ARTS ET MÉTIERS ParisTech
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CENTRE NATIONAL D'ÉTUDES SPATIALES

MECHANICAL STRUCTURE

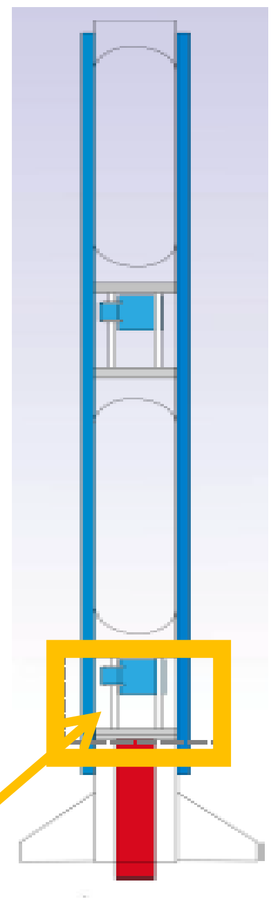
CONCEVOIR DEMAIN

Definition report of the thrust link part for SERA ASTREOS launcher

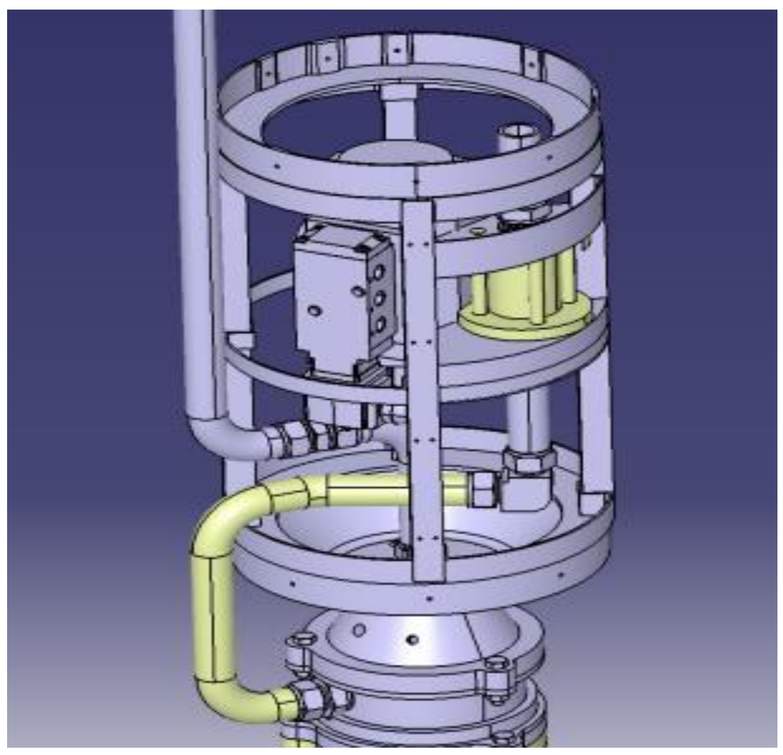
Presentation

The goal of this project is to define and manufacture the mechanical part which links the MLE5K engine (MINERVA project) of the SERA ASTREOS launcher to the structure of the rocket.
This mechanical part has to withstand 5kN of thrust and 2kN of shear force during the flight.
Moreover, some aspects have to be taken in account just as the volume available for the valve and fluid parts and their accessibility for the alimentation system of the engine (umbilicals,…), or, the mechanical interface with the skirts.
The study is separated into the mechanical design of the thrust ring and the design of the cage.

Our main objective, this year, is to complete the first design of this mechanical part and start the process of validation of this one with tests. The part could be used in the next SERA ASTREOS launcher and being an interesting base for the inter-tank structure design.



