# Safer, Faster, Cheaper:

## Aviation Certification for the 21st Century

*- Appendices -*

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## - Appendices -

Eno
Center for
Transportation

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# List of Abbreviations

AFS – Flight Standards Service

AIR – Aircraft Certification Service

ARC – Aviation Rulemaking Committee

ATC – Air Traffic Control

ATO – Air Traffic Organization

BASA – Bilateral Aviation Safety Agreement

CFR – Code of Federal Regulations

COS – Continued Operational Safety

CTO – Control Tower Operator

FAA – Federal Aviation Administration

GAO – U.S. Government Accountability Office

MTOW – Maximum Takeoff Weight

NAS – National Airspace System

NextGen – Next Generation Air Transportation System

NRC – National Research Council

ODA – Organization Designation Authorization

OIG – U.S. DOT's Office of the Inspector General

RCCB – Regulatory Consistency Communications Board

U.S. DOT – U.S. Department of Transportation

# 1. Foreword

This document offers a more in-depth analysis on two areas that are addressed in the full report *Safer, Faster, Cheaper: Aviation Certification for the 21st Century*. The first is a more technical explanation of how certification of aviation products, air traffic controllers, and repair stations works. The second is a chronological literature review of the numerous reports, mainly from governmental sources, that have been produced since the 1980s about aviation certification.
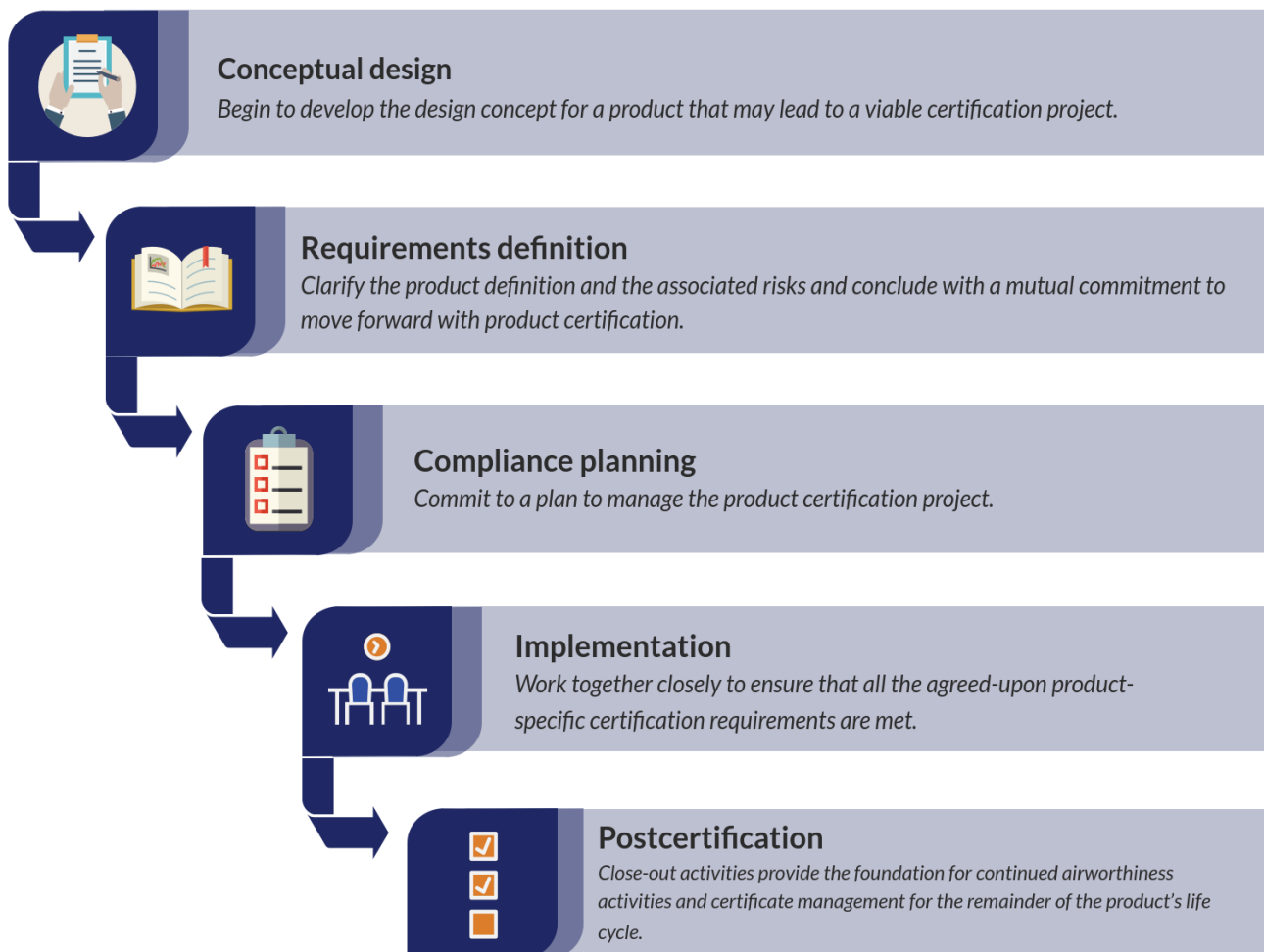
# 2. Detailed Overview of Certification

## 2.1 Aircraft and components

Aircraft certification is the responsibility of the Federal Aviation Administration's (FAA) Aircraft Certification Service (AIR). According to AIR, this office has a team of approximately 690 engineers and 250 inspectors. The majority of these engineers and inspectors are in aircraft certification offices or oversight offices supporting type certification, i.e. certificate for specific aircraft, and continued operational safety, while the remaining perform regulatory and policy work. These FAA experts issue certifications and approvals for new aircraft and aircraft articles, designs and production approvals, as well as for major changes to the designs. The design and production approvals include completed aircraft, aircraft engines and propellers as well as the avionic equipment (electronic elements in the aircraft) needed to use the Next Generation Air Transportation System (NextGen) modernized airspace. According to AIR, by the end of 2016, the department was working on over 7,500 certification projects, including almost 3,000 new and amended type certificates, and over 2,200 new and amended supplemental type certificates. In fiscal year 2013, AIR issued 3,496 design approvals, 57 production approvals, and 535 airworthiness certificates.

