

# The Incredible Complexity of Commercial Aviation

## **1. All the amazing numbers and a bit of history**

## **2. Regulations and Agencies**

FAA, CAB, NTSB, TSA, ATA, IATA, ICAO, EASA how they have advanced to keep us safe.

ETOPS. – Extended Twin Engine Range

## **3. Aircraft design and certification**

Safety records, performance improvements, engines.

Basics of aerodynamics of flight, typical commercial flight.

Airliners near ready for Service

## **4. Aircraft manufacturing**

Manufacturers, wood to composites, outsourcing, engines & introducing new airliners from Boeing, Airbus & the competition from China & Russia

## **5. Airline operations**

History, scheduling, fees, labor, fuel, catering, sales , introducing new airplanes

## **6. Aircraft maintenance and Airports**

FAA regulations, aircraft check levels, component repairs, problem feed back to FAA and manufacturers. Major airports' traffic, ownership, fees, regulations, employment.

## **7. Air traffic control ,737 MAX issues and the effects of Covid19 on the commercial airline industry**

FAA operations, purpose, system description the Next Gen system

## **8. Future of Commercial Aviation**

What is next in commercial aviation, UDF, new fuels, Supersonic Transport, more advanced materials, or?

## Session 2

### Regulations and Agencies

FAA, CAB, NTSB, TSA, ATA, IATA, ICAO, EASA how they have advanced to keep us safe.

ETOPS – Extended Twin Engine Range

# Regulations-History of U.S. Airline Regulations

- **1920** - The Growing Need for Regulation
  - Air Mail Service was initiated
  - Air traffic was continuing to grow and prosper
  - Aviation was becoming very dangerous with many accidents and lives lost
- The **Air Mail Act of 1925** facilitated the creation of a profitable commercial airline industry, and airline companies such as **Pan American Airways**, **Western Air Express**, and **Ford Air Transport Service** began scheduled commercial passenger service
- The **Air Commerce Act** in **1926** charged the Secretary of Commerce with fostering air commerce, issuing and enforcing air traffic rules, licensing pilots, certifying aircraft, establishing airways, and operating and maintaining aids to air navigation
- A new **Aeronautics Branch** in the Department of Commerce assumed primary responsibility for aviation oversight
- **1934**, the Department of Commerce renamed the Aeronautics Branch the **Bureau of Air**  
The **Bureau** encouraged a group of airlines to establish the first air traffic control centers (Newark, Cleveland, and Chicago ) to provide in-route air traffic control
- **1936**, the Bureau took over these centers
- **1938 Civil Aeronautics Act** established the independent **Civil Aeronautics Authority (CAA)**
  - It established a three-member **Air Safety Board** that would conduct accident investigations and recommend ways of preventing accidents
  - It also expanded the government's role in civil aviation by giving **CAA** power to regulate airline fares and determine the routes individual carriers served

# Regulations-History of U.S. Airline Regulations

- **1940** the **CAA** was split into two agencies, the **Civil Aeronautics Administration (CAA)** and the **Civil Aeronautics Board (CAB)**
- The **CAA** retained responsibility for:
  - Air traffic control
  - Airman
  - Aircraft certifications
  - Safety enforcement
  - Airway development
- **CAB** responsibilities included:
  - Safety rulemaking
  - Accident investigation
  - Economic regulation of the airlines
- **1958**, the **Federal Aviation Act**, transferred the **Civil Aeronautics Authority's** functions to a new independent **Federal Aviation Agency** responsible for civil aviation safety
- **1966** Congress established the **Department of Transportation (DOT)**
- The **Federal Aviation Agency** became one of several organizations within **DOT** and received a new name, the **Federal Aviation Administration (FAA)**
- The **CAB's** accident investigation function was transferred to the new **National Transportation Safety Board (NTSB)**
- **1968** Congress vested in FAA's administrator power to set aircraft noise standards

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- The **Federal Aviation Agency** became one of several organizations within **DOT** and received a new name, the **Federal Aviation Administration (FAA)**
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- **1968** Congress vested in FAA's administrator power to set aircraft noise standards
- **1970 Airport and Airway Development Act**
  - Placed the **FAA** in charge of a new airport aid program funded by a special aviation trust fund
  - Made **FAA** responsible for safety certification of airports served by air carriers

# Regulations-History of U.S. Airline Regulations

- **1978 Airline Deregulation Act** created a highly competitive airline industry
- Deregulation increased **FAA** workload exponentially
- The **FAA** had to certify every new airline, and there were hundreds of applications after deregulation that FAA had to review and approve or disapprove
- In the immediate years after the deregulation act, **FAA** flight standards and other offices focused primarily on the new applicants
- **1995 DOT** transferred the commercial space transportation office to the **FAA**
- The new **FAA** office regulated the U.S. commercial launch industry, licensed commercial launch operations of both orbital and suborbital rockets
- **2012 FAA Modernization and Reform Act** set a deadline of September 30, 2015, for the agency to establish regulations to allow the use of commercial drones

