

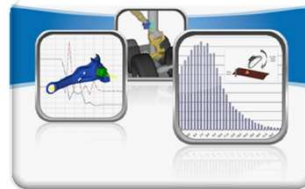
# Applications for Weight Optimization

with Altair  HyperWorks®

Eduards Devels – DES ART Head Office Gdynia



**Altair OptiStruct®**  
Optimization for  
Structures, Vibrations and  
Durability



**Altair HyperStudy®**  
Multi Disciplinary Design Studies,  
Design of Experiments (DOE),  
& Stochastic Studies



# ABOUT DES ART

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## HISTORY AND TODAY

- 1998 Company was established
- 2003 DES ART become NAFEMS' Corporate Member of International Association for Engineering Analysis Community
- 2005 Quality System implemented ISO
- 2007 Branch office in Sanok was established
- 2008 DES ART became a part of PROCAD S.A. Group
- 2010 Branch office in Wroclaw was established

Today DES ART is one of the most advanced in FEM technology multidisciplinary engineering company in Poland.

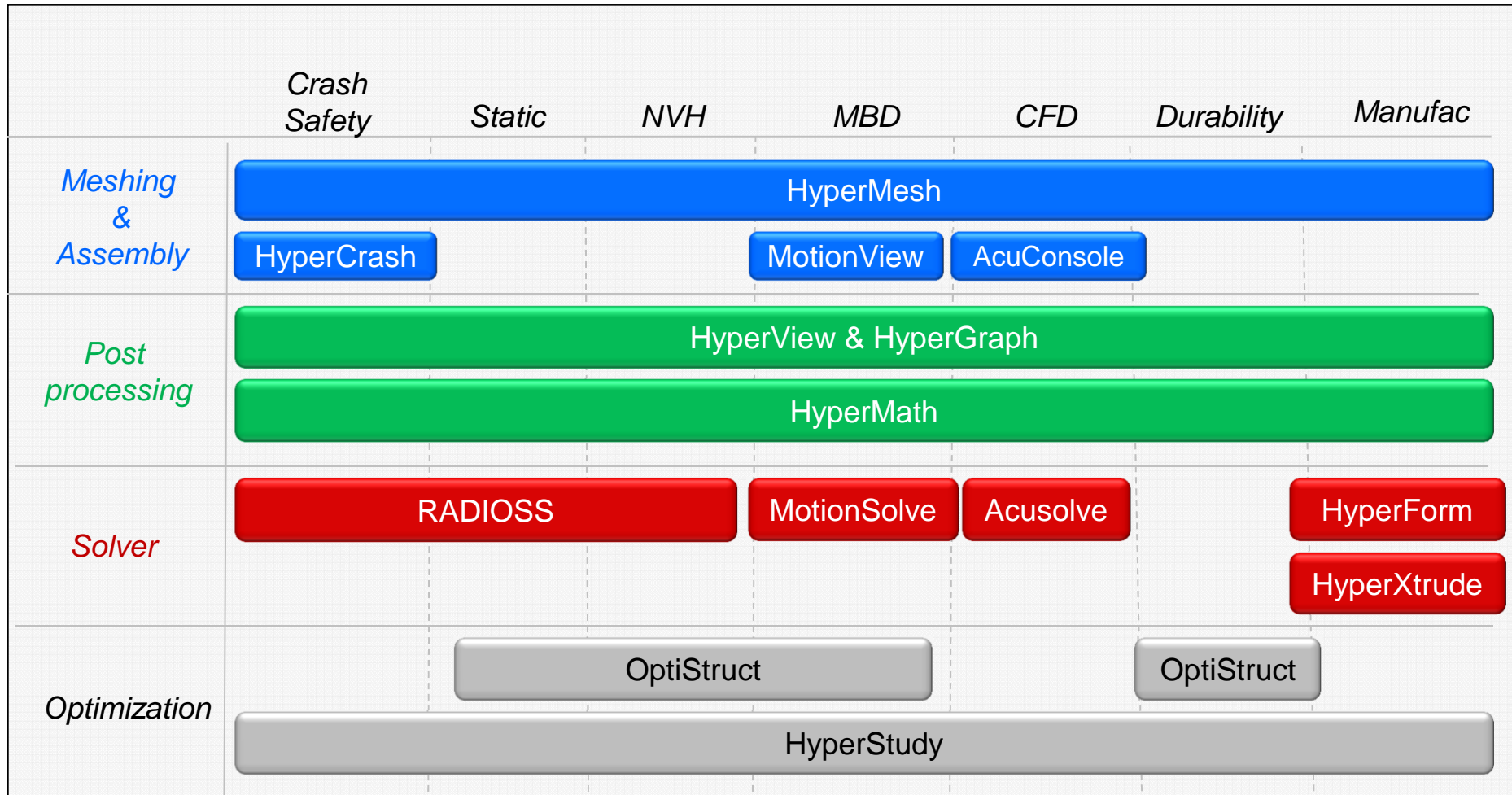
In total over 30 specialists in different disciplines, 3 of them have PhD degree.

## Altair Engineering, Inc. Company Overview

- A global software and services company focused on data analysis, visualization and high performance computing
  - Founded in 1985
  - Privately held
  - Headquarters: Troy, MI USA
  - Over 1500 employees worldwide
  - Offices: North / South America, Europe, Asia, Australia
  - Revenues \$200M USD

