

PEGASE PROJECT : COMPOSITE NOZZLE REALIZATION

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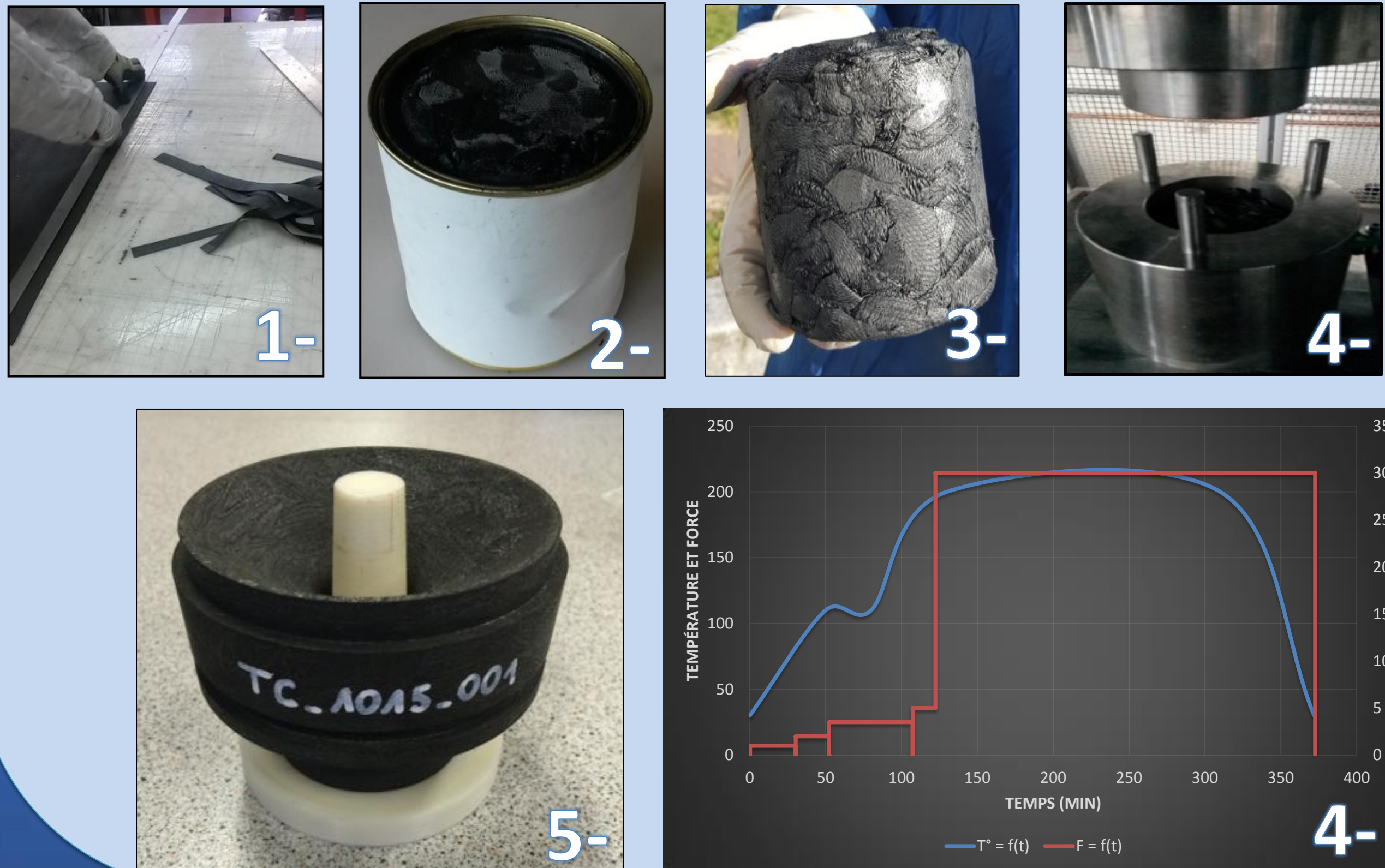
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Context : PERSEUS project is an initiative of the CNES which aim is to promote the emergence of innovating industrial technologies for spacecraft project realized by young people of higher education. In this, the macro-project PEGASE composed by 4 teams with dedicated skills is developing its own launcher.