Figure 1 shows the key phases of the certification process for these aviation products.

**Figure 1. Key phases of the certification process for aviation products**

**Conceptual design**
*Begin to develop the design concept for a product that may lead to a viable certification project.*

**Requirements definition**
*Clarify the product definition and the associated risks and conclude with a mutual commitment to move forward with product certification.*

**Compliance planning**
*Commit to a plan to manage the product certification project.*

**Implementation**
*Work together closely to ensure that all the agreed-upon product-specific certification requirements are met.*

**Postcertification**
*Close-out activities provide the foundation for continued airworthiness activities and certificate management for the remainder of the product's life cycle.*

*Source: U.S. Government Accountability Office, "Aviation Safety: Status of Recommendations to Improve FAA's Certification and Approval Processes", GAO-14-142T, 2013.*

The Code of Federal Regulations (CFR) governs the certification for aviation products. Within the CFR, there are several "parts" that pertain to the processes for certification. These parts and how they function are described below.

Title 14**,** Chapter I, Subchapter C, of CFR provides the framework for the issuance of type certificates for products, articles, and processes. Type certificates are issued for aircraft, aircraft engines and propellers. Other approvals cover articles that will be installed on those products. A design approval indicates that the drawings and specifications show compliance with applicable airworthiness standards.

While Subchapter C is presently composed of 17 different parts, the most relevant for this discussion are: parts 21, 23, and 25. Part 21 relates to the certification procedures for products and articles, Part 23 is the standard for smaller aircraft (up to 19 seats and a maximum takeoff weight (MTOW) of 19,000 lbs. for commuter planes, or up to nine seats and an MTOW of 12,500 lbs.), and Part 25 is for large transport category airplanes with

multi-engines and more than 19 seats or an MTOW greater than 19,000 lbs. Besides what is present in the basic regulations, there are also other rules and guidance, such as advisory circulars, and policy statements that regulate the certification of part 23 and part 25 airplanes.[1]

## 2.2 Air traffic control and air traffic controllers

For air traffic controllers, different regulations apply depending on the type of work they do. There are regulations that apply, for example, to a control tower operator (CTO), or for controllers in other facilities like en route centers or approach control.

Like with aircraft and components, the certification rules for air traffic control (ATC) and controllers can be found in Title 14. CTOs are certified under Title 14, Chapter I, Subchapter D, Part 65, Subpart B. This subpart requires that persons at a tower must possess a tower rating or a tower operator certificate. It also lays out the written and practical tests required for issuance of those certificates. While many ATC tower operators are FAA employees, others work for one of the three private companies (RVA, Midwest, and Serco) that operate towers under the Contract Tower Program.[2]

However, this certification process, along with its accompanying Order 8000.90B, only applies to air traffic controllers certified in an air traffic control tower. It does not apply to en route centers or approach control air traffic controllers. For those, internal FAA guidance applies, namely Order 3120.4P, Air Traffic Technical Training. There is no explicit certification regulatory scheme for the two functions; the government is both the provider and the safety arbiter of the air traffic control system. Regulations apply to the public, not the agency.

Order 3120.4P sets forth how air traffic controllers are trained. Chapter 6 establishes the training requirements, while the appendixes provide the technical details for all positions.

Chapter 6 of this order also establishes requirements and procedures for standardization of instruction and evaluation of on-the-job training and position certification process. It directs each facility to establish target hours, minimum certification hours, and on-the-job training hours for each operational position. The hours can be adjusted depending on whether the trainee in question has previous experience or not (for example, if the trainee was transferred from another FAA facility of if it is the trainee's first assignment).

Each trainee is assigned to a training team that measures their progress and provides consistent feedback. The instructors for each team must undergo training from their own superiors prior to their assignment.

At the conclusion of the training period, the trainees undergo a certification skill check, which determines if the trainee has knowledge and skill level necessary to work on their own in that position. Figure 2 provides an overview of the certification process for these controllers.