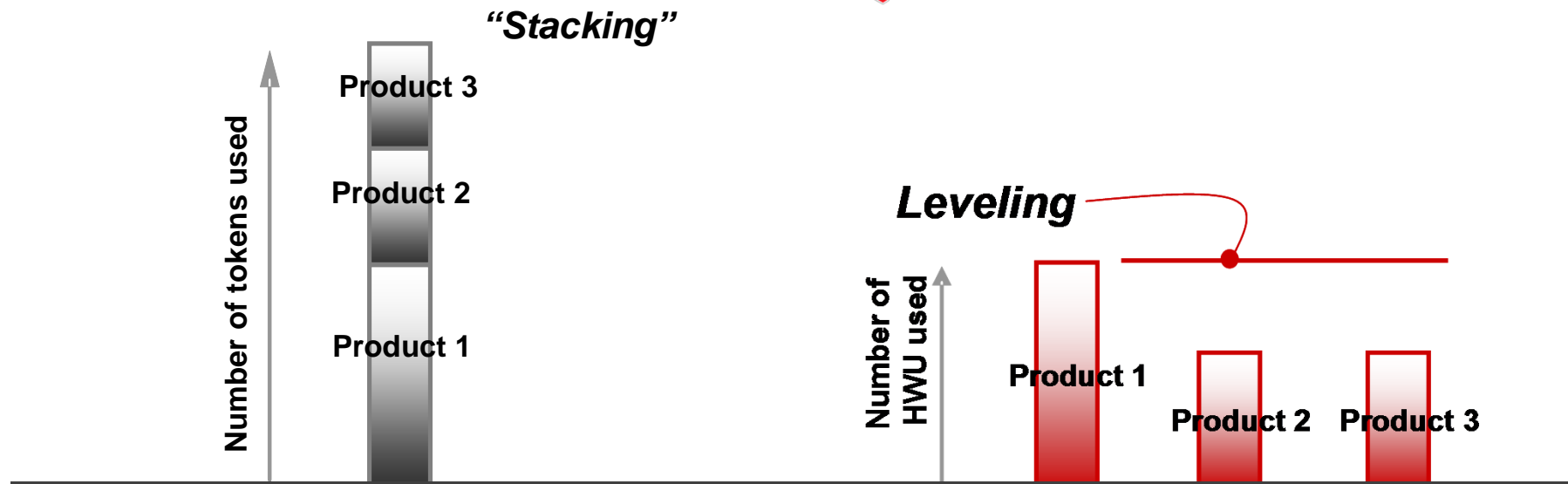


# HyperWorks Program Package



# Altair HyperWorks Licensing Concept

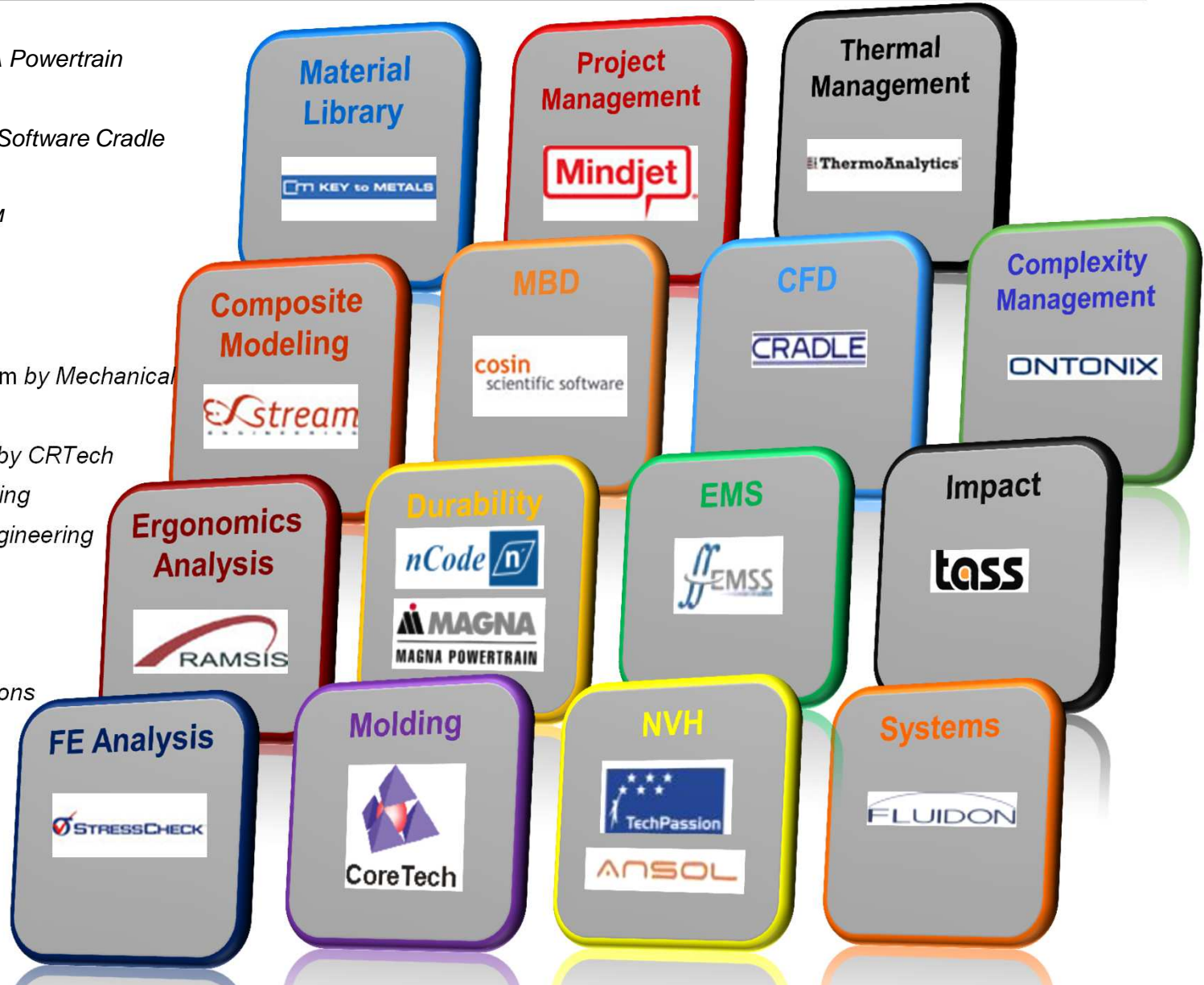
- Innovative Licensing System to Reduce Software Costs and Increase Utilization



# HyperWorks Partner Alliance



1. DesignLife by nCode
2. FEMFAT by ECS MAGNA Powertrain
3. MADYMO by TASS
4. SC/Tetra, scSTREAM by Software Cradle
5. Moldex3D by CoreTech
6. KEY TO METALS by KTM
7. MindManager by Mindjet
8. StressCheck by ESRD
9. DIGIMAT by e-Xstream
10. CarSim, BikeSim, TruckSim by Mechanical Simulation
11. Sinaps & SINDA/FLUINT by CRTech
12. ESAComp by Compoengineering
13. CONVERSE by PART Engineering
14. Ftire by cosin
15. RadTherm by TAI
16. Coustyx by ANSOL
17. RAMSIS by Human Solutions
18. VMAP by TechPassion
19. FEKO by EMSS
20. DSHplus by FLUIDON
21. OntoNet by Ontonix
22. CoDA, LAP by Anaglyph





# Does Weight matter?



# Does Weight matter?

**Aircraft**

You are in: [Home](#) > [Aircraft](#) > News Article

DATE: 22/07/10  
SOURCE: Flight Daily News

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**FLIGHT**  
DAILY NEWS



## FARNBOROUGH: Airbus eyes weight-saving technologies

By Murdo Morrison

Composite seats, simplified electrics and fully wireless in-flight entertainment are among the weight-saving technologies that Airbus will adopt on future airliners.

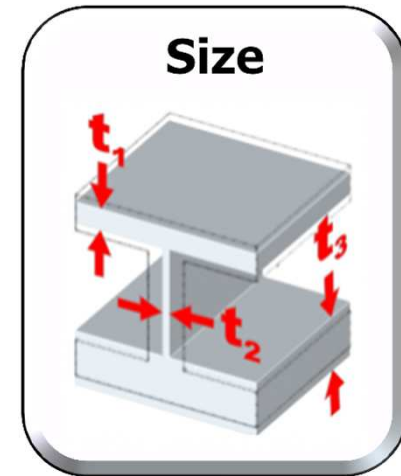
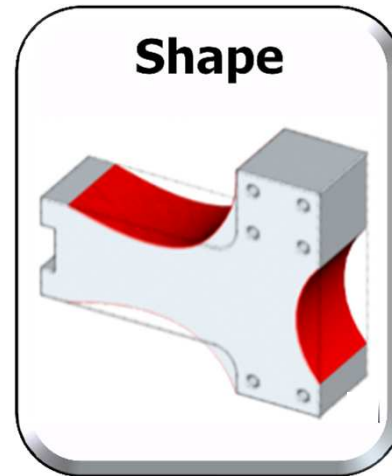
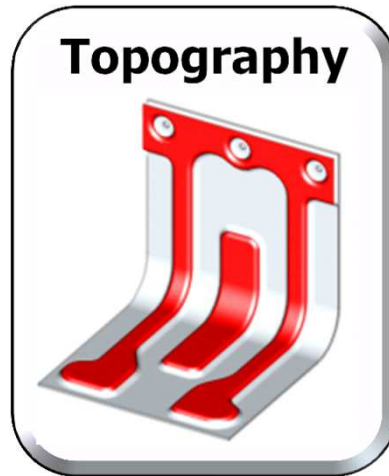
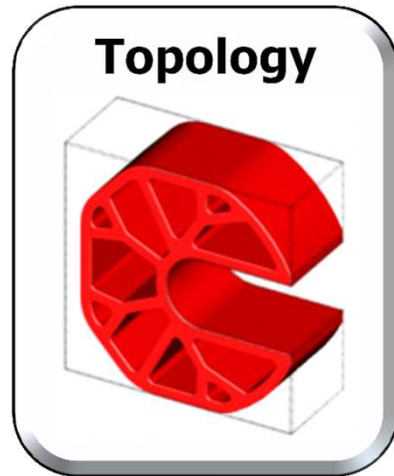
EADS chief technology officer Jean Botti says engineers are "pushing very hard" to find ways of making Airbus airliners more efficient.

Speaking in London at an EADS media seminar ahead of the show, the EADS technology czar said Airbus had made great strides in weight saving between designing the A380 and the A350.

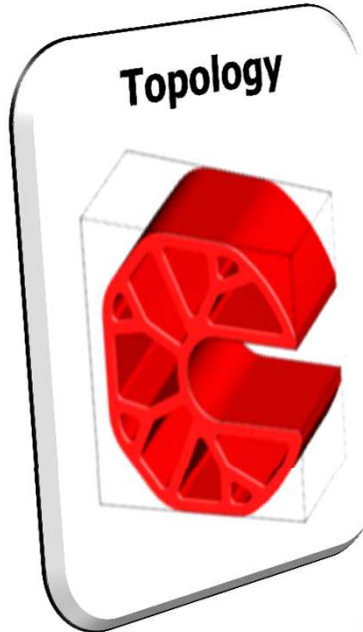




# Tools for Concept Layout & Optimization

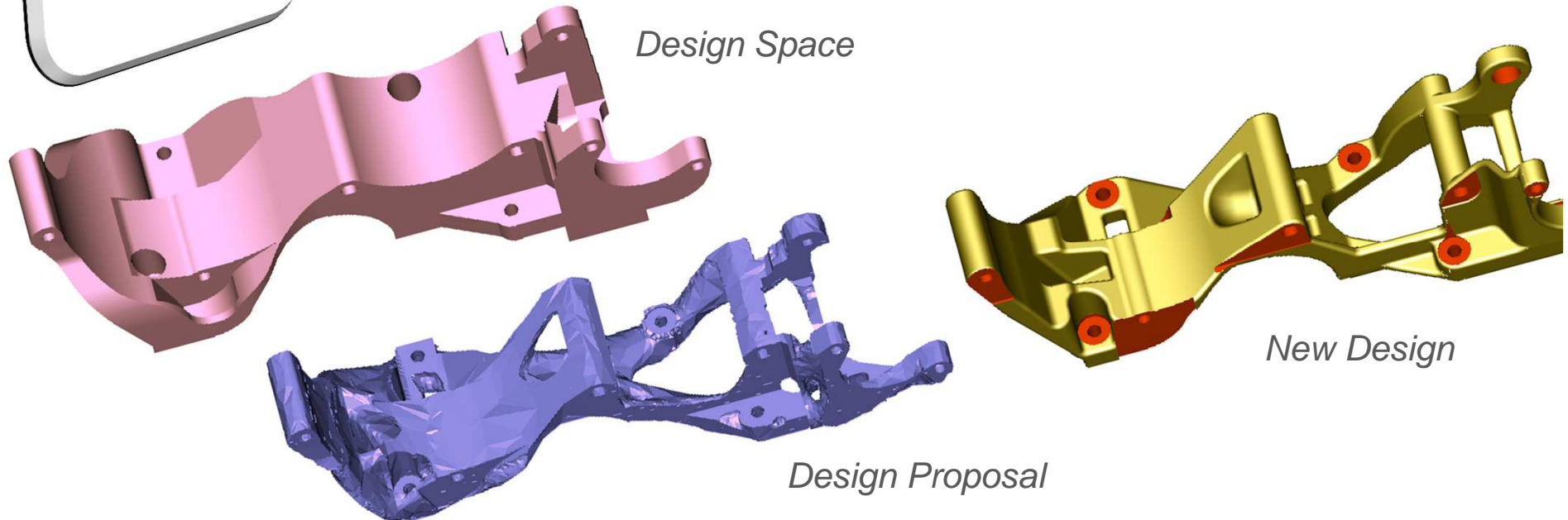


# Tools for Concept Layout & Optimization



**Method of determining optimal material distribution within a given package space**

- Overall design
- Rib pattern design
- Sheet metal optimization
- ...