## Regulations-Federal Aviation Administration

- The **FAA's** authority is defined in the **Code of Federal Regulations (CFR)**
- **CFR** is the codification of the general and permanent rules and regulations published in the **Federal Register** by departments and agencies of the U.S. government
- **Federal Aviation Regulations (FARs)** are part of **Title 14** of the **Code of Federal Regulations (CFR)**
- **Title 14 CFR - Aeronautics and Space** is one of fifty titles comprising the United States **Code of Federal Regulations (CFR)**
- The **FARs** are rules prescribed by the **Federal Aviation Administration (FAA)** governing all aviation activities in the United States
- The rules are designed to promote safe aviation protecting pilots, flight attendants, passengers and the general public from unnecessary risk
- A wide variety of activities are regulated:
  - Aircraft design and maintenance
  - Typical airline flights
  - Pilot training activities
  - Hot-air ballooning
  - Lighter-than-air aircraft
  - Man-made structure heights
  - Obstruction lighting and marking
  - Model rocket launches
  - Model aircraft operations
  - Unmanned Aircraft Systems (UAS)
  - Kite flying
  - Space launches

# Regulations-Federal Aviation Administration –Title 14 CFR Parts

- Part 1 – Definitions and Abbreviations
- Part 13 – Investigation and Enforcement Procedures
- **Part 21 – Certification Procedures for Products and Parts**
- Part 23 – Airworthiness Standards: Normal, Utility, Acrobatic and Commuter Airplanes
- **Part 25 – Airworthiness Standards: Transport Category Airplanes**
- Part 27 – Airworthiness Standards: Normal Category Rotorcraft
- Part 29 – Airworthiness Standards: Transport Category Rotorcraft
- **Part 33 – Airworthiness Standards: Aircraft Engines**
- Part 34 – Fuel Venting and Exhaust Emission Requirements for Turbine Engine Powered Airplanes
- Part 35 – Airworthiness Standards: Propellers
- **Part 36 – Noise Standards: Aircraft Type and Airworthiness Certification**
- **Part 39 – Airworthiness Directives**
- **Part 43 – Maintenance, Preventive Maintenance, Rebuilding, and Alteration**
- Part 45 – Identification and Registration markings (§§ 45.1 - 45.33)
- Part 47 – Aircraft Registration (§§ 47.1 - 47.71)
- Part 48 – Registration and Marking Requirements for Small Unmanned Aircraft (§§ 48.1 - 48.205)
- Part 49 – Recording of Aircraft Titles and Security Documents (§§ 49.1 - 49.63)
- **Part 61 – Certification: Pilots, Flight Instructors, and Ground Instructors**
- Part 63 – Certification: Flight Crewmembers Other Than Pilots
- Part 65 – Certification: Airmen Other Than Flight Crewmembers
- Part 67 – Medical Standards and Certification
- Part 68 – Requirements for Operating Certain Small Aircraft without a Medical Certificate
- Part 71 – Designation of Class A, Class B, Class C, Class D, and Class E Airspace Areas; Airways; Routes; and Reporting Points
- Part 73 – Special Use Airspace
- **Part 91 – General Operating and Flight Rules**



# Regulations-Federal Aviation Administration –Title 14 CFR Parts

- Part 97 – Standard Instrument Approach Procedures
- Part 101 – Moored Balloons, Kites, Unmanned Rockets, Unmanned Free Balloons, and Certain Model Aircraft
- Part 103 – Ultralight Vehicles
- Part 105 – Parachute Operations
- Part 107 – Small Unmanned Aircraft Systems
- Part 117 – Flight and Duty Limitations and Rest Requirements: Flight-crew Members
- **Part 119 – Certification: Air Carriers and Commercial Operators**
- **Part 121 – Operating Requirements: Domestic, Flag, and Supplemental Operations**
- **Part 125 – Certification and Operations: Airplanes Having a Seating Capacity of 20 or More Passengers or a Payload Capacity of 6,000 Pounds or More**
- Part 129 – Operations: Foreign Air Carriers and Foreign Operators of U.S. Registered Aircraft Engaged in Common Carriage
- Part 133 – Rotorcraft External-Load Operations
- Part 135 – Operating Requirements: Commuter and On Demand Operations and Rules Governing Persons on Board Such Aircraft
- Part 136 – Commercial Air Tours and National Parks Air Tour Management
- Part 137 – Agricultural Aircraft Operations
- **Part 139 – Certification of Airports**
- Part 141 – Flight Schools
- Part 142 – Training Centers
- **Part 145 – Repair Stations**
- Part 147 – Aviation Maintenance Technicians Schools

# Regulations-Federal Aviation Administration –Title 14 CFR Parts

## 14 CFR Subchapter I - AIRPORTS

- PART 150 - AIRPORT NOISE COMPATIBILITY PLANNING (§§ 150.1 - 150.35)
- PART 151 - FEDERAL AID TO AIRPORTS (§§ 151.1 - 151.131)
- PART 152 - AIRPORT AID PROGRAM (§§ 152.1 - 152.609)
- PART 153 - AIRPORT OPERATIONS (§§ 153.1 - 153.5)
- PART 155 - RELEASE OF AIRPORT PROPERTY FROM SURPLUS PROPERTY DISPOSAL RESTRICTIONS (§§ 155.1 - 155.13)
- PART 156 - STATE BLOCK GRANT PILOT PROGRAM (§§ 156.1 - 156.7)
- PART 157 - NOTICE OF CONSTRUCTION, ALTERATION, ACTIVATION, AND DEACTIVATION OF AIRPORTS (§§ 157.1 - 157.9)
- PART 158 - PASSENGER FACILITY CHARGES (PFC'S) (§§ 158.1 - 158.95)
- PART 161 - NOTICE AND APPROVAL OF AIRPORT NOISE AND ACCESS RESTRICTIONS (§§ 161.1 - 161.505)
- PART 169 - EXPENDITURE OF FEDERAL FUNDS FOR NONMILITARY AIRPORTS OR AIR NAVIGATION FACILITIES THEREON (§§ 169.1 - 169.5)