**Figure 2. On-the-job training and certification process for air traffic controllers**



Legend:
OJF: On-the-job familiarization
OJT: On-the-job training
SET: Skill enhancement training
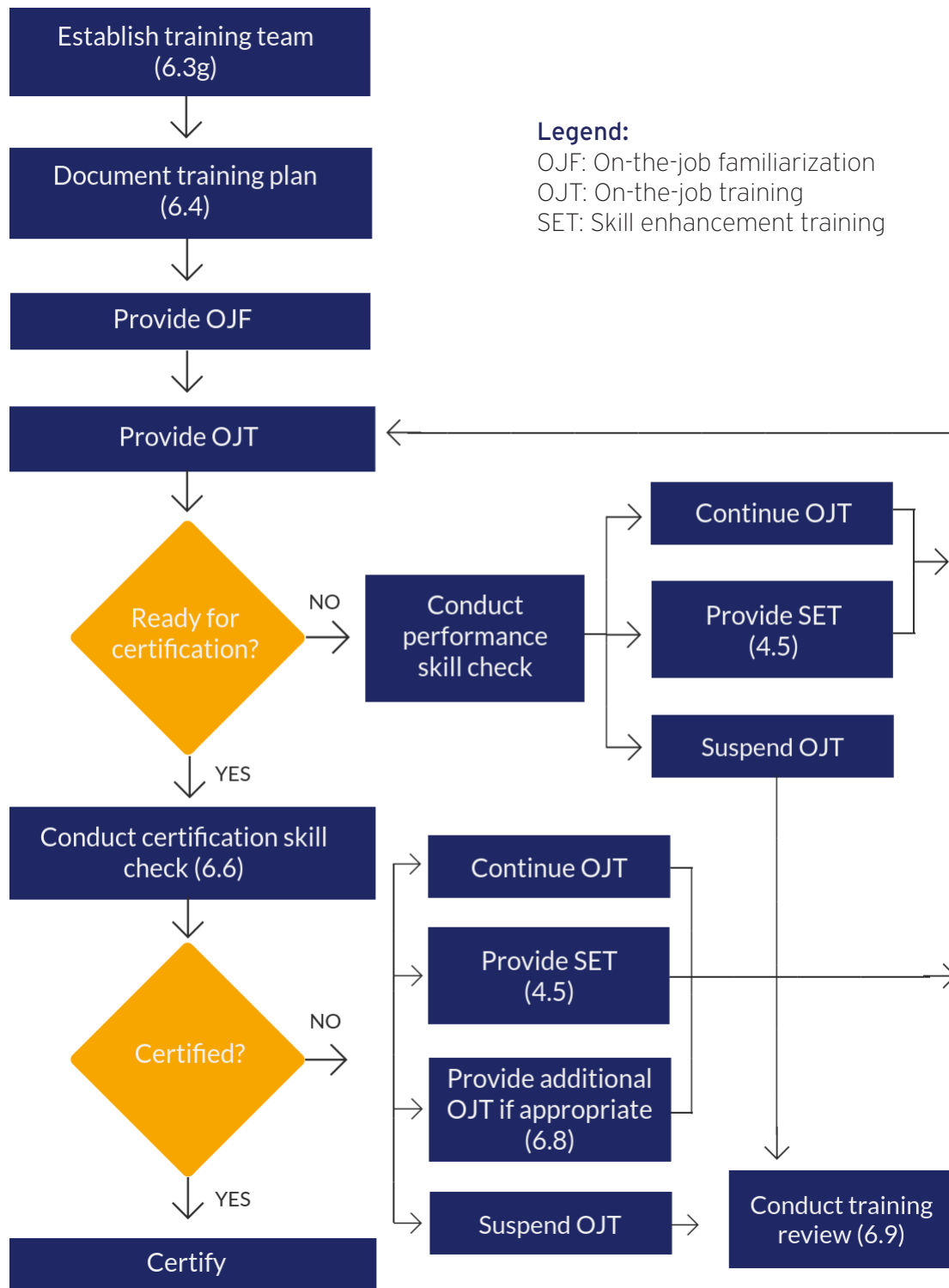
*Source: Federal Aviation Administration, "Order JO 3120.4P", U.S. Department of Transportation, 2015.*

For control tower operators, aforementioned Order 8000.90B applies in some cases. Up until 2015, all control tower operators had to receive a certificate under this internal mandate; since then, a controller that holds a credential with a tower rating provided under Order 3120.4P s exempt from getting a CTO certificate.

For those that still require a CTO certificate, Order 8000.90B establishes the requirements. To get a CTO certificate, trainees must pass an Airman Written Test, administered by a credentialed CTO examiner. After passing the exam, the person will be required to take a facility-specific-rating test, which is specific for the type of facility they will be working on.

## 2.3 Repair stations

Repair stations' certification is under the purview of the Flight Standards Division (AFS) of the FAA. Figure 3 shows the key phases of their certification process.

*Figure 3. Key phases of the certification process for air operators and air agencies*

**Pre-application**
The applicant delivers a pre-application statement of intent to an FAA field office

**Project acceptance**
FAA field office & division managers accept or reject the certification project based on available resources

**Project assignment**
The field office manager assigns the project to a manager (and an additional inspector, as necessary)

**Project schedule**
The field office manager determines if an accepted project can begin at a time that meets the office's workload and is agreeable to the applicant

**Formal application**
The applicant submits a formal application, including a schedule of events. The district office and certification team review the application, may hold a formal application meeting, and determine whether to accept the application

**Document compliance**
The certification team reviews and, if they meet standards, approves the applicant's manuals and other documents

**Demonstration and inspection**
The certification team inspects the applicant's faciliites and equipment and observes personnel in the performance of their duties. The team emphasizes compliance with regulation and safe operating practices

**Certification**
The certification team issues the applicant a certificate with a number, creates a file and surveillance plan, and files a certification report.

*Source: U.S. Government Accountability Office, "Aviation Safety: Status of Recommendations to Improve FAA's Certification and Approval Processes", GAO-14-142T, 2013.*

Repair station certification is regulated under Title 14, Chapter I, Subchapter H, Part 145 of the CFR. Generally, the company must have the house, facilities, equipment, personnel, materials, and data necessary to accomplish maintenance, preventive maintenance, and alterations. The company must also provide a repair station and quality manual, training manual, and forms manual that explains how it will operate and ensure that the work it performs is correct.

The repair stations can hire non-certified mechanics (and in fact only around 35 percent of the 141,000 maintenance personnel employed by U.S. repair stations are certified), but those mechanics need to be supervised by a certified mechanic.[3] In turn, the certified mechanic also has to give return to service approval after the work is completed. The FAA certificate will then state the repair station location, and the "rating" it has (i.e., the type of services and equipment it is certified to maintain).

Repair stations can hold their certifications indefinitely, with two exceptions. A station can surrender its certificate if the FAA accepts it for cancellation. More severely, the FAA can suspend or revoke certifications if an inspection (which can be conducted at any time) shows a repair station to be out of compliance.