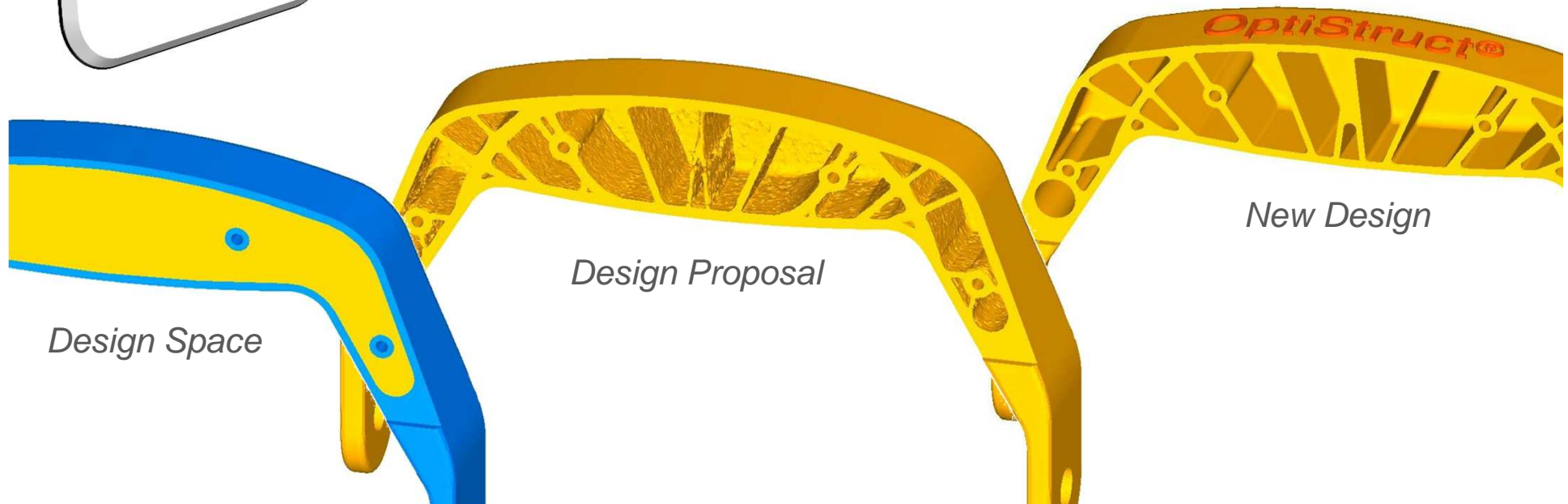


# Tools for Concept Layout & Optimization



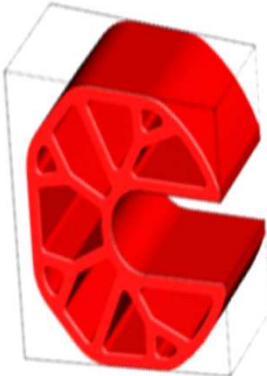
**Method of determining optimal material distribution within a given package space**

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- ...



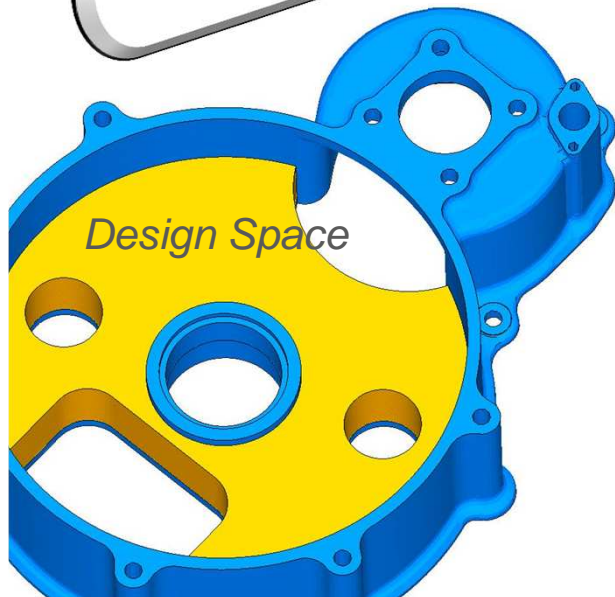
## Tools for Concept Layout & Optimization

### Topology

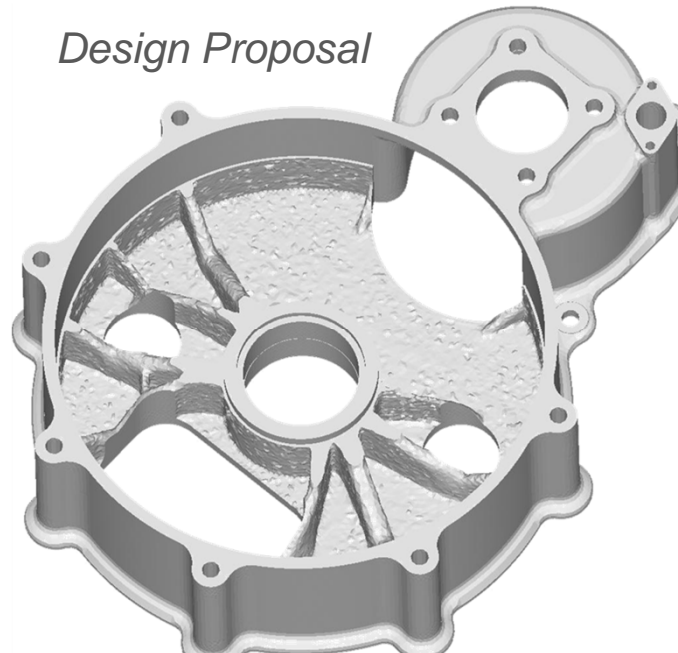


**Method of determining optimal material distribution within a given package space**

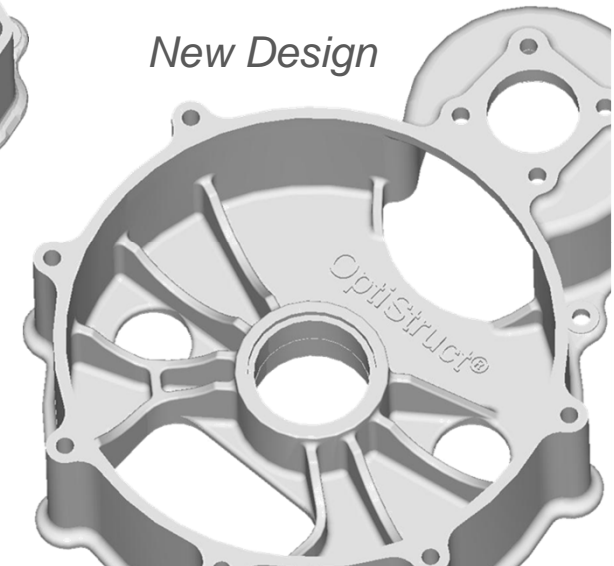
- Overall design
- Rib pattern design
- Sheet metal optimization
- ...



