

# *Engine /Aircraft Interface*

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- Though the engine and aircraft certification processes are theoretically independent from each other, the purpose of an engine is nonetheless to be eventually installed in an aircraft and therefore the interactions have to be taken into account.



- The basic principle is simple – engine certification requirements are addressed through engine certification, and aircraft certification requirements are addressed through aircraft certification.
- Nevertheless, it is recognised that some aircraft certification activities are significantly affected by engine design.



- Typical interface items are (1/4):
  - Engine control, including thrust control malfunction,
  - Software and complex hardware qualification,
  - Thrust reverser and engine endurance testing,



- Typical interface items are (2/4):
  - Inlet and engine natural icing,
  - Bleed air contamination,
  - Fuel and oil specifications,
  - Fuel contamination and icing (water-in-fuel)



- Typical interface items are (3/4):
  - Fire protection, including engine mount fireproofness and overheat of the control system,
  - Engine inflight restart including rotor lock,



## ➤ Typical interface items are (4/4):

- Engine failure models,

- MMEL / time limited dispatch,

- Fuel venting,

- Ratings

- ETOPS



## ➤ CS requirements and associated AMCs to be considered for interfaces (1/5)

### ➤ CS E 30 Assumptions

- CS E 30 (a) In the course of establishing compliance with CS-E certain assumptions have to be made concerning the conditions that may be imposed on the Engine when it is eventually installed in the aircraft. In order that the validity of the conditions assumed in the Engine certification may be assessed for any particular installation, prior to Engine certification, the details of the assumptions made must be submitted. These assumptions must be included in the Engine instructions for installation required under CS-E 20 (d).





## ➤ CS requirements and associated AMCs to be considered for interfaces (2/5)

### ➤ CS E 20 Engine configuration and interfaces;

- CS E 20 (d) Manuals must be provided containing instructions for installing and operating the Engine. These instructions must contain a definition of the physical and functional interfaces with the aircraft and aircraft equipment. They must also include a description of the Primary and all Alternate Modes, and any Back-up System, together with any associated limitations, of the Engine Control System and its interface with the aircraft systems, including the Propeller when applicable.



- CS requirements and associated AMCs to be considered for interfaces (3/5)
  - CS E 1000 General (Environmental and Operational design requirements)

CS E 1010 Fuel venting;

CS E 1020 Engine Emissions

CS E 1030 Time Limited Dispatch

CS E 1040 ETOPS

CS-E 1050 Exposure to volcanic cloud hazards



- CS requirements and associated AMCs to be considered for interfaces (4/5)
  - AMC 20-1 Certification of Aircraft Propulsion Systems Equipped with Electronic Controls;
  - AMC 20-3 Certification of Engines Equipped with Electronic Engine Control Systems;
  - AMC 20-6 Extended Range Operations with Two-Engine Aeroplanes ETOPS Certification and Operation
  - E650 Vibration Surveys, section (f);
  - E780 Tests in Ice-Forming Conditions



- Other requirements where aircraft assumptions/installation may have an effect/input on engine certification (5/5)
  - E50 Engine Control System;
  - E500 Functioning;
  - E510 Safety Analysis, “partial or complete loss of power”, as a Minor Engine Effect per section (g)(1) should be carefully considered.





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# End

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