For repair stations in countries in which the U.S. has a bilateral aviation safety agreement (BASA), the FAA may issue a certificate if a repair station already has a certificate from its own national authorities, creates a manual describing how "special conditions" will be handled, and passes an audit for the additional requirements by the "domestic" national aviation authority. For example, the FAA has an agreement with 18 European Union members. In those countries, 407 repair station certificates have been issued by the FAA, with EASA and local authorities being responsible for day-to-day oversight.[4]

BASAs remove duplicate oversight, saving the industry and the agencies resources. Each authority, including the FAA, maintains responsibility to make "foreign" repair stations comply with domestic regulations. A 2015 report by the Office of the Inspector General (OIG) at the U.S. Department of Transportation (U.S. DOT) indicated that the FAA might not be fulfilling its oversight requirements when handing repair station certification to foreign authorities.[5] Because of these findings by the OIG and the Government Accountability Office (GAO), there have been worries that some of these foreign repair stations might not be following the same safety standards as U.S.-based repair stations.

The 2016 FAA authorization extension has language aimed at enhancing oversight over these foreign repair stations. These provisions relate to oversight of repair stations that perform "heavy maintenance" of commercial airliners, employees' background checks, and alcohol and controlled substance testing.[6]

# 3. Literature Review

Over the past few decades, the FAA's ability to ensure efficient and effective certification processes has been evaluated and brought into question; typically in terms of how the FAA certifies aviation products and oversees airline safe practices. This section provides a historical perspective of FAA certification since the 1980s, with a more detailed analysis on the most recent developments.

## 3.1 1980s

Queries and studies during the 1980s focused on the safety of products. Reports concluded that the FAA lacked the expertise to oversee the aviation safety system.

### 3.1.1 1980 National Research Council Report

Following the crash of American Airlines flight 191 in Chicago in May 1979, which killed 273 people, Secretary of Transportation Neil Goldschmidt commissioned the National Research Council (NRC) to study the FAA's "policies and procedures for certifying the airworthiness of commercial transport aircraft."[7] At the time, there were about 3,000 FAA certification personnel.

Initially, it was thought that a design problem in the aircraft (a McDonnell Douglas DC-10-10) caused the accident and the FAA grounded all aircraft of the type until a solution was discovered. Eventually, maintenance was found to have been the problem.

The report validated the confidence in the safety of the system, despite the Chicago and other high-profile accidents. But it also noted that the certification system needed improvement. Three main issues were discussed in the report:

1. *Type certification and rulemaking*, i.e., the certification of an aircraft and its components. The report concluded that the level of technical oversight was superficial in many instances due to lack of experts within the FAA, inconsistent interpretations of regulations, and lack of communication among and between the FAA's headquarter services divisions and regional offices;
2. *Production and maintenance.* The report noted complacency during these certification stages and advised the FAA to increase its emphasis on quality assurance, and to make use of more oversight audits and inspections, including unannounced ones.
3. *Leadership and advice.* The report recommended creating a panel of experts to advise the FAA on new standards for rapidly changing technology and who to hire for senior FAA-career positions.

The report had three main recommendations for FAA's certification system, and one related to aircraft design. The latter was to require aircraft to be more damage-tolerant and able to land with severe structural impairment.

**As to the FAA's certification processes, the report recommended:**

1. The need for highly competent, dynamic, and longer term FAA leadership.
2. Improved FAA technical staff with greater levels of competence, which would require significant organizational changes.
3. Creation of a committee, reporting to the FAA Administrator, to provide advice on the application of new technologies.

### 3.1.2 1980 House of Representatives Report

In 1980, the Government Activities and Transportation Subcommittee of the House of Representatives' Committee on Government Operations published a damning report on the FAA that concluded, "deficiencies in the certification process have and could continue to create serious hazards to aviation safety."[8] The report identified deficiencies in all three phases of the certification process: the *design phase*, *manufacturing*, and during the *flying life of the aircraft*.

The report found two fundamental problems. First, the FAA had become oriented to the needs of the industry, not the travelling public. Second, the FAA failed to apply the agency's limited resources appropriately. The report recommended that Congress remove the promotion of air commerce from the FAA's charter. At the time, the agency's mission was to "promotion of civil aeronautics and safety of air commerce" and regulate safety which created a perceived conflict of interest. Eventually, during the 1990s, that mandate was removed from the FAA charter. Echoing other studies and congressional direction, it also recommended that the FAA delegate more certification tasks.

### 3.1.3. 1988 and 1989 GAO reports

The lack of a qualified FAA workforce, highlighted in the 1980 NRC report, was discussed in two GAO reports.[9] The reports focused on two issues: delays in obtaining new inspectors and training challenges.

Delays in obtaining new inspectors were blamed on a hiring freeze that resulted from a delay in congressional appropriates, as well as a backlog at the FAA training facilities. However, the GAO also found that the FAA did not centralize recruitment; rather staffing was an issue handled locally. Additionally, the GAO noted that inspector recruitment efforts had been limited.

The GAO also discovered that during some flight checks the FAA inspectors overseeing the pilots did not have proper recurring flight training and/or had expired qualifications. Airworthiness inspectors, which audit maintenance programs and certificates, were working without the FAA-required training. The FAA asserted that it prioritized training for new hires over recurrent or additional training for working inspectors. Nevertheless, in the early 1990s, the GAO reported on continuing issues in the same areas.[10]

FAA training was the subject of another GAO report in 2005, which showed a much-improved situation.[11] The report concluded that the FAA adopted many previous GAO recommendations. However, around half of FAA inspectors claimed a lack of needed technical knowledge. To that GAO finding, the FAA responded that many inspectors wanted competencies in areas not critical for their assigned safety oversight roles.

## 3.2 1990s

Research published in the 1990s continued to report on significant challenges with FAA certification. The agency's failure to act upon numerous recommendations was highlighted by these documents.