*Design Proposal*

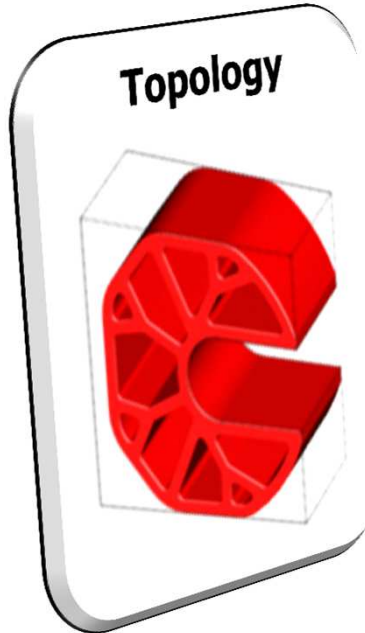


*New Design*



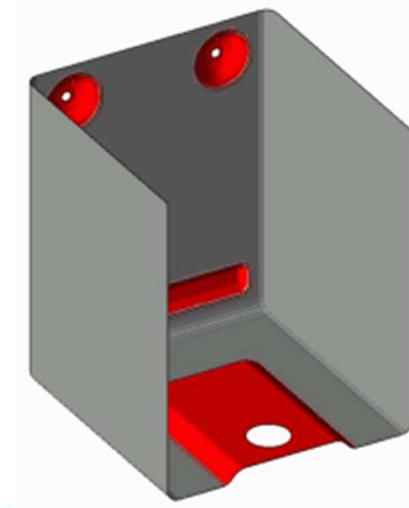


# Tools for Concept Layout & Optimization

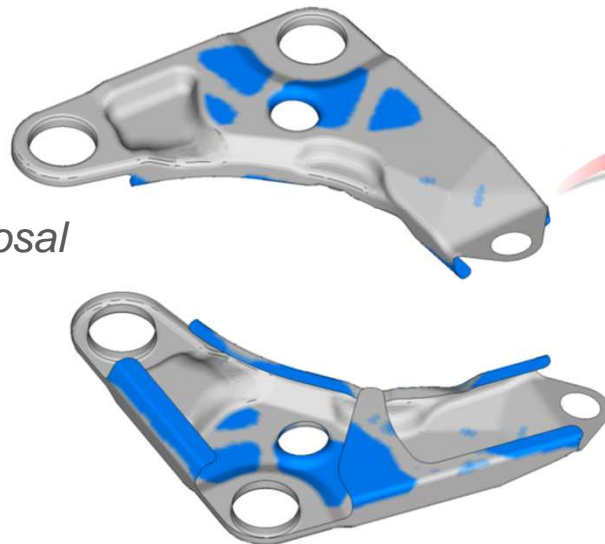


**Method of determining optimal material distribution within a given package space**

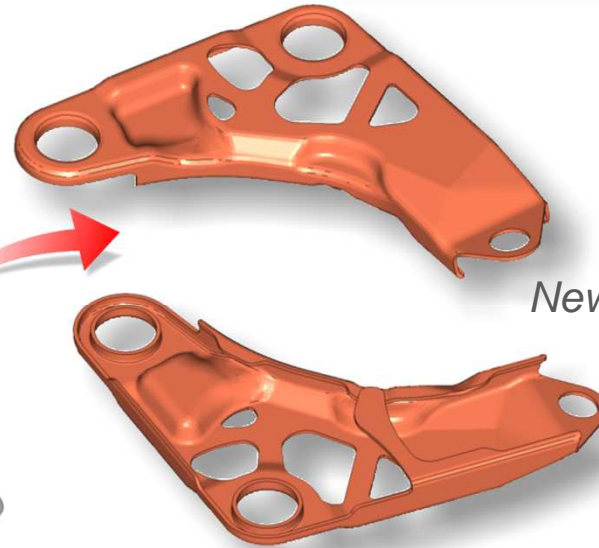
- Overall design
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- ...



*Design Proposal*

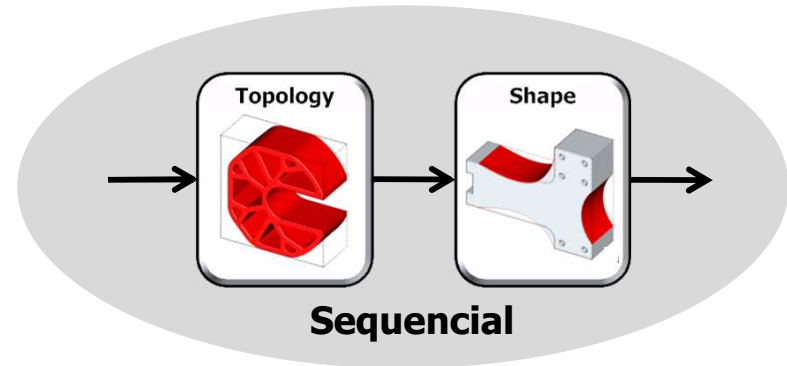
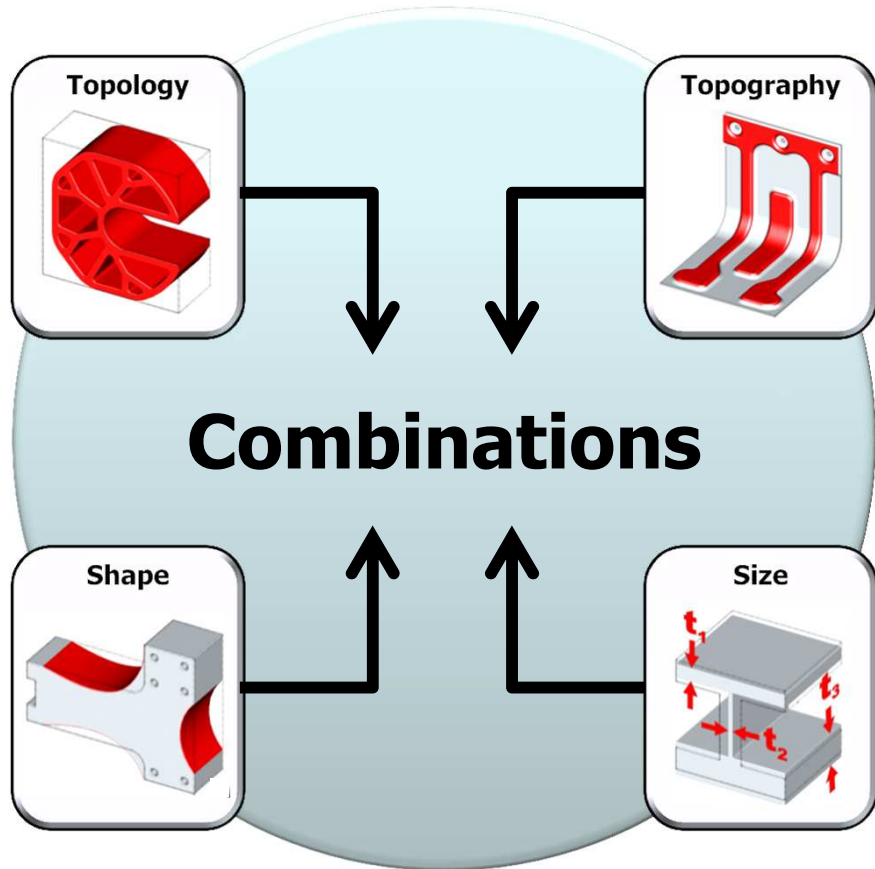


*New Design*

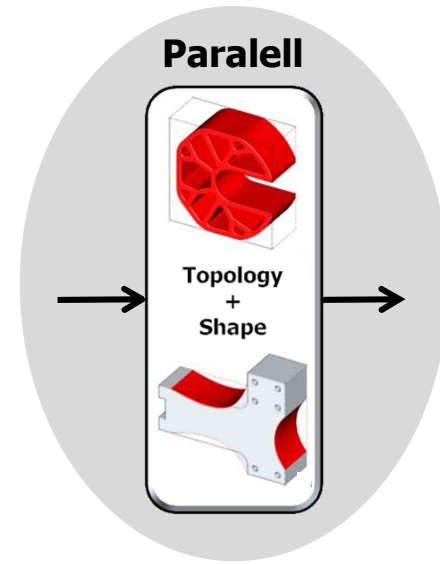




# Tools for Concept Layout & Optimization



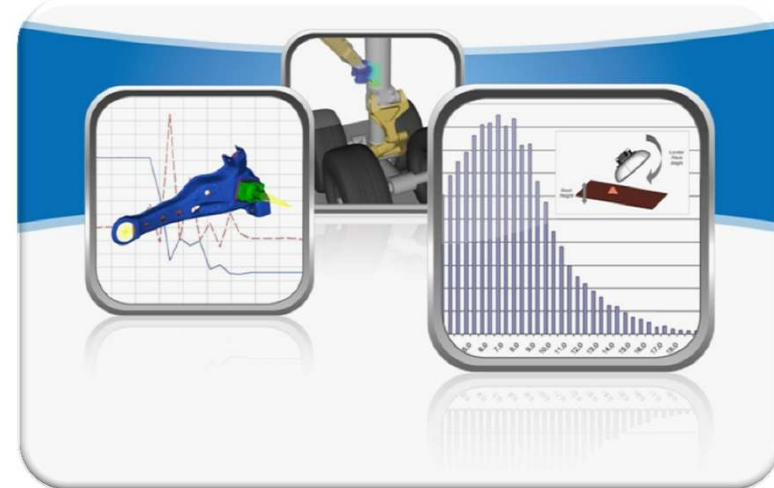
$\neq$



## Tools for Concept Layout & Optimization



**Altair OptiStruct®**  
Optimization for Structures,  
Vibrations and Durability



**Altair HyperStudy®**  
Multi Disciplinary Design Studies,  
Design of Experiments (DOE) &  
Stochastic Studies

## Case Study

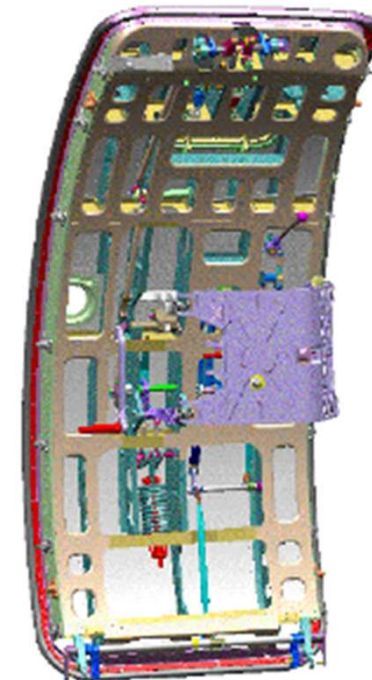
### Eurocopter Aircraft Door Hinge :