- Every day, the FAA's Air Traffic Organization (ATO) provides service to more than 44,000 flights and 2.7 million airline passengers across more than 29 million square miles of airspace.

## Regulations - Federal Aviation Administration (FAA)

- The **Federal Aviation Administration (FAA)** is the U.S. government organization that regulates all aspects of civil aviation in U.S. as well as over its surrounding international waters
- Its powers over international waters were delegated to the FAA by authority of the **International Civil Aviation Organization (ICAO)**
- Created in August 1958, the **FAA** replaced the former **Civil Aeronautics Administration (CAA)** and later became an agency within the U.S. **Department of Transportation (DOT)**
- The FAA is divided into four "lines of business" (**LOB's**) each with a specific role
- **Aviation Safety (AVS):** Responsible for aeronautical certification of aircraft, manufacturers, pilots, airlines, mechanics and repair stations and all the documentation and oversight for everything.
- **Air Traffic Organization (ATO):** ATO employees manage air traffic facilities including Airport Traffic Control Towers (**ATCT**) and Terminal Radar Approach Control Facilities (**TRACONS**).
- **Airports (ARP):** plans and develops projects involving airports, overseeing their construction and operations. Ensures compliance with federal regulations.
- **Commercial Space Transportation (AST):** ensures protection of U.S. assets during the launch or reentry of commercial space vehicle

## Regulations -FAA: Federal Aviation Administration

- The **FAA's** regulatory process involves:
- **Federal Aviation Regulations (FAR)** that apply to civil aviation
- **ORDERS** - These are procedures that the **FAA** uses to implement **FAR's**
- **ADVISORY CIRCULARS** - These provide guidance and explanation to the industry and address topics covered in the **FAR's**
- **AIRWORTHINESS DIRECTIVES** - Are **legally enforceable regulations** issued by the **FAA** in accordance with **14 CFR part 39** to correct an unsafe condition in a product
  - Part 39 defines a product as an aircraft, engine, propeller, or appliance
  - Approximately 16,000 **AD's** issued to date
- **FAA's** commercial aviation regulatory responsibilities are accomplished by:
- Certification and design approval of commercial aircraft/engines/propellers/parts
- Manufacturing and production approval
- Airworthiness approvals
- Overseeing operation of civil aircraft in service
- Approval of maintenance requirements/operations
- Return to service after maintenance
- And Accredited Distributor Program

# Regulations - Federal Aviation Administration (FAA)

## A. Certification and Design Approval of Commercial Aircraft/Parts

- **FAA Engineering** is responsible for approving the design of all new aircraft and parts before they can enter civil aviation
- **This is called “type design”**
  - This approval will likely require **FAA** certification tests-per **FAR’s**
- After certification of new models of aircraft, engines and propellers the **FAA issues a Type Certificate (TC)** to the applicant (i.e. company that holds the design)
  - This is approval for the design only
  - Subsequent design changes require **FAA** Engineering approval

The United States of America  
Federal Aviation Administration  
Department of Transportation

## Type Certificate

Number AGWF

*This certificate issued to* **MCDONNELL DOUGLAS CORPORATION**  
*certifies that the type design for the following product with the operating limitations and conditions therefor as specified in the Federal Aviation Regulations and the Type Certificate Data Sheet, meets the airworthiness requirements of Part 4b of the Federal Aviation Regulations.*

DC-9-11, DC-9-12, DC-9-13, DC-9-14, DC-9-15,  
DC-9-31, DC-9-15F, DC-9-32, DC-9-32F, DC-9-41,  
DC-9-33F, DC-9-21, DC-9-51, DC-9-34F, DC-9-34,  
DC-9-81, DC-9-82, DC-9-83

*This certificate, and the Type Certificate Data Sheet which is a part hereof, shall remain in effect until surrendered, suspended, revoked, or a termination date is otherwise established by the Administrator of the Federal Aviation Administration.*

*Date of application:* See Page 2.      This certificate consists of three pages.  
*Date of issuance:* See Page 3.

*By direction of the Administrator*  
(Signature) Keith D. Anderson  
MANAGER, LOS ANGELES AIRCRAFT  
CERTIFICATION OFFICE

*This certificate may be transferred if endorsed as provided on the reverse hereof.*

Any alteration of this certificate and/or the Type Certificate Data Sheet is punishable by a fine of not exceeding \$1,000, or imprisonment not exceeding 3 years, or both.  
FAA FORM 8110-9 (7-87) SUPPLEMENTAL FAA FORM 331

(21000NEW8.PG) 8-4

Figure 12-14. Type certificate.