### 3.2.1 1993 GAO report

In 1993, aircraft certification still had major flaws. The increased complexity of aircraft design introduced since the early 1980s had only exacerbated the issues. A GAO report concluded that the FAA delegated many responsibilities under its various programs[12] (up to 95 percent in 1989, compared to 70 to 75 percent in 1980, and an increase of 300 percent in the number of designees), but failed to ensure effective oversight and that its staff had technical knowledge for appropriate oversight.[13] While the certification process led to generally safe airplanes, the report argued that it was due to the efforts, expertise, and high commitment to safety of the aircraft manufacturers. The contribution of FAA to that safety record was unclear.

On the issue of delegation, the report concluded that the FAA did not:

1. Define critical activities in which its staff must be involved;
2. Establish the necessary level and quality of oversight of designees;
3. Define standards to evaluate staff members' performance.

The GAO also reported that the FAA did not hire enough experts or provide enough training for existing personnel, creating a knowledge gap between FAA and industry. Additionally, the experts' role in certification was not well defined, leading to suboptimal use of time and expertise. Many times, the report explained, experts became involved late in the process resulting in a loss of effectiveness and efficiency. The problems were essentially the same as those identified by the NRC in 1980, the GAO added.

The report recommended that the FAA should define a minimum effective role in certification by identifying critical activities requiring oversight. It suggested that FAA experts should be involved early and at key junctures in the certification process. It also recommended that the FAA hire more experts and establish better training programs for existing personnel.

### 3.2.2 1996 GAO report

In 1996 the GAO reported on the FAA's progress in implementing the recommendations that both the GAO and other entities had made since the beginning of the decade.[14] This was an overarching report with a section dedicated to certification.

The report concluded that while the FAA mostly agreed with the recommendations that these entities made to the agency, it failed to implement them in a timely manner. Overall, when responding to recommendations, the agency failed to provide completion dates, resulting in an inability for Congress and other governmental overseers to measure the FAA's progress. Nevertheless, the GAO found that FAA was generally making progress in the certification arena by implementing recommendations from previous years.

The GAO recommended that the Secretary of Transportation direct the FAA Administrator to provide timely responses to Congressional requests. These responses should include timelines for implementation, and the Secretary should monitor FAA's implementation of recommendations, especially the ones more critical to safety.

### 3.2.3 1997 Mineta Commission

The 1996 FAA reauthorization bill included the establishment of a National Civil Aviation Review Commission tasked to perform an independent assessment of FAA financial requirements.[15] The Commission was chaired by former Representative Norman Mineta and became colloquially known as the Mineta Commission.[16] One of the areas that the commission studied was FAA's safety oversight role, including certification.

One major concept of the Mineta Commission was for FAA to become a more performance-based organization. That concept led to the creation of the Air Traffic Organization (ATO) within the FAA in 2000. Since then, the ATO is the agency's branch responsible for operating air traffic control.

For its certification responsibilities, the commission recommended that stakeholder involvement should be sought to prioritize FAA initiatives. That prioritization was to be risk-based, i.e., FAA involvement in certification should focus first on activities that have greater safety risks. Finally, implementation of any recommendations should be evaluated based on performance measurements.

The commission also provided recommendations regarding international cooperation by suggesting greater use of bilateral agreements. This measure would reduce duplicate international certification work. Additionally, work to harmonize regulations between the U.S. and other countries could reduce certification work on exporting aviation products.

## 3.3 2000s

While critical, reports during this era moved from safety issues to focus on procedural issues and inconsistent interpretation of regulations. Repair stations were also the topic of several reports during this period.

### 3.3.1 2005 OIG Report

The OIG studied the issue of repair station oversight in reports in 2003, and then again in 2005.[17]

The 2005 report noted that airlines were increasing the use of repair stations, instead of relying on in-house capabilities to maintain their fleets. While stressing that using repair stations was not inherently problematic, it was noted that the FAA concentrated most of its oversight on the airlines' in-house maintenance procedures, instead of where the maintenance was actually performed, i.e., the repair stations. The OIG cited the example of an unnamed airline that received 400 inspections on its in-house maintenance activity in a given year, while the contract maintenance at repair stations was audited only seven times. This was despite around 50 percent of this airline's maintenance activities being done at the outsourced repair stations.

On the issue of foreign repair stations, the report explained that there are agreements with other countries to allow the FAA to accept those countries' oversight for repair stations. However, the OIG noted, the FAA had not developed an adequate system to monitor the surveillance to ensure FAAcertified foreign repair stations continued to meet U.S. safety standards.

To address these issues, the OIG recommended that the FAA adopt a risk-based oversight system to focus on the most critical elements of the aircraft maintenance industry. While the FAA showed openness to develop such a system, it needed to train its inspectors and develop new software for data analysis to move to such a paradigm.

### 3.3.2 2008 Secretary Peters' Blue Ribbon Panel

In early 2008, Secretary of Transportation Mary Peters commissioned a report on FAA's approach to aviation safety, namely its safety culture and its implementation of safety management.[18] The report followed allegations that the FAA had known about maintenance issues with Southwest Airlines' aircraft but had failed to act.

The report made recommendations in a number of areas. One was on airworthiness directives (FAA regulations mandating corrective actions or inspections to operating aircraft). It was recommended that the FAA should provide timely information on new mandated requirements, in advance of compliance dates, to all relevant FAA field offices and also allow the airlines to collaborate more closely with the agency in implementation measures to allow progress tracking.

Another recommendation was on FAA's voluntary disclosure programs, where certificate holders and their employees can report safety issues without punitive reactions. The report stressed the importance of these programs (of which there are several), that they should be retained, and that the certificate holders and employees should be incentivized to make use of them.

Finally, as to FAA's culture, the commission noted that it found the "FAA's aviation safety staff to be unambiguously committed to its core mission of safety." However, there was a wide variation in regulatory oversight, with personnel using different approaches depending on personal ideologies. Coherence and rationality in regulatory decision-making practices were needed, the report urged.