Objectives : IMA's objectives are producing nozzles by different innovating methods and, at least, managing the assembly of the all launcher. This mean configuration management and parts gathering.

Compound

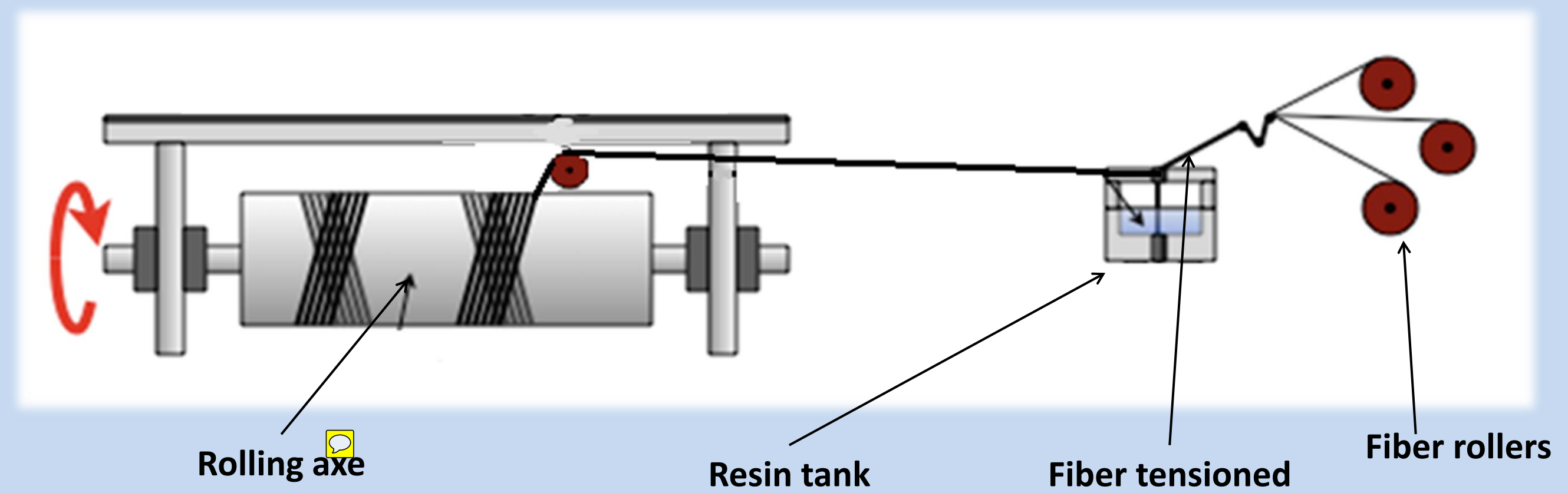
- 1- Carbon Phenolic prepreg cut in bands and balled-up
- 2- Preform by mechanic press and maintain a temperature of -18°C
- 3- Insert the preform in the mold installed in a hot-press
- 4- Apply the polymerization/compression cycles
- 5- Machining of the nozzle from brut



Studied methods:

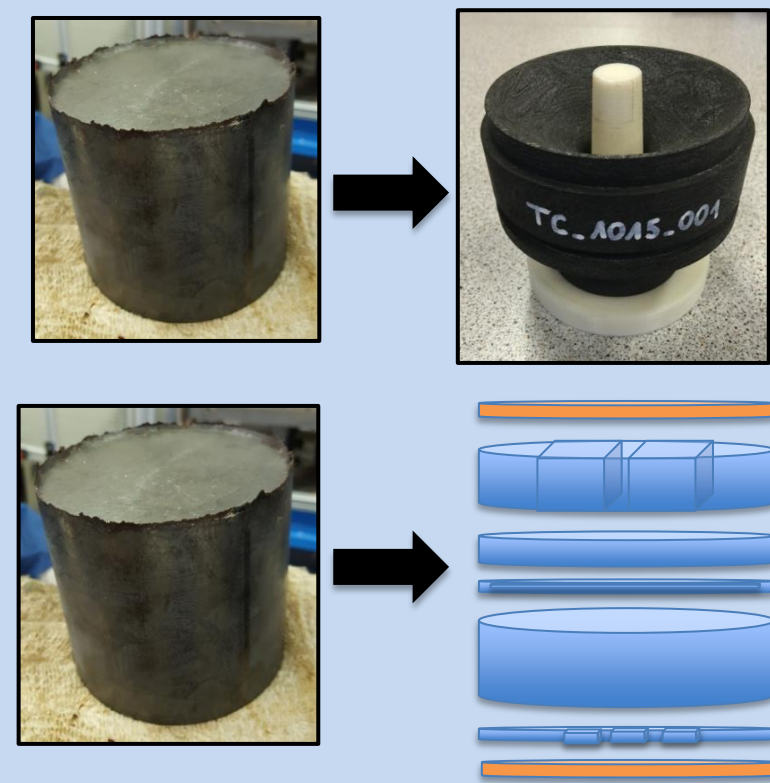
Filament winding

- 1- Fiber rollers and resin tank installation
- 2- Automatic rolling
- 3- Machining of the nozzle from brut

