



## FUTURE REPAIR AND MAINTENANCE FOR AEROSPACE INDUSTRY

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**Quality manual model with specific  
procedures for the newly developed  
workflow**

Final Version

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## **Executive summary**

This document deals with the definition of procedures and registers of the new certification processes for AM implementation into manufacturing and repairing of an aircraft component.

In order to establish the basis of a Quality Management System (QMS) for a company which uses in its supply chain AM, all the relevant standard have been analysed. In particular, ISO 9000 EN 9100 Rev C, EN 9110 and EN 9120.

Nowadays, any aerospace company which provides services or products following the principles and requirements of those standards can be audited, and then certified by an authorized company.

Due to the nature of the project, all the differences between EN 9100 Rev C and EN 9110 has been analysed in order to identify all clauses that can affect the certification of the QMS.

Effective implementation of EN 9110 in case of an MRO company or EN 9100 otherwise, will provide an organization with a good sound system to ensure safety, reliability and airworthiness.

Based on ISO 9001:2000, it contains nearly 100 additional requirements specific requirements to the aerospace industry such as:

- Addresses civil aviation authorities and where in the standard that those requirements apply.
- Addresses definitions unique to the MR&O industry such as, Maintenance, Technical Data, Human Factors & Release Certificates.
- Includes expanded requirements for personnel conducting MR&O task.
- Addresses the qualification of new maintenance processes.

In addition, a Quality Manual Template that has been linked to the developed procedures has been created. This will facilitate the implementation or modification of a Quality Manual for a company which has decided to implement AM in its supply chain. This quality manual template is included in the Annex II.

New AM features are integrated in the current quality management systems. New procedures and documentation are defined for design processes, manufacturing and initial testing of build conditions. All this information is included in Annex III.

Process qualification procedures and registers are defined and a manual is implemented that specifies a method by which the components processed as it has been specified are examined to ascertain if they meet the required specifications (qualifying criteria) in a repeatedly manner to be identified as qualified. This information is included in Annex I and Annex IV.

An extensive set of data structured in registers for quality management systems and for process qualification are included in Annex IV and Annex V.

**Key achievements:**

- All relevant standards have been analysed for establishing the basis of a Quality Management System (QMS) for a company that uses AM in its supply chain.
- Differences between EN 9100 Rev C and EN 9110 has been analysed in order to identify all clauses that can affect the certification of the QMS.
- General procedures, operational instructions and control procedures have been developed to be included in a QMS.
- Quality Manual template has been defined and particularise for including AM process.
- Additive Manufacturing Qualification Manual for Ti6Al4V with Powder Bed Fusion have been developed as a reference for other metal alloys using full melt powder bed fusion as electron beam melting and laser melting.
- Qualification procedures and qualification registers have been developed as guidelines for the Qualification manual.
- All information regarding Quality and Qualification aspects are stored in registers.