## 3.4 2010s

The 2010s, specifically the 2012 FAA reauthorization bill, brought significant action to solve the two major issues that stakeholders have identified with FAA certification: delays in approvals and inconsistencies in interpretation. Both areas were the subjects of Congressional-mandated committees.

### 3.4.1 2010 GAO Report

In 2010, GAO released a report that concluded that certification and approval procedures from both, AIR and AFS, FAA services were effective and contributed positively to the safety of the aviation system (their principal objective). However, the report found that there were concerns regarding delays in approvals and differences in interpretation of standards. [19]

Lack of resources and heavy staff workloads were also identified as issues. Delays and interpretation problems led to higher costs, negatively affecting the industry from a financial standpoint. While the FAA had been implementing a quality management system, which provided stakeholders a way to appeal FAA decisions, the FAA could not determine if the system was reducing inconsistencies in application of the agency's standards. The FAA did not have outcome-based performance measures and a continuous evaluative process to determine progress toward its goals. The GAO recommended the FAA to develop a continuous evaluative process and a method to track submissions through approval or certification.

### 3.4.2 2012 FAA Reauthorization - Section 312 Report

Section 312 in the *FAA Modernization and Reform Act of 2012* mandated that "the Administrator of the Federal Aviation Administration, in consultation with representatives of the aviation industry (…) conduct an assessment of the certification and approval process."[20] This led to the creation of the Aviation Certification Process Review and Reform Aviation Rulemaking Committee (Section 312 ARC), which released its report in May 2012.[21]

The committee reviewed and assessed the FAA's certification and approval processes. The report noted that only one-third of AIR resources are spent on actual production certification activities. The majority of FAA's manpower was used on other areas, such as Continued Operational Safety (COS) of the current U.S. fleet and updating standards to keep pace with emerging technology and industry innovation. The committee also found that the AIR workload is expected to grow because of:

1. Increased introduction of new aviation products, technologies and materials;
2. New rulemaking and fleet-wide safety initiatives;
3. International type validations;
4. Migration of technologies from large transport airplanes to other category aircraft.

**The committee recommended the following:**

1. Development of comprehensive means to implement and measure the effectiveness of implementation and benefits of certification process improvements;
2. Enhanced use of delegation;
3. Integrated roadmap and vision for certification process reforms;
4. Update Part 21 (the certification procedures for parts and products) to reflect a systems approach for safety;
5. Culture and change management;
6. Process reforms and efficiencies for other AIR functions.

In 2013 the FAA developed a plan with 14 initiatives to enable the implementation of the committee's recommendations.[22]

**The initiatives included:**

1. Development of an integrated roadmap for major change initiatives in certification;
2. Deployment of a system to monitor process improvement and effectiveness;
3. An Organization Designation Authorization (ODA) action plan;
4. Expansion of delegation in several areas;
5. Project sequencing process improvement;
6. Expediting rulemaking;
7. Consistency of regulatory interpretation;

In the same year, the FAA also released a long-term vision for its certification procedures, *AIR: 2018*.[23] By March 2017, 13 of the 14 initiatives were completed, a significant improvement from mid-2014 where only one had been completed. [24]

Following a recommendation of the Section 312 committee, the FAA announced in September 2014 that project sequencing, first implemented in 2005, would be replaced with the *AIR Project Prioritization and Resource Management*. [25]

### 3.4.3 2012 FAA Reauthorization - Section 313 Report

The 2012 FAA reauthorization also mandated, in Section 313, a study on the consistency of interpretation of regulations and standards.[26] As a result, the Consistency of Regulatory Interpretation Aviation Rulemaking Committee (Section 313 ARC) was created; its report was released in November 2012.[27]

**Using a case study approach, this ARC found issues in five areas:**

1. Rulemaking;
2. Application;
3. Issue resolution;
4. Training and lack of information;
5. Culture and organization.

**The committee identified three main causes for those inconsistencies:**

1. Unclear regulatory language leading to inconsistent application by inspectors and certificate holders;
2. Inadequate and nonstandard FAA and industry training leading to inconsistent regulatory application;
3. Reluctance by both industry and the FAA to work out issues in interpretation, with fears of delays and retribution leading to acceptance of inconsistent decisions.

To address these issues, the ARC proposed a series of recommendations on two main areas: improve the consistency of regulatory application by AFS and AIR, and improve the communication among and between those offices and the industry.

On the first topic, the ARC recommended that AFS and AIR review all guidance documents and interpretations to identify and cancel outdated material. The FAA should also consolidate all certification-related procedures and regulations in a single master electronic database that cross-referenced guidance material to its applicable rule.

The ARC also recommended the development of a standardized decision-making methodology for creators of policy and guidance material that ensures consistency among and between those documents and regulations. Furthermore, the ARC suggested a review and revision of FAA training procedures for its rulemaking and certification personnel to ensure that any proposed or enacted regulations had clear purpose, technical requirements, and intent.

On the issue of communication between the FAA and industry, the ARC recommended the creation of a board to provide timely resolution on questions related to the application of regulations, the Regulatory Consistency Communications Board (RCCB).[28] Finally, the Section 313 ARC also recommended the creation of a communication center to provide real-time guidance to FAA personnel and industry certificate/approval holders and applicants. By March 2017, two out of six initiatives to address the ARC recommendations were

completed, three were under way, and one (the creation of a communication center) was abandoned as the same result could be achieved by the RCCB without overburdening resources.[29]

### 3.4.4 2013 GAO Report

The GAO revisited FAA's certification processes in 2013.[30] In this report, the GAO studied the status of the recommendations it had made in 2010, as well as those in the Section 312 ARC report.[31]

In 2010, the GAO had recommended that the FAA should develop a continuous evaluative process and a method to track submission approvals. By 2013, the GAO reported that the agency addressed the first recommendation fully, with the creation of metrics that provide the ability to track process performance and product conformity to standards. The FAA partially addressed the second one by making changes in a software that it uses, which tracks how long certification submissions are wait-listed in order for resources to be allocated to better meet demand.

