



The Power of Flight

EASA Workshop

Additive Manufacturing: CFM Conclusion

Cologne, September 29th 2016

Additive Manufacturing Process compliance with the EASA Regulation



21.A.31 Type design

(a) The type design shall consist of:

1. **the drawings and specifications**, and **a listing of those drawings and specifications**, necessary to define the configuration and the design features of the product shown to comply with the applicable type-certification basis and environmental protection requirements;
2. **information on materials and processes and on methods of manufacture and assembly of the product necessary to ensure the conformity of the product**;
3. an approved airworthiness limitations section of the instructions for continued airworthiness as defined by the applicable certification specifications; and
4. any other data necessary to allow by comparison, the determination of the airworthiness, the characteristics of noise, fuel venting, and exhaust emissions (where applicable) of later products of the same type.

Additive Manufacturing Process compliance with the EASA Regulation



CS-E 70 Materials and Manufacturing Methods

- (a) The suitability and durability of materials used in the Engine must be established on the basis of experience or tests. The assumed design values of properties of materials must be suitably related to the minimum properties stated in the material specification.
- (b) Manufacturing methods and processes must be such as to produce sound structure and mechanisms which retain the original mechanical properties under reasonable service conditions.

Recommendation:

- No change required to Type Design definition requirement (Part 21.A.35 & CS-E 70) for part manufactured with Additive Manufacturing Process

Additive Manufacturing Process compliance with the EASA Regulation



AMC E 70 Castings, Forgings, Welded Components

	Castings	Forgings	Welding	Additive
Defined Processing	✓	✓	✓	✓
Quality Control Approach	✓	✓	✓	✓
Demonstrated Capability	✓	✓	✓	✓
Flaw Detection Process	✓	✓	✓	✓
Change Control Process	✓	✓	✓	✓

CFM, GE and Safran are considering Additive Manufacturing Process as a Special Manufacturing Process

- Addressed by company's material and process norms and
- Controlled through Companies' Quality and Manufacturing systems.

- Current regulation is appropriate, however AM guidance are needed. CM and AMC E-70 should be the appropriate vehicle, as for castings, forgings and welding.