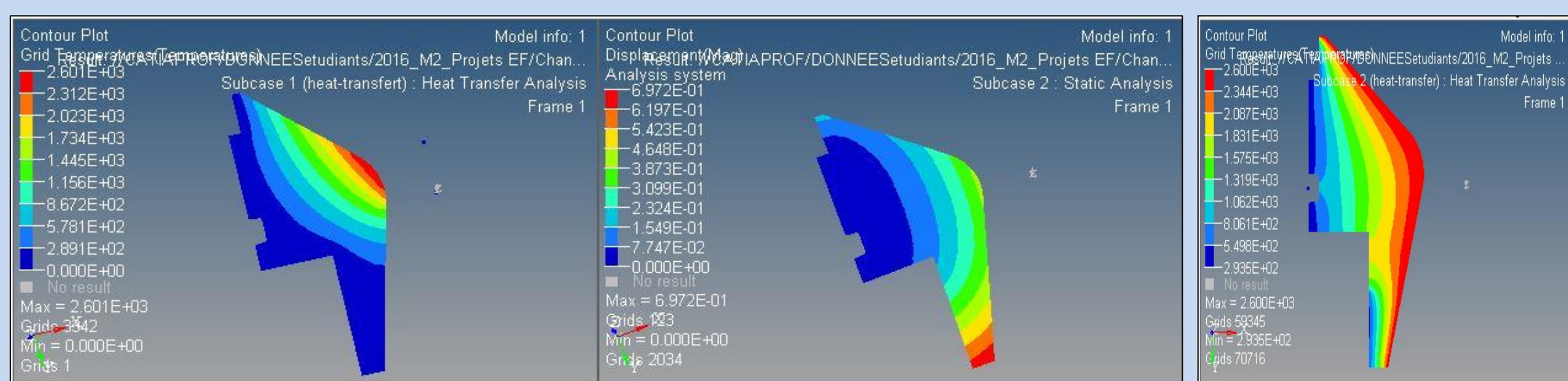
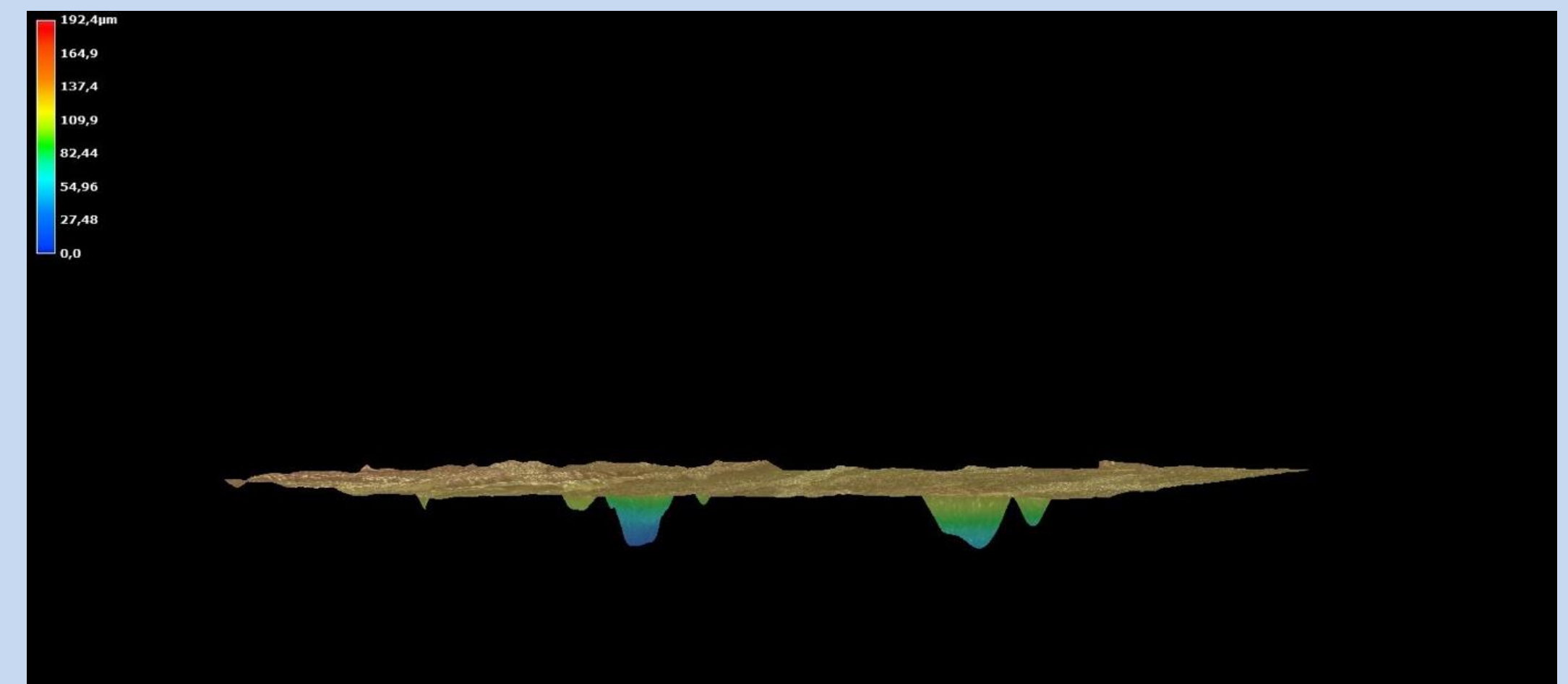