# Regulations - Federal Aviation Administration (FAA)

- Companies that make replacement parts, and are not **TC** holders (or licensed by the **TC** holder), have their design approved by the **FAA** under **Parts Manufacturer Approval (PMA)** or **Technical Standard Order Authorization (TSOA)**
- This applies to all aircraft, engines, propellers and their detailed parts
  - Only exception is industry/military standard parts
- **FAA Engineering** also approves repair/maintenance documents and subsequent changes

MANUFACTURERS CERTIFICATE OF CONFORMANCE  
FAA-PMA APPROVED AIRCRAFT PARTS  
TEXAS AEROPLASTICS, 152 BOEING WAY, ROANOKE, TEXAS 76262

QTY	PMA Part #	Description	Drawing #
<input checked="" type="checkbox"/> 1ea.	150-LFS	Strut Fairing, lower left Cessna 140A, 150, 152	Drawing # 1 and 2 Rev. IR 9/28/82
<input checked="" type="checkbox"/> 1ea.	150-RFS	Strut Fairing, lower right Cessna 140A, 150, 152	Drawing # 1 and 2 Rev. IR 9/28/82
<input checked="" type="checkbox"/> 1ea.	150-L/S	Strut Fairing, lower left Cessna 140A, 150, 152	Drawing # 2 and 3 Rev. IR 9/28/82
<input checked="" type="checkbox"/> 1ea.	150-R/S	Strut Fairing, upper right Cessna 140A, 150, 152	Drawing # 2 and 3 Rev. IR 9/28/82

USA FAA-PMA Approval Holder # PQ4855W

Inspection

This label certifies that the above listed and supplied items are in conformance with requirements of the FAA-PMA manufactures specifications as required.

Installers signature: \_\_\_\_\_ Date: \_\_\_\_\_  
License # \_\_\_\_\_

# Regulations - Federal Aviation Administration (FAA)

## B. Manufacturing and Production Approval

- **FAA Manufacturing** approves manufacturers to produce aircraft, engines, propellers, and their detailed parts
- For companies who manufacture aircraft, engines or propellers, (including spare parts), the **FAA** approval is a “**Production Certificate**” (**PC**)
- The **FAA** approvals, for companies that are not a **PC** holder, are called a “**Parts Manufacturers Approval**” (**PMA**) or “**Technical Standard Order Authorization**” (**TSOA**)
- These “production approvals” are granted after a complete evaluation of the companies’ **Quality System**
- Purpose is to assure the controls are in place to consistently produce items that conform to **FAA** approved **Type Design**
- Companies who hold a **PC**, **PMA** or **TSOA** are called **FAA Production Approval Holders (PAH’s)**, under **FAR PART 21**

# Regulations - Federal Aviation Administration (FAA)

## C. Airworthiness Approvals

- Aircraft, engines, propellers, and their detailed parts receive airworthiness approval from the **FAA** prior to release to customers
- This approval is the **FAA's** certification that the parts conform to **FAA** approved design and are in condition for safe operation
- Importing countries always require airworthiness approvals
- Domestic customer may also request an airworthiness approval
- In most cases this is requested.
- For parts the airworthiness approval is **FAA Form 8130-3** issued by the **FAA** or an authorized **FAA Designee**

1. Approving Civil Aviation Authority/Country: FAA/United States		2. <b>AUTHORIZED RELEASE CERTIFICATE</b> FAA Form 8130-3, AIRWORTHINESS APPROVAL TAG			3. Form Tracking Number:	
4. Organization Name and Address:					5. Work Order/Contract/Invoice Number:	
6. Item:	7. Description:	8. Part Number:	9. Quantity:	10. Serial Number:	11. Status/Work:	
12. Remarks:						
13a. Certifies the items identified above were manufactured in conformity to: <input type="checkbox"/> Approved design data and are in a condition for safe operation. <input type="checkbox"/> Non-approved design data specified in Block 12.			14a. <input type="checkbox"/> 14 CFR 43.9 Return to Service <input type="checkbox"/> Other regulation specified in Block 12 Certifies that unless otherwise specified in Block 12, the work identified in Block 11 and described in Block 12 was accomplished in accordance with Title 14, Code of Federal Regulations, part 43 and in respect to that work, the items are approved for return to service.			
13b. Authorized Signature:		13c. Approval/Authorization No.:	14b. Authorized Signature:		14c. Approval/Certificate No.:	
13d. Name (Typed or Printed):		13e. Date (dd/mmm/yyyy):	14d. Name (Typed or Printed):		14e. Date (dd/mmm/yyyy):	
<b>User/Installer Responsibilities</b>						
<p>It is important to understand that the existence of this document alone does not automatically constitute authority to install the aircraft engine/propeller/article.</p> <p>Where the user/installer performs work in accordance with the national regulations of an airworthiness authority different than the airworthiness authority of the country specified in Block 1, it is essential that the user/installer ensures that his/her airworthiness authority accepts aircraft engine(s)/propeller(s)/article(s) from the airworthiness authority of the country specified in Block 1.</p> <p>Statements in Blocks 13a and 14a do not constitute installation certification. In all cases, aircraft maintenance records must contain an installation certification issued in accordance with the national regulations by the user/installer before the aircraft may be flown.</p>						

