AEC2 - AEC* of Flight and Structure

From the Advanced Master ASAA (Aviation Safety: Aircraft Airworthiness)

* Aircraft Engineering for Certification

Key elements

Period: **November to December**

Estimated duration: **90 hours**

For whom:
recent graduates, jobseekers and experienced employees

Location:
ISAE-SUPAERO, Toulouse

Language: **English**

Highlights

- Engineering & certification
- Flight dynamics
- Flight telemetry session
- Airplane structure certification
- Case studies

This certificate provides an overall understanding of jet airplane flight dynamics and performances. It also provides the essential knowledge to understand the behavior of aircraft metallic and composite materials and structures, and assess their performances and limits. It defines and thoroughly explains the associated key certification requirements and criteria as per authorities' regulations.

Prerequisites

- A good engineering background
- Basic knowledge of aircraft certification process and procedures
- Basic knowledge of flight physics & aeronautics
- Aircraft certification process and procedures

*not compulsory

Learning objectives

After completing this course, participants will be able to:

- Describe and calculate airplane flight dynamics and performances parameters;
- Describe the parameters and criteria essential, from a safety perspective, to evaluate performances, handling qualities, stability and control and their relationship;
- Explain the main Flight certification requirements as per CS-25/FAR-25 Subpart-B, C & D, their relationship with flight dynamics and performances parameters, and the associated means of compliance;
- Collect and analyze in-depth and autonomously relevant regulatory certification documents
- Describe the ageing effects on a structure and the associated impacts and limitations;
- Describe the parameters and criteria essential, from a safety perspective, to evaluate an airplane structure (metallic and composite) and the related certification strategy.

Information and registration

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Course content

AW7 – Flight (44 h):

Principles of straight and steady level flight

- Straight and level steady flight physics & performance
- International standard atmosphere, pressure, altitude, true airspeed and indicated airspeed

Airplane performance

- High speed cruise performance
- Climb and acceleration performance
- Maneuvering performance: Lift and normal acceleration – Load factor – Flight envelope
- Take-off and landing performance

Handling qualities

- Center of gravity envelope
- Primary flight controls: forces, moments, deflections – Certification requirements – Trim
- Handling qualities certification requirements

Stability and control

- Longitudinal and lateral stability and control
- Dynamic stability

AW8 – Structure (50 h):

Introduction to aircraft structure certification

- Certification philosophy - Historical perspective

Structure fundamentals

- Elasticity – Beams – Plates
- Finite elements modelling key points

Materials for aeronautical application

- Properties of metallic and composites materials
- Certification requirements

Aircraft structural architecture

- Static strength – Design principles and sizing criteria

Loads

- Ground and flight loads – Gusts – Flight envelope
- Flexible aircraft and flutter

Fatigue and damage tolerance

- Fatigue endurance and crack propagation – Fatigue tests – Damage tolerance in practice

Ageing aircraft

- Corrosion control and prevention program
- Structure limit of validity – Widespread fatigue damage

Composites structure & Emerging technologies

- Principles for certification and continuing airworthiness of composite structures
- Emerging technologies for structure

Application through aircraft structure certification case-studies

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Teaching methods

Teaching methods	Yes
Lectures / tutorial	X
Collaborative learning	
Flipped classroom	
Blended learning (online and face to face)	
Learning by doing	X
Project-based	
Simulation	X
Case study	X

Assessment

Written exams