the certification process is a series of steps that generally include: planning how to meet federal requirements; gathering non-flight test compliance data showing compliance; flight testing to show compliance; and finally, closure. At closure, the FAA reviews program and certification documents to assess whether the company satisfied regulatory and compliance requirements.

Certification is comprehensive, intricate, and labor-intensive. The FAA’s Aircraft Certification Office has 950 engineers and inspectors in 38 field offices. The FAA has 10 Aircraft Certification Offices (ACOs) which are responsible for approving the design certification of aircraft, aircraft engines, propellers, and replacement parts for those products. The certification oversight and approval for the 787-8 was conducted by the Seattle ACO.

International certification

Internationally, certification authority is determined by the “state of design,” meaning the country in which the engineering design work occurred. The relationship between the FAA and international agencies is spelled out in bilateral agreements that dictate the certification process and compliance. Non-U.S. civil aviation authorities review and, in many cases, adopt FAA determinations, while also imposing unique requirements of their own.



How does the FAA establish requirements?

Setting certification requirements begins with what is called the “certification basis,” a document Boeing submits that proposes the criteria for its new airplane design. After FAA review and approval, these criteria are incorporated into Boeing’s certification plan, which is designed to demonstrate compliance with all regulatory requirements.

The final FAA certification basis comprises the following areas: airworthiness standards, fuel venting and exhaust emissions, and noise standards and continued airworthiness and

safety improvements. Where existing regulations are ill-suited to address novel or unusual design features, the FAA develops and applies new requirements called “special conditions.”

These special conditions ensure that new design features are fully addressed in the certification process.

Roles and responsibilities



Aviation safety is a shared responsibility – and while the FAA is the primary regulator of aviation safety in the U.S. – it, Boeing and the aircraft operators have distinct roles.

The FAA establishes design, manufacturing, and operations regulations and issues findings indicating whether parties are in compliance. Boeing, as the airplane manufacturer, “owns” airplane designs; demonstrates compliance with FAA regulations; and proves its facilities, manufacturing and quality processes can replicate production reliably. Operators – usually an airline – must operate and maintain their fleets.

Delegated authority

Boeing works with the FAA throughout the certification process. When Congress created the FAA in 1958, it recognized the practical and fiscal necessity of using private sector expertise to keep pace with the growing aviation industry. If FAA officials were to analyze and review compliance with every single certification requirement, it would require thousands of new engineers and inspectors, additional facilities, and likely hundreds of millions in new funding from Congress. Accordingly, the FAA gave the agency the authority to delegate certain certification activities, as the agency deems necessary, to qualified persons. The designee program itself has roots as far back as 1927, and the Federal Aviation Act continued and allowed for the expansion of delegations of authority. The FAA oversees designee activities and any authorized compliance finding made by a designee or delegated organization is, in effect, an FAA finding.

The FAA began reorganizing and consolidating its designee programs in 2005. By November 2009, all companies that had applied for organizational designee status, including Boeing, had completed the transition as required by the FAA. Boeing’s receipt of Organization Designation Authorization (ODA) allows Boeing employees to perform certain delegated activities on behalf of the FAA, subject to strict FAA oversight and compliance with FAA procedures. This delegation of authority allows the FAA to prioritize its review of issues and to ensure that its own expert personnel are devoted to the highest-value activities, such as new aircraft certification.

In the next 20 years, the worldwide fleet of airplanes is expected to double, which means that in addition to expanding airline fleets with existing airplane models, new models will be introduced. Such a dramatic increase in volume could stretch FAA resources and distract the agency from its priorities – safety, rulemaking and certification. The delegation system ensures that the FAA is able to focus on these critical priorities, while delegating routine compliance activity to manufacturers, subject always to strict oversight by the FAA.

In-service safety

In addition to certification, the FAA has a continuing duty to monitor certificate holders. Boeing supports the FAA's oversight activities after airplanes are in service, monitoring issues that arise, issuing service bulletins to operators, and reporting any problems to the FAA. In-service operations are part of the continued learning regarding the safety and reliability of the design, and part of learning how designs can be improved on future models.

Boeing and the FAA work in partnership on safety initiatives under the Continued Operational Safety Program, in which engineering teams thoroughly review data from in-service events. Should safety-of-flight issues arise, meaning those that could compromise the safe operations of an airplane, Boeing and the FAA take action to mitigate risk, identify solutions and provide guidance to operators. These recommendations are often converted to mandatory airworthiness directives (AD).

787 Dreamliner certification

The 787 Dreamliner represents the most exhaustive certification effort ever undertaken at Boeing, not surprising given the range of new technologies, systems and materials embedded in its design. Boeing applied to the FAA for certification of the 787 in March 28, 2003. That began a process that, over the course of eight years, required thousands of



demonstrations of the 787's safety from design review to component testing to system and structural testing to thousands of hours of flight testing. Beginning at the design phase, every element of the 787 was examined and evaluated to determine how it performs both separately and in conjunction with other parts and systems.

At the conclusion of the certification process, the FAA reported that its staff logged 200,000 hours of technical work on the 787 type certification. Boeing

employees exceeded that mark while showing compliance with more than 1,500 airworthiness regulations and presenting 4,000 documents comprising test plans, flight test reports and safety analyses. Boeing employees also demonstrated compliance with over 16,000 federal requirements relating to inspection, test parts and setup. Boeing received FAA type certification for the Dreamliner in August 2011.

The eight-year certification process for the 787 was the most rigorous in Boeing's history, and the design of the 787 incorporates nearly a century of aviation learning and safety improvements. When the 787 returns to service, passengers should know that it is safe, that it is technologically the most advanced airplane in history, and that they are experiencing an airplane that is a milestone in the history of the safest mode of transportation in the world.

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