

- ALMIA CONSORTIUM – Aeronautical part -

Combining topology optimization with additive manufacturing minimizes weight of part and buy to fly

OBJECTIVES

- Redesign using topology optimization – Weight reduction – Cost reduction – Hardware demonstration

A COLLABORATIVE PROJECT

ALMIA Project

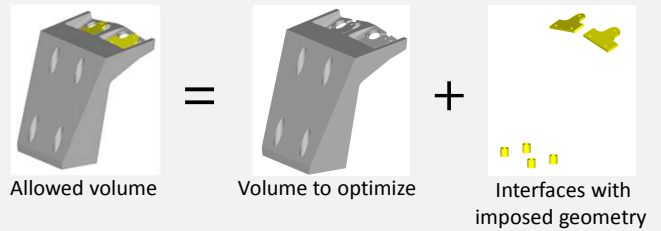
The ALMIA (Additive Layer Manufacturing for Industrial Application) project is a collaborative project with 4 companies and 1 university:

- 2 end users :  
- 1 design office (project leader) : 
- 1 Additive manufacturing supplier: 
- 1 University : 

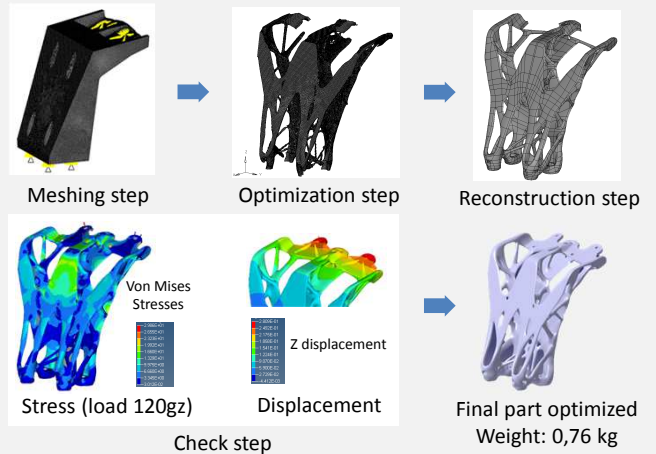
TOPOLOGY OPTIMIZATION PROCESS

The topology optimization has been done with Altair® OptiStruct® by SOGECLAIR in close relationship with our internal design office.

Definition of the optimized volume



Main steps of the calculation process



CURRENT DESIGN

Current design of the bracket

Today the part is fully machined from an aluminium block



- Material : 7175
- Weight:
- Aluminium block: 18,8 kg
 - Machined part: 1,00 kg

INPUT DATA

Material : A357 (AS7G06)

Properties	Unit	Value
Young Modulus	(MPa)	58000
Poisson ratio		0.33
Density	kg/mm ³	2.68 10 ⁻⁶
Ftu	(MPa)	287
Fty	(MPa)	241

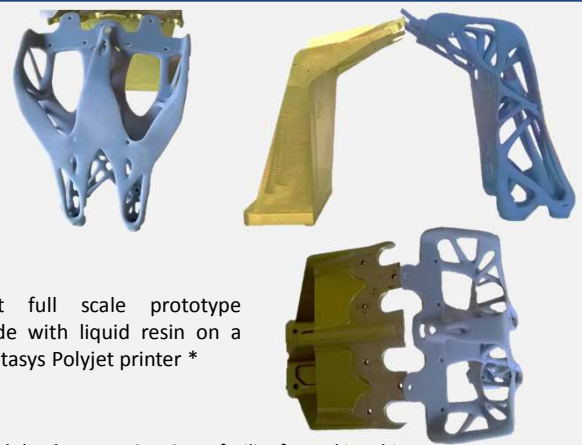
Volume compliance: to prevent any interference with other parts

Weight: Minimize the weight

Static load conditions :

	x	y	z
Applied acceleration (g)	120	120	120
Sensor axis deflection (mm)	< 0.4	< 0.4	< 0.05
Maximum stress (MPa)	30	30	30

OPTIMIZED DESIGN



First full scale prototype made with liquid resin on a Stratasys Polyjet printer *

* Special thanks to UTAS APS Buc facility for making this prototype

RESULTS & OUTLOOK

- Buy to fly reduced from 96 %
- Weight gain: 24% (although material mechanical properties was divided by two between 7175 and A357)
- Make the optimized part with A357 powder on a EOS M280 (at Fusia)
- Perform the heat treatment and the surface treatment

Project funded by :