FAA Form 8130-3 (02-14)

NSN: 0052-00-012-9005



# Regulations - Federal Aviation Administration-FAA Designees

- **FAA Designees** are individuals, with aviation experience, that have been trained and certified by the **FAA** to act on their behalf, under **FAR Part 183**
- **Categories of Designees:**
- **Designated Manufacturing & Inspection Representative (DMIR):**
- Individuals that operate at a **Production Approval Holder (PAH)** or Supplier
  - Privileges are limited to the **PAH's** authorities
- **Organizational Designated Airworthiness Representative (ODAR):**
- Person at a **PAH** organization that is designated to act as an **FAA Designee**
  - Privileges are limited to the **PAH's**
  - Individuals are then identified within the **PAH** for specific authorities
- **Designated Airworthiness Representative (DAR):**
- Individuals that operate independently
- They fall into two categories, **Manufacturing** and **Maintenance**
- **Manufacturing DAR's** are limited to new parts
- **Maintenance DAR's** are generally limited to used and or repaired parts
- Designees' authority to release parts is a privilege granted by the **FAA**
- Each Designee has specific subject limitations and authorities
- Ongoing training and oversight from the FAA is also required

# Regulations - Federal Aviation Administration-FAA Designees -History

- **1927** First individual designees appointed
- Fifty doctors appointed as **Aviation Medical Examiners (AME)**
- Over the next 78 years additional designees added:
- **Designated Manufacturing Representative-DMIR**
- **Designated Pilot Examiner-DPE**
- **Designated Organization Representative-DOA**
- **Designated Engineering Representative-DER**
- **Designated Airworthiness Representative-DAR**
- **2005 - Organization Designation Authorization ODA**
- **Boeing** today, has 1,500 people in its **ODA**, under supervision by an FAA team of 45 people, which only 24 are engineers
- By 2018, the **FAA** was letting **Boeing** certify 96 percent of its own work
  - This change occurred over time

# Regulations - Federal Aviation Administration (FAA)

## D. Overseeing Operation of Civil Aircraft in Service

- **FAA Flight Standards** oversees all aspects of commercial aviation in service
- This includes
  - Airlines
  - Pilots
  - Airports
  - Air Traffic Control



# Regulations - Federal Aviation Administration (FAA)

## E. Approval of Maintenance Requirements/Operation

- **FAA Engineering** approves all repair/maintenance documents and changes prior to use
- **FAA Flight Standards** approves individuals/organizations that provide maintenance of US registered aircraft and return of aircraft, engines, propellers, and parts to service
- Typical organizations are:
- **Airlines**, that provides continuing maintenance under their operating authority (**FAR PARTS 121 or 135**)
- **Repair Stations**, who are granted a **Repair Station Certificate** from the **FAA**, operating under **FAR Part 145**
- These authorities are granted after a complete **FAA** evaluation of the companies' quality systems
- Purpose is to assure they will consistently provide maintenance in accordance with **FAA** approved maintenance documents

UNITED STATES OF AMERICA  
DEPARTMENT OF TRANSPORTATION  
FEDERAL AVIATION ADMINISTRATION

### Air Agency Certificate

Number 20HR111C

This certificate is issued to  
OASIS AVIATION MAINTENANCE, INC.  
whose business address is  
6 FALCON DRIVE  
SUITE 106  
PEACHTREE CITY, GA 30269

upon finding that its organization complies in all respects  
with the requirements of the Federal Aviation Regulations  
relating to the establishment of an Air Agency, and is  
empowered to operate an approved REPAIR STATION

with the following ratings:  
LIMITED AIRFRAME  
LIMITED POWERPLANT  
LIMITED INSTRUMENT (08/28/2013)  
LIMITED RADIO (08/23/2013)

This certificate, unless canceled, suspended, or revoked,  
shall continue in effect INDEFINITELY.

Date issued:  
APRIL 17, 2013

By direction of the Administrator  
*Clovis L. Jackson*  
Clovis L. Jackson, Acting Manager  
Atlanta FSDO-11

THIS CERTIFICATE IS NOT REVERSIBLE, AND ANY MAJOR CHANGE IN THE BASIC FACILITIES, OR IN THE LOCATION THEREOF,  
SHALL BE IMMEDIATELY REPORTED TO THE APPROPRIATE REGIONAL OFFICE OF THE FEDERAL AVIATION ADMINISTRATION

Any alteration of this certificate is punishable by a fine of not exceeding \$1,000, or imprisonment not exceeding 3 years, or both.