The part under study

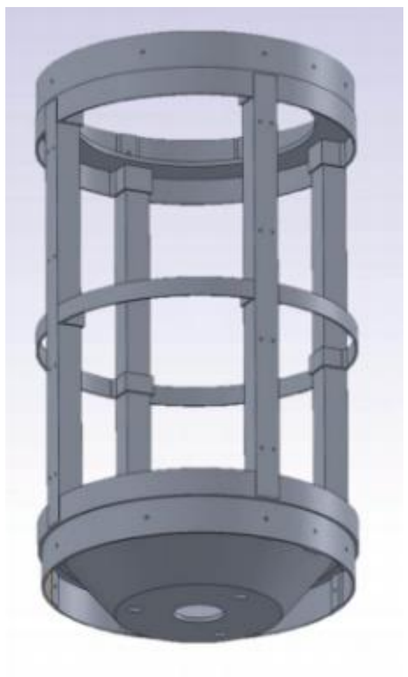


CAD representation of the system

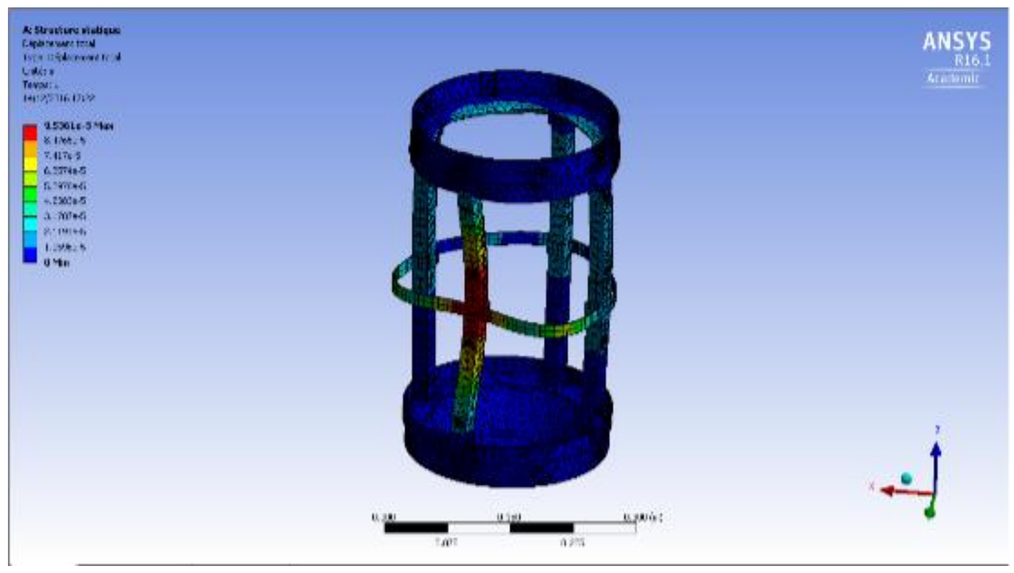
Project layout

1st objective – DESIGN THE PART
Definition of the specifications of the part
Propositions of different architectures considering the strains
Choice of the best solution (taking in account manufacturing feasibility)
Optimisation of the part

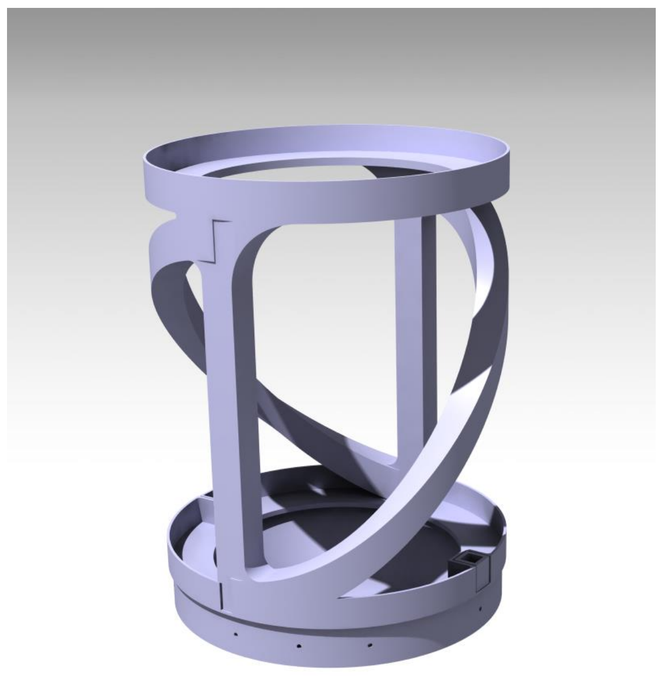
2nd objective – VALIDATE THE PART :
Manufacturing
Mechanical tests to validate the prototype



First architecture submitted by a first definition of the part (made by Romain Diram)



Mechanical simulation for unvalidation of the first model



CAD model of one prototype of the part

Project process

1 year study (started October 2016)
4th year project : 80h of work per student allowed
Supervised by P. Carpentier (professor in mechanical conception)

Progress status

- Specifications of the part
- Study of the submitted part and his mechanical strength
- Modelisation of different architectures for the part
- Mechanical strength simulation of the prototypes designed

Remaining work

- Choice of the best architecture
- Optimisation of the one chosen
- Manufacturing of the part
- Mechanical tests on the prototype

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