Compound material

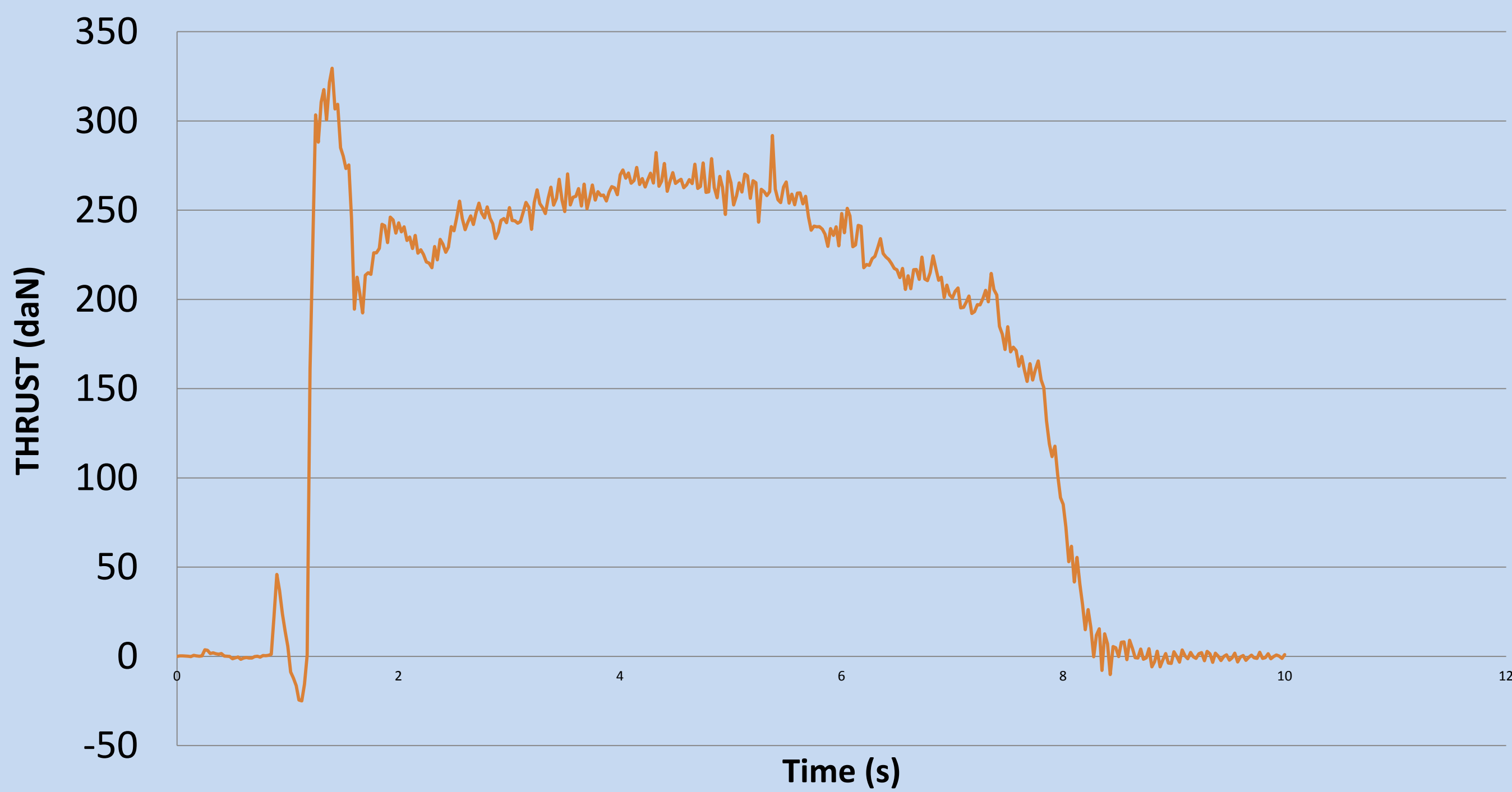
- Fabrication of two bruts by compound method
 - Machining of a nozzle
 - Machining of samples for mechanical tests
- Modelling of nozzle and mold by finite elements for :
 - 1. Thermomechanical studies
 - 2. Thermic study (diffusivity)



- Characterization of the porosity of the compound
- With optical installation, we determined porosity about 25%



Compound nozzle firing



- Firing of the nozzle in ONERA's facilities (Toulouse) the 03 of December 2015
- Measured parameters allegedly the same as Cesaroni's launcher (reference model)



Launcher Assembly Management

- Full control of Technical Specifications
- Modelling of produced parts assembly
- Integration check

