

# DESIGN AND MANUFACTURE OF A SAFETY CRITICAL AEROSPACE COMPONENT BY ADDITIVE MANUFACTURING

## EWIRA - External Wing for Regional Aircraft demonstrator

This ongoing Horizon 2020, Clean Sky 2 project aims to evaluate the maturity of Additive Manufacturing for future use in safety critical aerospace applications. This is to be achieved through the re-design and manufacture one of the aileron hinge brackets. The Aileron forms part of the aircrafts control system.



AIM: The MTC aims to demonstrate weight reduction through the application of innovative design optimisation techniques. Validate the selected Additive Manufacturing process to enable testing on a flying demonstrator aircraft.



### THE CHALLENGE

Some of the barriers to the adoption of Additive Manufacturing for full scale production includes, process repeatability, reliability, robustness and standardization.

The key challenges within EWIRA:

- ▶ Validation of the design and manufactured component to enable flight testing
- ▶ Obtain a fully optimised lightweight design
- ▶ Surface improvement to achieve fatigue requirements

### THE SOLUTION

- ▶ The traditional bracket re-designed utilising novel topology optimisation techniques to ensure the maximum design freedom of the AM process
- ▶ Electron beam melting using Ti-6Al-4V selected as the manufacturing method
- ▶ Establishing and control of key process variables to ensure coupon and component manufacture to fixed process
- ▶ Perform a material test program enabling generation of design allowable's
- ▶ Demonstration through flight testing

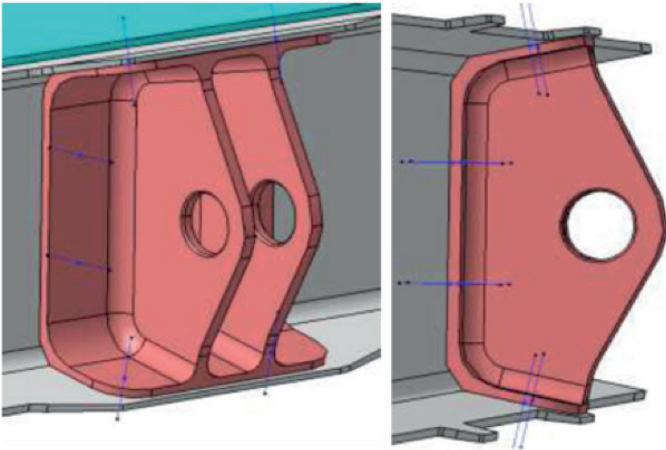
## THE OUTCOME TO DATE

- ▶ Bracket design optimized using a strut based design to achieve 15% weight reduction
- ▶ Fixed manufacturing process established and implemented
- ▶ Manufacture of test coupons to generate a full set of design allowables
- ▶ Evaluation of a number of surface finishing techniques with a view to improve fatigue performance

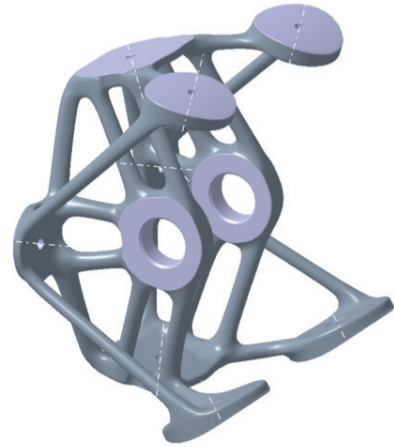
## THE BENEFITS

- ▶ Validation of alternative design optimization techniques
- ▶ Greater understanding of the EBM key process variables and defect classification
- ▶ Establish the technology readiness for the use of AM in critical aerospace applications.
- ▶ Additional learning through flight test demonstration

## PREVIOUS DESIGN



## OPTIMISED DESIGN



## PROJECT PARTNERS