#### Design Problem:

- weight reduction
- reduction in development time

#### Methods used:

- Topology Optimization
- Subsequent Shape Optimization

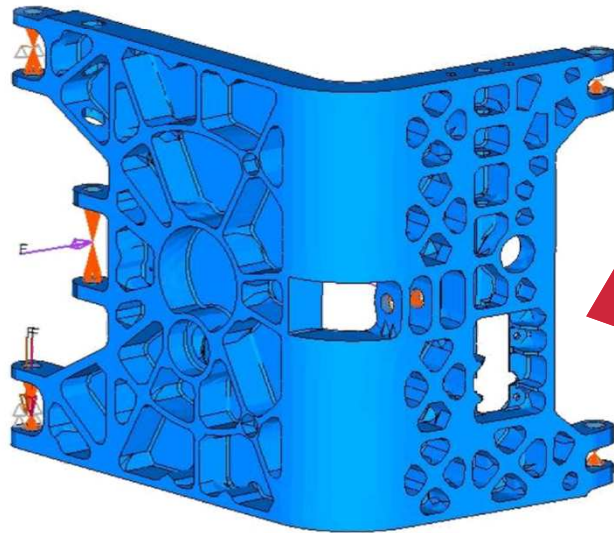


# Eurocopter Aircraft Door Hinge

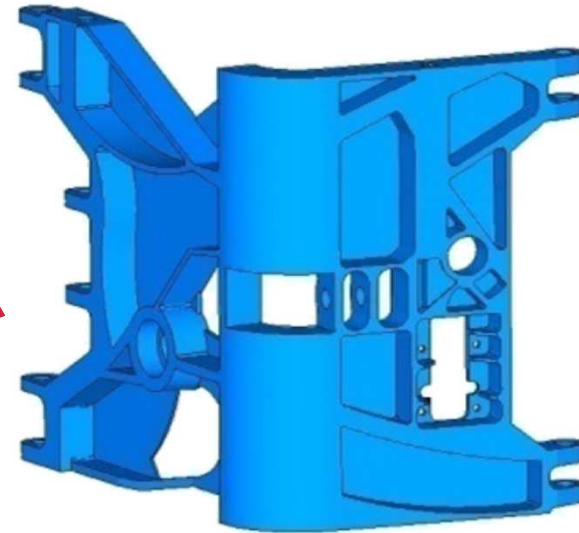


Mass = 9.15 Kg  
Design Time: 3 Months

Mass = 7.5 Kg  
Design Time: 3 Weeks

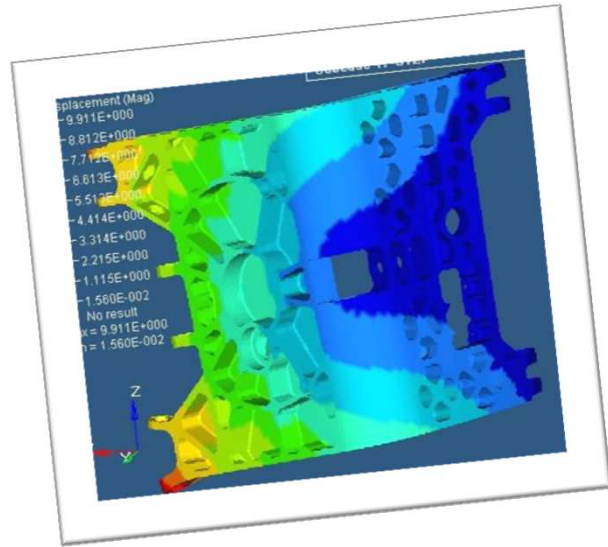


Conventional Design Process



Optimization Driven Design Process

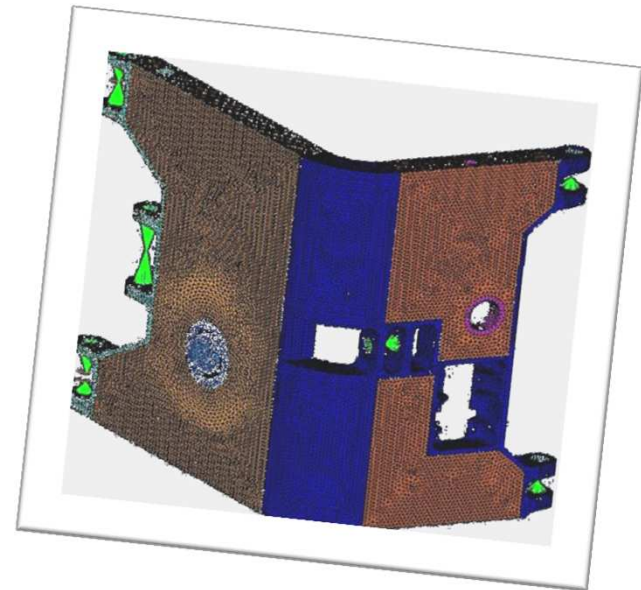
# Eurocopter Aircraft Door Hinge



Analysis of Original Design

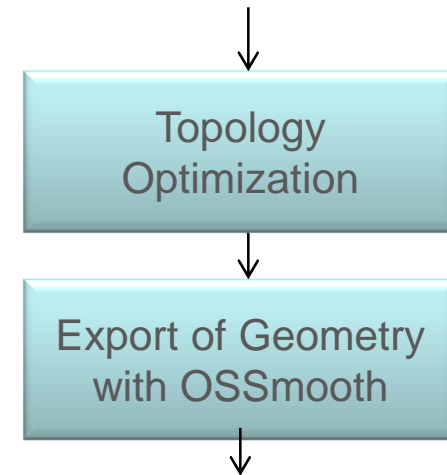
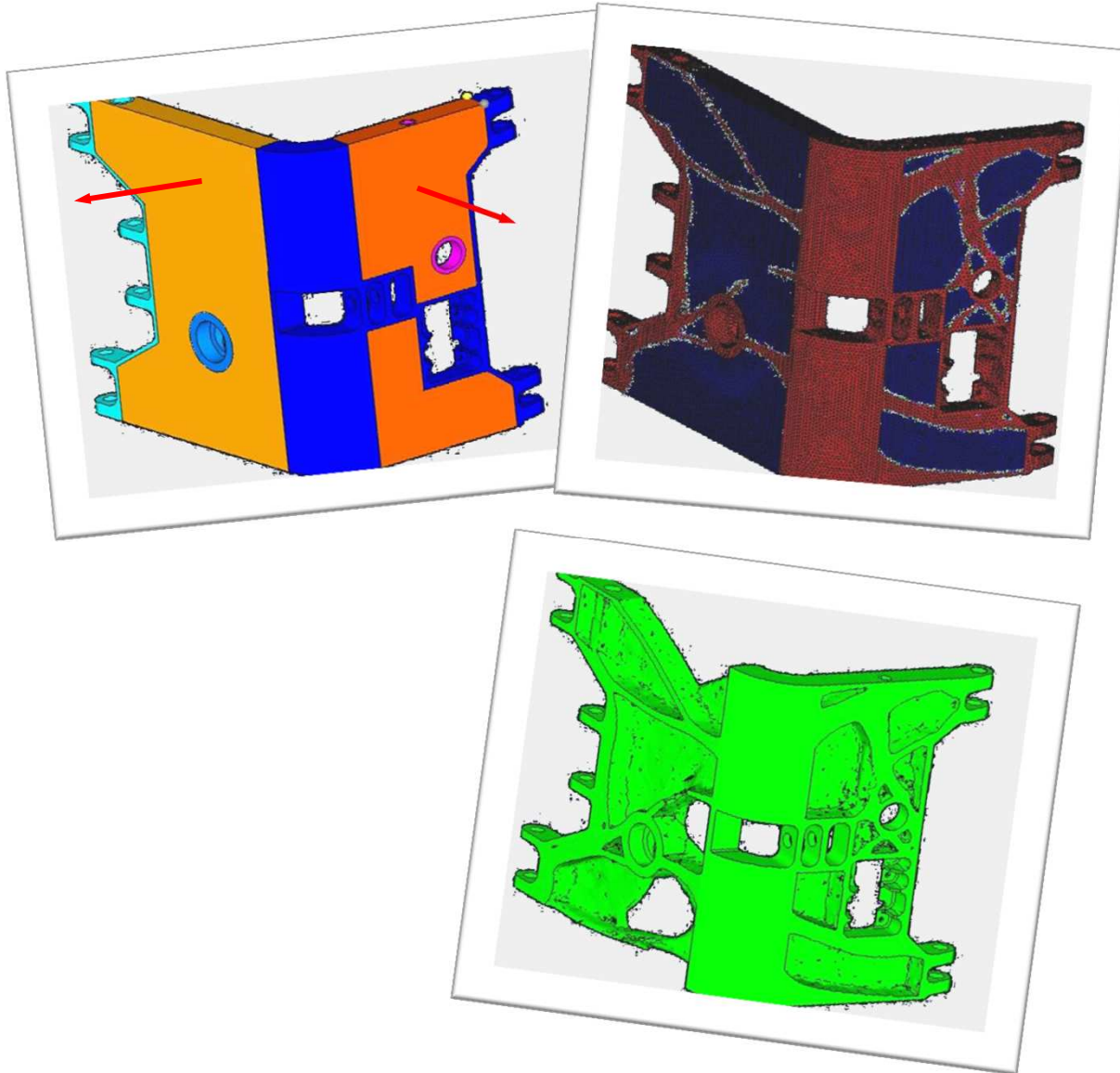