FAA Form 8000-4 (1-87) SUPERSEDES FAA FORM 330 Electronic Form (PDF)

# Regulations - Federal Aviation Administration (FAA)

## F. Return to Service

- Return to Service tag is issued after maintenance is completed
- Use of FAA Form **8130-3** is strongly encouraged by the **FAA** but it isn't necessary
  - Repair facilities may use their version of a tag with wording required by **FAR Part 43**
- Returns to Service tags are issued by authorized **FAA Designees** or **FAA** authorized maintenance facilities

## G. Accredited Distributor Program

- The **FAA** provides for, and strongly endorses participation in, a **Voluntary Industry Distributor Accreditation Program** to improve the ability of certificated persons to establish the eligibility of parts and products for installation on type-certified products
- New surplus parts/products obtained from after market sources can be released after their eligibility is established
- These are released on Certificate of Conformities (CoC)s and if required **FAA Airworthiness Approvals** or **Return to Service tags**

## **Type Certificates, Production Certificates, and Airworthiness Certificates**

**Type Certificate (TC):** A TC is a design approval issued by the FAA when the applicant demonstrates that a product complies with the applicable regulations. As defined by Title 14 Code of Federal Regulations (CFR) section 21.41, the TC includes the type design, the operating limitations, the Type Certificate Data Sheet (TCDS), the applicable regulations with which the Administrator records compliance, and other conditions or limitations prescribed by the Administrator. The TC is the foundation for other FAA approvals, including production and airworthiness approvals.

**Type Certificate Data Sheet (TCDS):** The TCDS is a formal description of the aircraft, aircraft engine, or propeller. It lists limitations and information required for type certification, including airspeed limits, weight limits, thrust limitations, etc.

**Production Certificate:** The production certificate is an approval to manufacture duplicate products under an FAA-approved type design (i.e., type certificate or supplemental type certificate). The holder of a production certificate may obtain an airworthiness certificate for aircraft produced under the production certificate without further showing that it complies with the appropriate airworthiness standards. The applicant must follow production application and approval processes.

**Airworthiness Certificate:** An airworthiness certificate is an FAA document which grants authorization to operate an aircraft in flight. An airworthiness certificate is issued to a properly registered aircraft that has been found to conform to its Type Certificate and to be in a condition for safe operations.

**Supplemental Type Certificate (STC):** An STC is issued when an applicant has received FAA approval to modify an aircraft from its original design. The STC, which incorporates by reference the related TC, approves not only the modification, but also how that modification affects the original design.

# Regulations - Federal Aviation Administration (FAA)

## Summary

- For all commercial aircraft, engines, propellers, and their detailed parts (with the exception of industry/military standard parts):
- FAA approves all designs.
- FAA approves all production operations/facilities
- FAA approves all repair/maintenance documents
- FAA approves all maintenance operations/facilities
- Airworthiness approvals and Return to Service approvals are issued under FAA control
  - Parts that do not meet the above requirements are considered “unapproved parts” by the FAA and are not eligible for installation and use in civil aviation



## Regulations -National Transportation Safety Board (NTSB)

- **NTSB** investigates civil aviation accidents and incidents
  - Also significant accidents in other modes of transportation
- The **NTSB** has no regulatory authority
- It determines probable cause of aviation accidents
  - It works with **FAA** safety personnel, airline, and airframe and engine investigators
  - It assists foreign safety agencies' investigations
  - It maintains a data base of aviation accidents
  - It conducts studies of safety issues of national significance
- The **NTSB** issues safety recommendations to the **FAA** aimed at preventing future accidents or unsafe conditions
  - The FAA responds to NTSB recommendations but does not have to implement them



- **NTSB** has investigated a large number of aviation accidents and incidents and has issued more than 12,000 safety recommendations in all modes of transportation
- **NTSB** analysis of factual information and its determination of probable cause cannot be entered as evidence in a court of law



# Regulations - Transportation Security Administration (TSA)

- **Transportation Security Administration (TSA)**
- Under the **Department of Homeland Security**
- 2001 the Aviation and Transportation Security Act, created TSA
- The TSA was initially placed under the Department of Transportation
- It was moved to the Department of Homeland Security when that department was formed on March 9, 2003
- The TSA's primary focus is on airport security and the prevention of aircraft hijacking
- It is responsible for screening passengers and baggage at more than 450 U.S. airports
- It fulfills this mission in conjunction with other federal agencies and state partners



# Regulations- European Aviation Safety Association (EASA)

- **European Aviation Safety Agency (EASA)**
- The agency of the **European Union (EU)** with responsibility for civil aviation safety
- **EASA** was established in 2002 by the European Commission, where it took over the functions of the Joint Aviation Authorities of the EU countries
- It essentially operates very similar to the **FAA**
- **EASA** carries out certification, regulation, and standardization for civil aviation
- It also performs investigation and monitoring much like the **FAA** does in the US
- **EASA** and **FAA** have engaged in “Rules Harmonization” for over 15 years



# Regulations-International Civil Aviation Organization (ICAO)

- **ICAO** is an agency of the **United Nations**
  - Founded in 1944
- It changes the principles and techniques of international air navigation and fosters the planning and development of international air transport to ensure safe and orderly growth
- The **ICAO Council** adopts standards and recommended practices concerning air navigation, its infrastructure, flight inspection, prevention of unlawful interference, and facilitation of border-crossing procedures for international civil aviation
- **ICAO** defines the protocols for air accident investigation that are followed by transport safety authorities in countries signatory to the **Chicago Convention on International Civil Aviation**
- **ICAO** codes are used for "official" purposes such as Air Traffic Control
- The **Air Navigation Commission (ANC)** is the technical body within **ICAO** composed of 19 Commissioners, nominated by the ICAO's contracting states and appointed by the ICAO Council
- **International Standards And Recommended Practices** are developed under the direction of the **ANC** through the formal process of **ICAO** Panels
- Once approved by the Commission, standards are sent to the Council, the political body of **ICAO**, for consultation and coordination with the Member States before final adoption
- **ICAO** is distinct from other international air transport organizations, particularly because it alone is vested with international authority (among signatory states)