Regarding the Section 312 ARC recommendations, the GAO found that the committee "took a reasonable approach in assessing FAA's aircraft certification process and developing recommendations." The agency's response and plan to address the committee's recommendations were considered "generally relevant", but there was a need to create a better performance measurement process to track the success and effectiveness of any initiatives taken.

This GAO report, like its 2010 predecessor, concluded that FAA's certification processes generally works well, but when they do not, the result can be costly for both the industry and the agency. While the FAA implemented many of the changes proposed by GAO and others, ultimately success requires a cultural change in the agency's workforce and that resistance to such transformation would continue to be an issue.

### 3.4.5 2014 GAO Reports

At the request of both the House of Representatives and the Senate, GAO released two identical reports in July 2014.[32]

The reports updated Congress on the status of FAA's initiatives to address the Section 312 ARC report recommendations, since at the time only one out of 14 were completed (as of March 2017, 13 are complete). Once again, the GAO noted that the FAA continued to lack a performance measurement system to track the success and effectiveness of the initiatives taken.

Regarding regulatory consistency recommendations from the Section 313 ARC, the GAO reported the FAA was in the process of mapping all policy and guidance to relevant aviation safety regulations and developing an electronic system to maintain the information and make it accessible internal and external users. The FAA had taken steps to eliminate obsolete guidance and link existing policy and guidance to the relevant regulations.

Like the 2013 report, the GAO concluded that a cultural change would enhance execution of the recommendations, and workforce reluctance might delay FAA's implementation plans.

### 3.4.6 2015 National Research Council Report

In 2015, at the request of Congress, the NRC reported on the agency's plan for the certification of new technologies into the National Airspace System (NAS), namely those related to NextGen, FAA's air traffic control modernization program.[33]

The report concluded that the FAA's plan lacked detail and specificity and did not provide an effective guide for FAA research over the medium term. The agency's high-level task plan was not the detailed research strategy Congress requested. FAA's plan did not demonstrate how the integration of aircraft, ground systems, and procedures would occur, undermining confidence in NextGen's implementation. The agency included many details on background and scope, but not on scheduling, milestones (including on what had already been done), and budgeting.

The report had multiple recommendations for the FAA, many of which were technical in detail (for example, the need for a closer look at the issue of cyber-security). The principal recommendation requested that the FAA create a comprehensive research plan outlining the full context for the certification and implementation of NextGen elements, and their relationship to other NAS activities and procedures. With a detailed strategy the FAA could recover the confidence of stakeholders in the implementation of NextGen. Confidence would help obtain the necessary investments for comprehensive use of NextGen capabilities.

The report also recommended that the FAA study other governmental and international best practices, namely methodologies used by organizations like the U.S. Air Force, NASA, or NAV CANADA, the Canadian ATC provider.

### 3.4.7 2017 GAO Report

In a 2017 testimony before the Senate, GAO reported once again on the status of the FAA's effort to improve its certification processes.[34] The testimony focused on three main areas:

1. FAA's implementation of the Section 312 and 313 ARCs recommendations;
2. AIR internal reorganization;
3. Stakeholder's views of certification processes.

On the first issue, GAO reported that out of 14 initiatives resulting from the Section 312 ARC, FAA had already implemented 13. The last one, which required going through a rulemaking process, is delayed and is not expected to finish soon, as the White House is reviewing all agencies' regulatory efforts. On the Section 313 ARC six initiatives, two are completed, three are undergoing, and one has been abandoned as it duplicates efforts already addressed by the other five.

On the AIR internal reorganization process, GAO reported that the office is moving from a product-based structure (small airplanes, rotorcraft, etc.) to a functional one with five divisions (Figure 4). The agency's goal with this reorganization is to increase the efficiency and effectiveness of its certification processes, and to address stakeholder's expectations. On this latter point, FAA says the new structure will allow the agency to work with the industry earlier in the development of new products, streamlining the certification process and making it more consistent.

**Figure 4. Proposed AIR's organizational chart**



| Executive Director |
| --- |

| Executive Technical Support Staff |
| Fuels Program Staff |
| International Division |

| Deputy Executive Director, Regulatory Operations | Deputy Executive Director, Strategic Initiatives |

| Policy and Innovation Division | Compliance and Airworthiness Division | System Oversight Division | Organizational Performance Division | Enterprise Operations Division |
| --- | --- | --- | --- | --- |
| Supports aerospace innovation by creating novel means of compliance, develops and maintains AIR regulations, manages the CSTA program and overall fleet safety, as well as educational outreach | Issues all design approvals for both domestic and foreign manufacturer as well as production and airworthiness certificates, executes COS processes, and provides flight test support | Oversees all FAA approval, certificate, and bilateral partners in addition to the designee and delegation programs | Monitors and assesses the overall internal health of AIR, and provides strategic leadership for planning and change management within the organization | Provides core services that enable success throughout AIR, including human resources, financial management, workforce development, IT support, and information management |

*Source: U.S. Government Accountability Office, "Aviation Certification: FAA Has Made Continued Progress in Improving Its Processes for U.S. Aviation Products", GAO-17-508T, 2017.*

Finally, GAO reported that while the FAA has been implementing several recommendations that the GAO, the ARCs, and other entities have made to the agency, several stakeholders have expressed two main concerns about the agency's implementations of these initiatives. One issue is that the FAA continuous to fail to measure the benefits and effectiveness of the initiatives it implements. Without those metrics, the industry cannot know the impacts of any reform efforts. Second, stakeholders noted that when the FAA says an initiative is "completed" or a recommendation has been "addressed" that does not necessarily mean that any measurable outcome has changed. It merely means that the FAA has completed the bureaucratic process to address the recommendation.