Meshing of Design Space

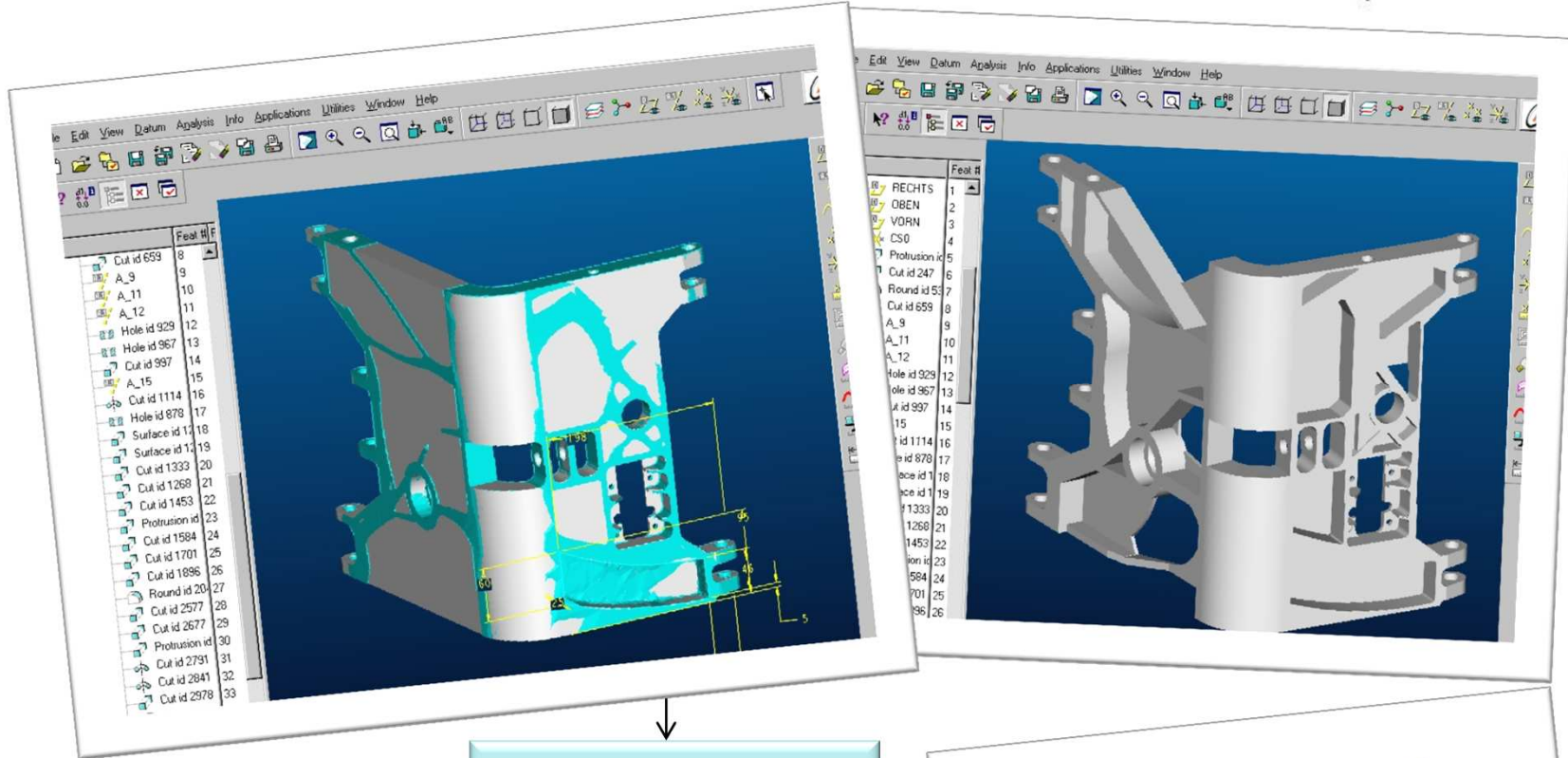




# Eurocopter Aircraft Door Hinge

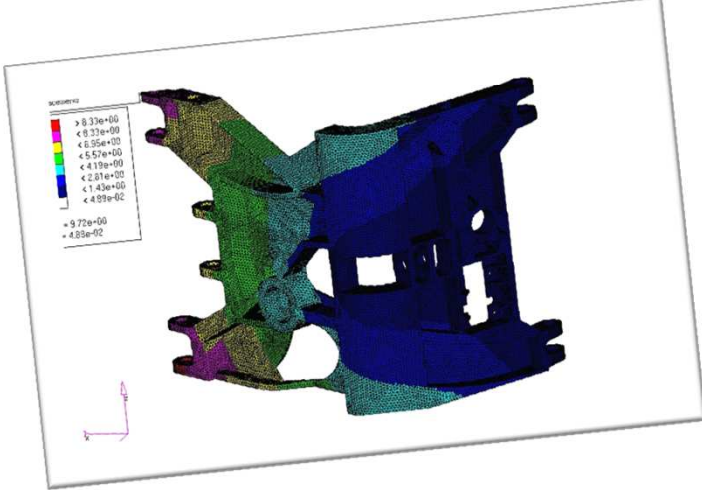


# Eurocopter Aircraft Door Hinge

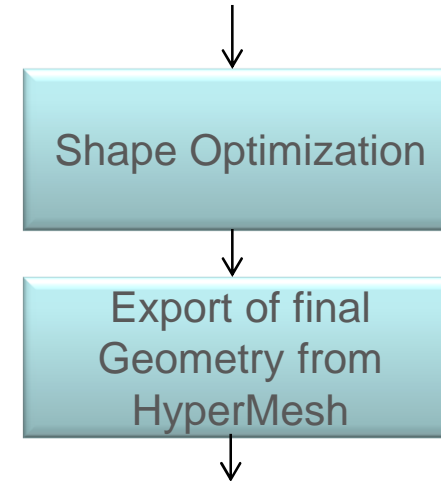
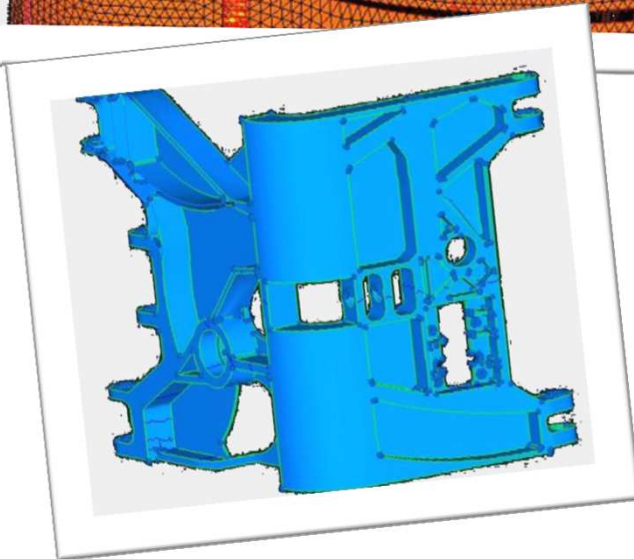
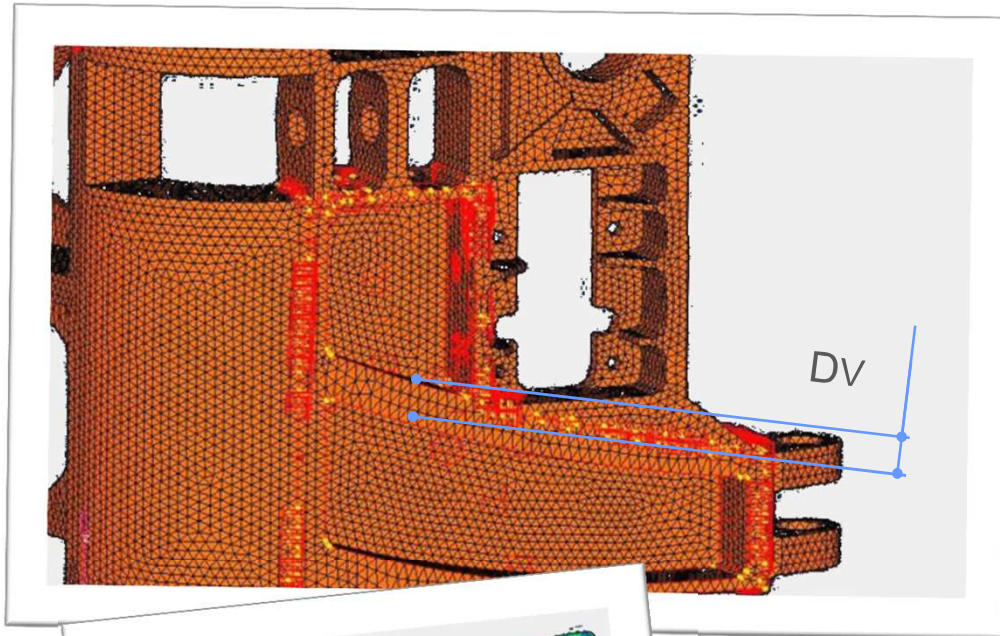