# Aviation Industry Associations - Airlines for America (A4A)

- **Airlines for America (A4A)**, formerly known as **Air Transport Association of America (ATA)**, is an American trade association and lobbying group based in Washington, D.C.
- It represents major North American airlines working with labor, Congress, the Administration and other groups to shape policies and measures that promote safety, security and a healthy U.S. airline industry
- It also manages the ATA Spec 100 and Spec 300
- **ATA Spec 100** defines a numbering scheme for aircraft parts and the appearance of printed aircraft maintenance information
- **ATA Spec 300** establishes regulations that ensure effective packaging for supplies and equipment shipped by airlines



ASSOCIATE MEMBER AIRLINE



# Aviation Industry Associations -International Air Transport Association (IATA)

- **IATA** is an industry association that represents some 290 airlines in 120 countries Carrying 82% of the world's air traffic
  - It was founded in 1945 with 57 members
- **IATA** aims to improve understanding of the air transport industry among decision makers and increase awareness of the benefits that aviation brings to national and global economies
- Advocating for the interests of airlines across the globe, **IATA** challenges unreasonable rules and charges, hold regulators and governments to account, and strives for sensible regulation
- For over 70 years, **IATA** has developed global commercial standards upon which the air transport industry is built
- **IATA** aims to assist airlines by simplifying processes and increasing passenger convenience while reducing costs and improving efficiency
- **IATA** helps airlines to operate safely, securely, efficiently, and economically under clearly defined rules
- Professional support is provided to all industry stakeholders with a wide range of products and expert services

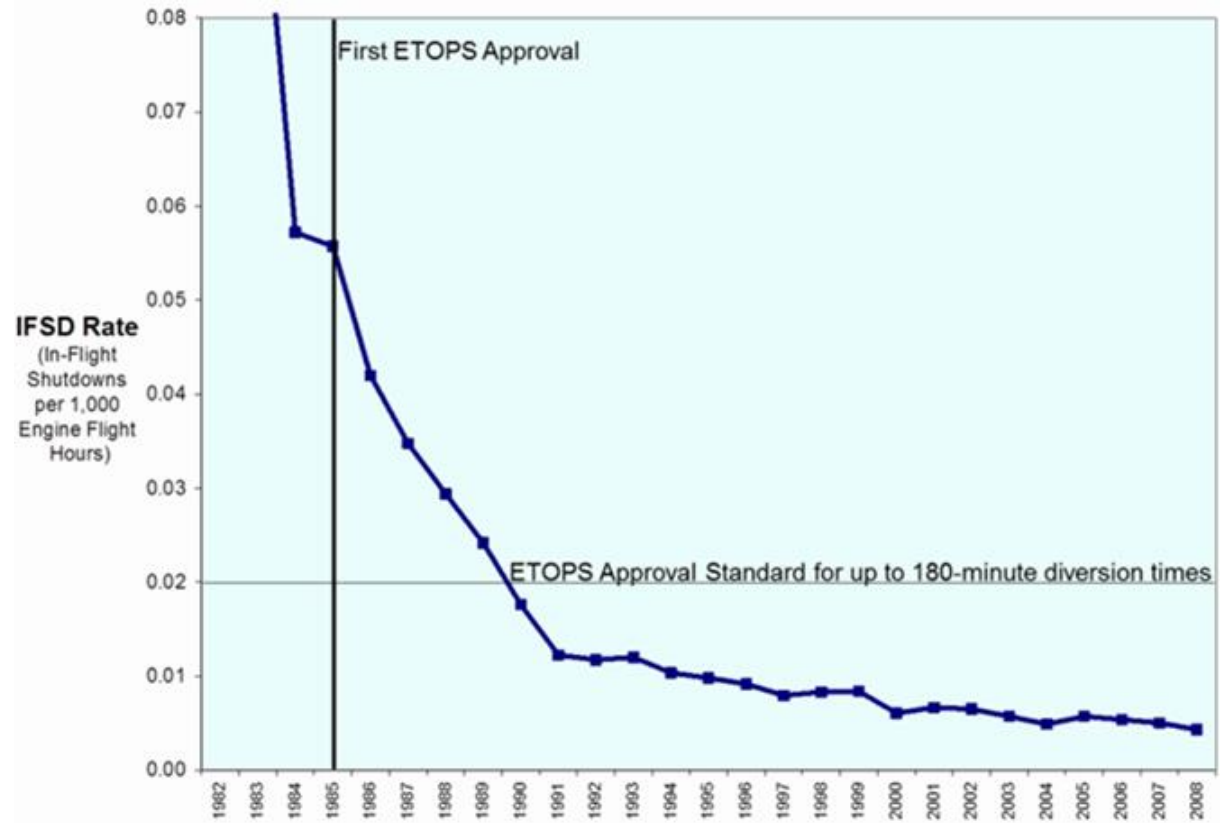
## Aviation Industry Associations – Air Transport Action Group & International Aerospace Quality Group