# 4. Endnotes

1       Federal Aviation Administration, "Transport Airplane Directorate –
        Lists of Part 25/26 Rules and Their Associated Advisory Circulars and Policy
        Statements", U.S. Department of Transportation, 2016.

2       Federal Aviation Administration, "Transport Airplane Directorate – Lists
        of Part 25/26 Rules and Their Associated Advisory Circulars and Policy
        Statements", U.S. Department of Transportation; and National Air Traffic
        Controllers Association, "Federal Contract Tower Air Traffic Controllers",
        undated.

3       U.S. Government Accountability Office, "Aviation Safety: FAA's Risk-Based
        Oversight for Repair Station Could Benefit from Additional Airline Data and
        Performance Metrics", GAO-16-679, 2016.

4       Office of the Inspector General, "FAA Has Not Effectively Implemented Repair
        Station Oversight in the European Union", U.S. Department of Transportation,
        2015.

5       Ibid.

6       U.S. Government Publishing Office, "Public Law 114-190 – FAA Extension, Safety,
        and Security Act of 2016", 2016.

7       National Research Council, "Improving Aircraft Safety: FAA Certification of
        Commercial Passenger Aircraft", 1980.

8       Committee on Government Operations, "A Thorough Critique of Certification of
        Transport Category Aircraft by the Federal Aviation Administration", 96th
        Congress, 2nd Session, 1980.

9       U.S. Government Accountability Office, "Recruitment, Hiring, and initial Training
        of Safety-Related Personnel", RCED-88-189, 1988; and U.S. Government
        Accountability Office, "FAA Aviation Safety Inspectors Are Not Receiving Needed
        Training", RCED-89-168, 1989.

10      U.S. Government Accountability Office, "Problems Persist in FAA's Inspection
        Program", RCED-92-14, 1991

11      U.S. Government Accountability Office, " Aviation Safety: FAA Management
        Practices for Technical Training Mostly Effective; Further Actions Could
        Enhance Results", GAO-05-728, 2005.

12      Delegation of certification activities dates from the 1920s. The FAA has the
        authority to delegate certain functions to "private" persons. This authority allows
        the delegated organizations or individuals to perform certification functions on the
        agency's behalf, including approving designs.

13      U.S. Government Accountability Office, "Aircraft Certification: New FAA Approach
        Needed to Meet Challenges of Advanced Technology", RCED-93-155, 1993.

14      U.S. Government Accountability Office, "Aviation Safety: FAA Generally Agrees
        With but Is Slow in Implementing Safety Recommendations", RCED-96-193, 1996.

15      U.S. Government Publishing Office, "Public Law 104-264 – Federal Aviation
        Reauthorization Act of 1996", 1996.

16      National Civil Aviation Review Commission, "Avoiding Aviation Gridlock: A
        Consensus for Change", 1997.

17      Office of the Inspector General, "Aviation Safety: Observations on FAA's Oversight
        and Changes in the Airline Industry", U.S. Department of Transportation, 2005;
        and Office of the Inspector General, "Air Carriers' Use of Aircraft Repair Stations",
        U.S. Department of Transportation, 2003.

18    Sec. Peters' Blue Ribbon Panel on FAA's Approach on Safety, "Managing Risks in Civil Aviation: A Review of the FAA's Approach to Safety", 2008.

19    U.S. Government Accountability Office, "Aviation Safety: Certification and Approval Processes Are Generally Viewed as Working Well, but Better Evaluative Information Needed to Improve Efficiency", GAO-11-14, 2010.

20    U.S. Government Publishing Office, "Public Law 112–95 – Federal Aviation Administration (FAA) Modernization and Reform Act of 2012", Section 312 (a), 2012.

21    Aviation Certification Process Review and Reform Aviation Rulemaking Committee, "Recommendations on the Assessment of the Certification and Approval Process", 2012.

22    Federal Aviation Administration, "Detailed Implementation Plan for the Federal Aviation Administration Modernization and Reform Act of 2012, Pub. L. 112-95, Section 312", U.S. Department of Transportation, 2013.

23    U.S. Government Accountability Office, "Aviation Safety: Status of Recommendations to Improve FAA's Certification and Approval Processes", GAO-14-142T, 2013.

24    U.S. Government Accountability Office, "Aviation Certification: FAA Has Made Continued Progress in Improving Its Processes for U.S. Aviation Products", GAO-17-508T, 2017.

25    Federal Aviation Administration, "FAA Streamlines Aircraft Certification Process", U.S. Department of Transportation, 2014.

26    U.S. Government Publishing Office, "Public Law 112–95 – Federal Aviation Administration (FAA) Modernization and Reform Act of 2012", Section 313, 2012.

27    Consistency of Regulatory Interpretation Aviation Rulemaking Committee, "Recommendations on Improving Consistency of Regulatory Interpretation", 2012.

28    The failed 2016 FAA reauthorization proposals in both the House and the Senate also mandated the creation of such a communications board.

29    U.S. GAO, 2017.

30    U.S. GAO, 2013.

31    U.S. GAO, 2010

32    U.S. Government Accountability Office, "Aviation Safety: FAA's Efforts to Implement Recommendations to Improve Certification and Regulatory Consistency Face Some Challenges", GAO-14-728T, 2014 (House version); and Government Accountability Office, "Aviation Manufacturing: Status of FAA's Efforts to Improve Certification and Regulatory Consistency", GAO-14-829T, 2014 (Senate version).

33    National Research Council, "Transformation in the Air: A Review of the FAA's Certification Research Plan", 2015; and Federal Aviation Administration, "Research Plan: Methods and Procedures to Improve Confidence in and Timeliness of Certification of New Technologies Into the National Airspace System", U.S. Department of Transportation, 2014.

34    U.S. GAO, 2017.

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