CAD-Modeling of Design Proposal

Analysis of Design Proposal

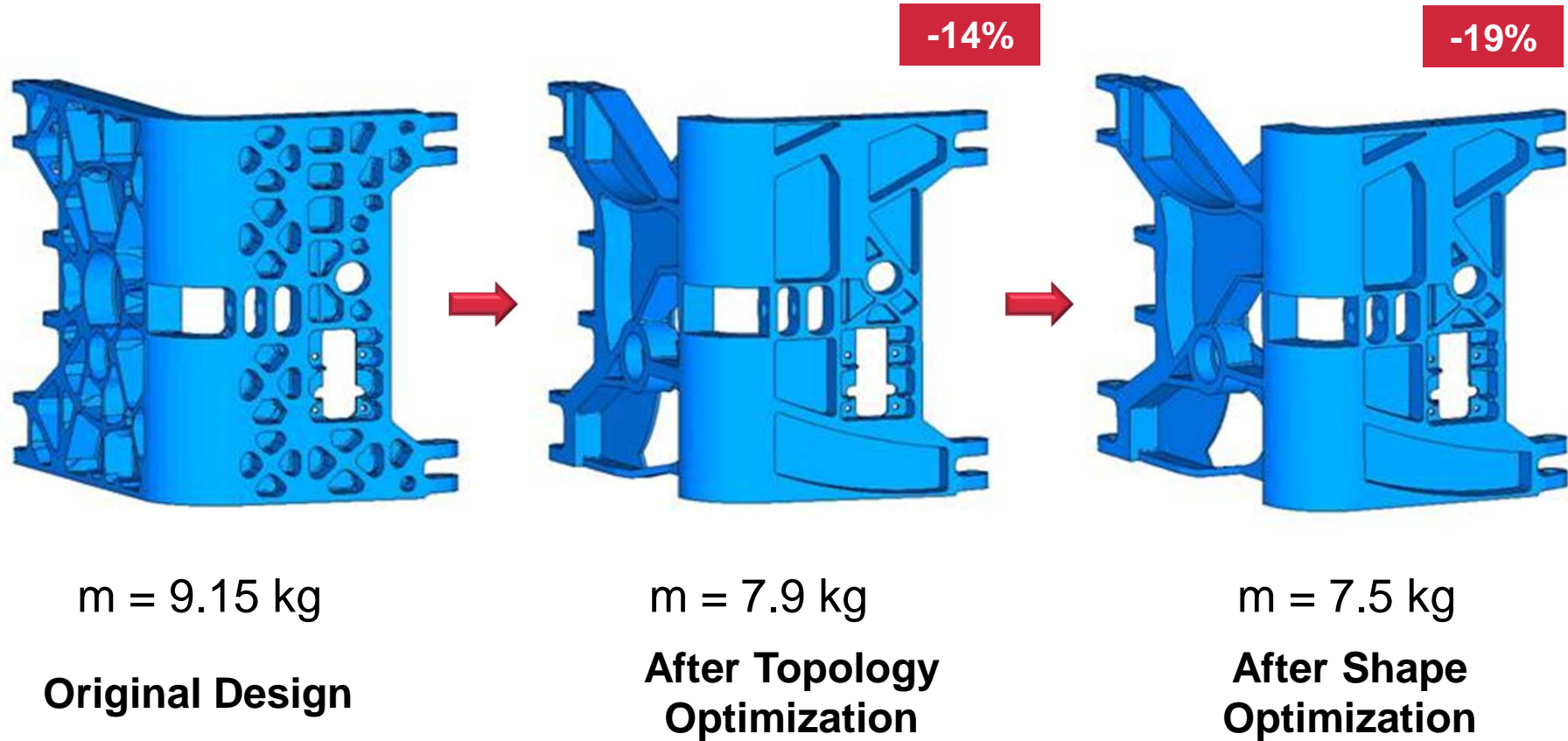


# Eurocopter Aircraft Door Hinge





## Eurocopter Aircraft Door Hinge



“We used OptiStruct on different parts of the aircraft passenger door system. The software helped us to achieve substantial weight savings.”

Peter Haensch, Optimization Specialist, Eurocopter GmbH, Germany

## Case Study

### Airbus A380 Leading Edge Rib Design

#### Design Problem:

- Weight reduction

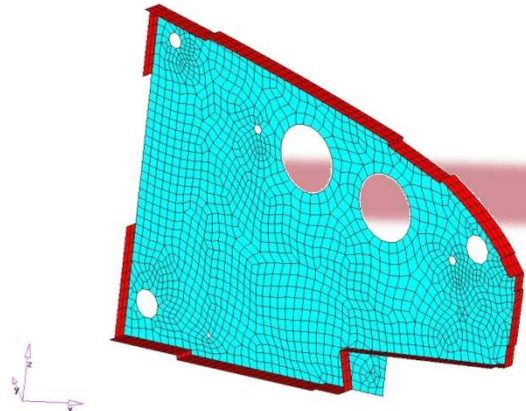
#### Methods used:

- Different disciplines in sequential order
- Process Automation

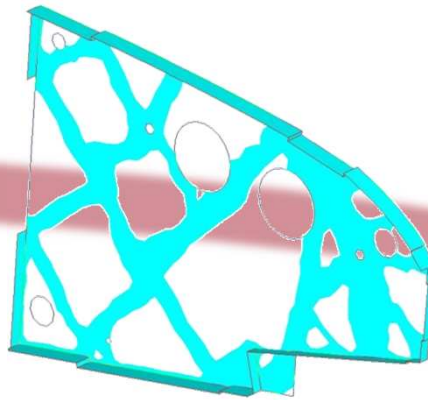




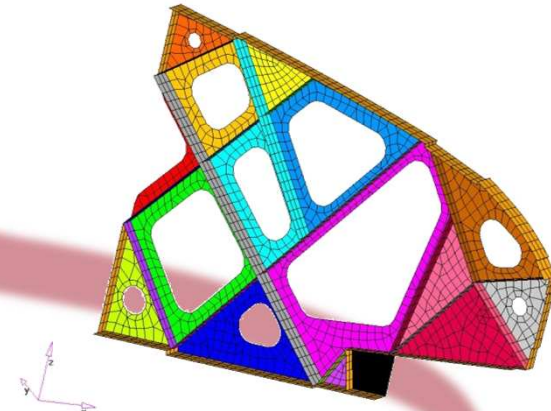
# Airbus A380 Leading Edge Rib Design



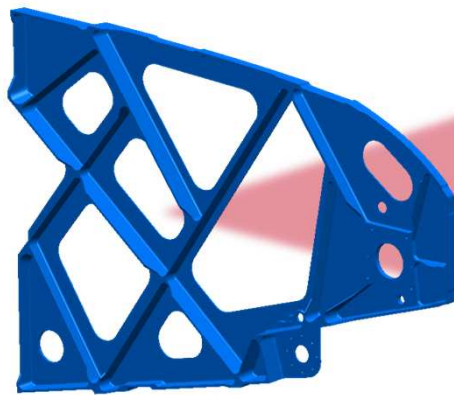
Topology Optimization Design Space and Load



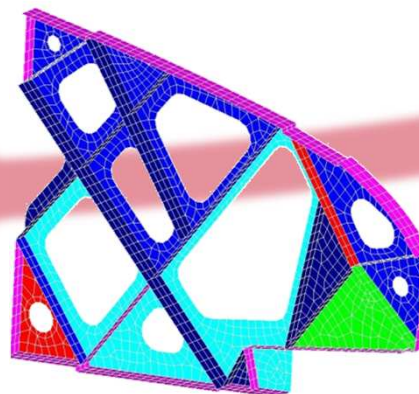
Topology Optimization Stiffness Material Layout