- **ATAG** is a coalition of aviation industry experts focusing on sustainable development issues
- Its board of directors is composed of senior representatives from :
  - **Trade associations:**
    - International
    - Civil Air Navigation Services Organization
    - International Air Transport Association
    - Airlines for America
    - Association of Asia Pacific Airlines
  - **Aircraft manufacturers**  
Airbus, ATR, Boeing, Bombardier, CFM, Embraer, Honeywell, Pratt Whitney, Rolls Royce
- **The IAQG** sets the standard for quality within the worldwide supply chain of the aerospace industry
- The organization is comprised of member companies within the aviation, space and defense industries who design, development, manufacture and support original equipment at system or subsystem levels
- **IAQG** is committed to establishing commonality of quality systems and improvement standards. These standards are documented, published and applied internationally by original equipment manufacturers (OEMs) and circulated throughout the supply chain
- This was the organ of **AS9100** which is an aero standard upgrade established in early 2000 from **ISO9001**

# Regulations ETOPS: EXTENDED TWIN OPERATION - History & Maintenance

## Extended Range Twin Aircraft Operational Performance Standards “Engines Turn Or Passengers Swim”

- Reduction in engine systems in flight shut down rates over the years
- Associated with greatly increased reliability of turbo fan jet engines
- Probability of two engines shutting down on one aircraft due to same failure is extremely remote
- Allowed increases in flight times to alternate airport at single engine speed
- Led to regulators acceptance of ETOPS



## ETOPS: EXTENDED TWIN OPERATION - History

- **Airbus A300 twinjets**, which were the world's first twin-engine wide-body aircraft, were operating across the North Atlantic, the Bay of Bengal and the Indian Ocean under a **90-minute ICAO** rule since **1977**
- **1985** the **FAA** increased the **ETOPS** to 120 minutes
- **1985 Trans World Airlines** operated the first 120-minute **ETOPS** (ETOPS-120) Boston-Paris service with a Boeing 767-200
- Resulting in consuming 7,000 lbs less fuel per hour than a 3 engine **Lockheed L-1011 Tristar** for the same mission
- This is a 7 hour flight equals **49,000 lbs of fuel savings for the flight**
- That triggered continued extensions which made this the most significant change in Aviation History
- Continued extensions of **ETOPS** had a negative effect on larger 3 and 4 engine aircraft in future years
- And eliminated the Feeder Hub Process
- **ETOPS: History of Extensions Minutes to the nearest airport:**
  - 1953 - 60 minutes flying time from the nearest airport.
  - 1977 – 90 minutes – first application aircraft was the **A300B4**
  - 1985 – 120 minutes
  - 1988 – 180 minutes
  - 1989 – 207 minutes **JAA, ICAO** other regulatory bodies agree.
  - 2009 – 240 minutes
  - 2011 – 330 minutes



# ETOPS: EXTENDED TWIN OPERATION

**The 60-Minute Rule Limits Twin-Engine Route Opportunities**



Note: Typical operational range is 400 nmi.  
Blue represents regions beyond the 60-minute rule limit.

**120-Minute ETOPS Rule Greatly Expands Route Opportunities**



Note: Typical operational range is 800 nmi.  
Blue represents regions beyond the 120-minute rule limit.

**180-Minute ETOPS Rule Further Expands Route Opportunities**



Note: Typical operational range is 1,200 nmi.  
Blue represents regions beyond the 180-minute rule limit.

- Current ETOPS rated twin engine aircraft have largely replaced 3 and 4 engine aircraft (**MD-11**, **L1011,747** and **A380**) on international flights
- Wide body twin engine aircraft use less fuel than 3 or 4 engine wide body aircraft

# ETOPS: EXTENDED TWIN OPERATION - Maintenance

- By incorporating specific hardware improvements and establishing specific maintenance and operational procedures
  - These hardware improvements were designed into future Boeing and Airbus airplanes
  - Manufacturers worked to “fix” IFSD causes in order to maintain aircraft/engines ETOPS ratings
  - New aircraft certified with ETOPS ratings based on experience with similar designs
- The **ETOPS** Maintenance Approach can be applied to all commercial airliners includes:
    1. **Engine health monitoring**
      - **ETOPS** operators are required to use **ECMs** to monitor adverse trends in engine performance and execute maintenance to avoid serious failures
    2. **Pre-departure additional service checks.**
      - **FAA AC 120-42A** requires certain **ETOPS** systems to be checked before each flight
    3. **Basic and multiple-system maintenance practices**
      - Two programs -- resolution of discrepancies and avoidance of multiple similar system maintenance -- are outlined in. **AC 120-42A**
    4. **Event-oriented reliability program**
      - An **ETOPS**-significant system is investigated to determine if a problem could be reduced or eliminated by changing the maintenance program

## Next Session

- **Aircraft design and certification**
- Safety records
- Performance improvements
- Engines
- Basics of aerodynamics of flight
- Typical commercial flight
- Airliners near ready for service