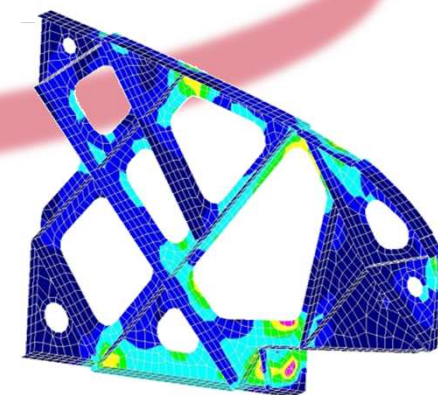
Topology Optimization Geometry Extraction



ICAD Solid Geometry Extraction

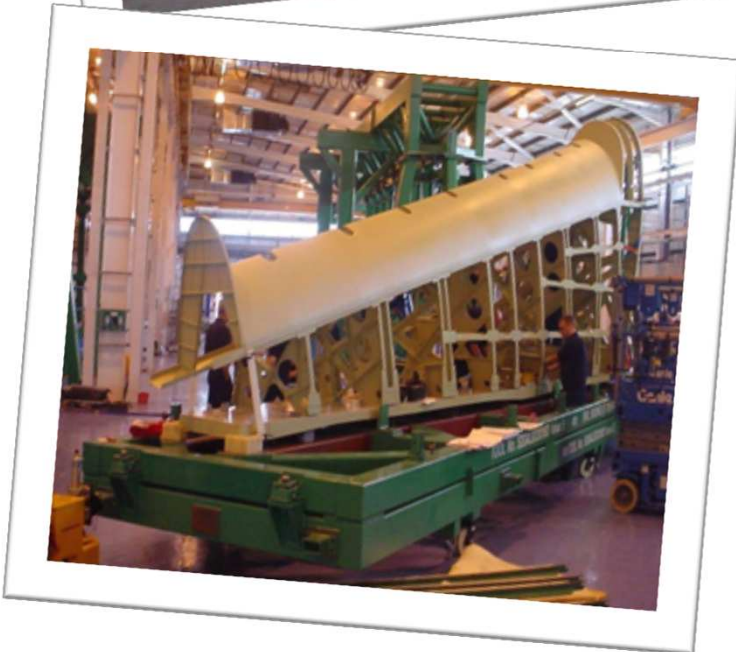
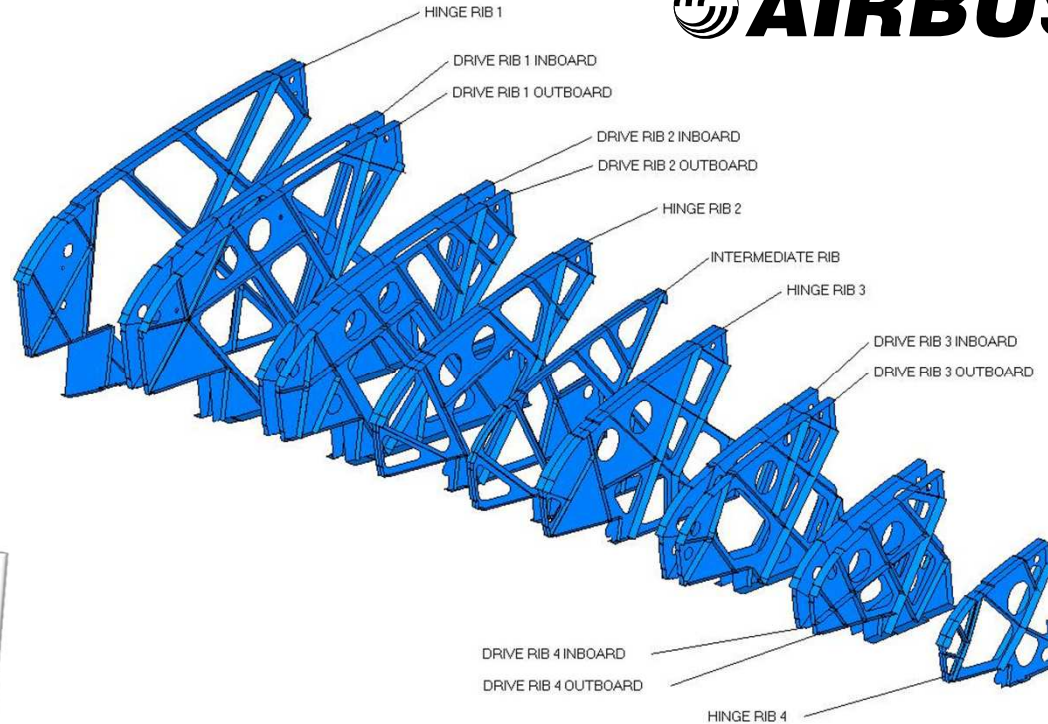


Size and Shape Optimization Geometry Extraction



Size and Shape Optimization Buckling and Stress

# Airbus A380 Leading Edge Rib Design

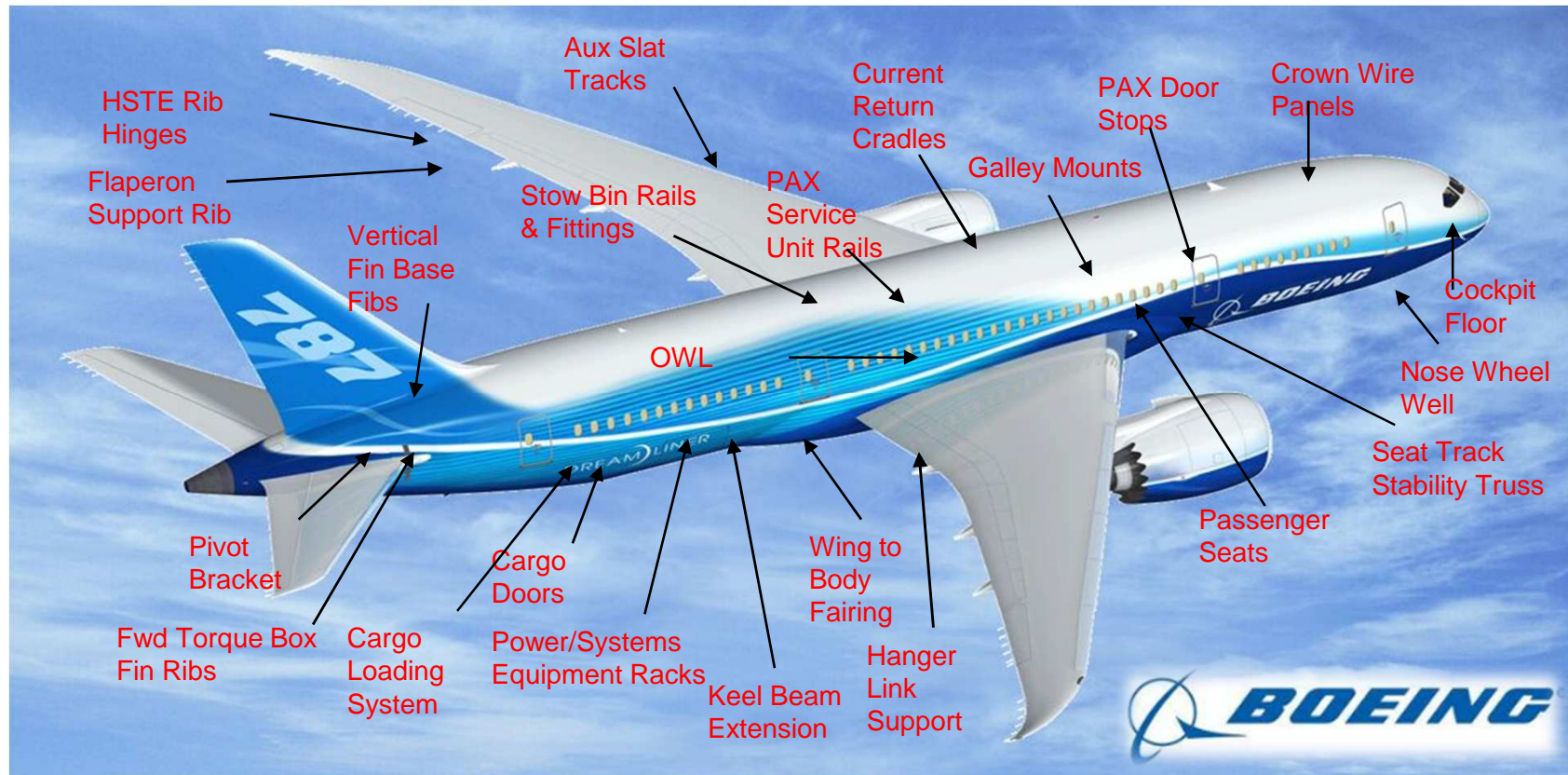


## Results:

- **Mass savings of 44% (500kg)**
- **Deadline met:**  
Ribs developed in 13 weeks through automated process



## Boeing 787 Optimization Centre



- All Airframe Components Screen for Optimisation - 1,500
- Around 150 Components Light Weighted using OptiStruct
- At the Projects Peak over 35 Altair Engineers were used
- Strong Local Focus (e.g. Seattle), Global Centres of Competency (e.g. UK), Offshore Cost Efficiency (e.g. India)

There're many more...





Our Mission is to innovate  
and to enable innovation  
for our customers.

Thank you!