

STUDENT AEROSPACE CHALLENGE 2016/2017

STUDY AND DESIGN OF A REUSABLE PRESSURE FED ENGINE

WP3 - Propulsion

Space Piranhas

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Application to the suborbital vehicle

A pressure-fed engine has a very simple cycle, is relatively easy to design due to its low working pressures and temperatures and the use of methane as a propellant makes it highly reusable, environmentally friendly and financially affordable.

Follow on studies

Improvement of the methane cooling system and a more efficient configuration for the propellants and helium tanks in order to increase the available space for passengers.

Project Description

A parametric study was conducted in order to understand the influence of the variation of the engine's main working parameters, such as mass flow, burn time, combustion temperature and nozzle exit pressure, upon the overall performances of the manned suborbital vehicle, SpaceShipOne.

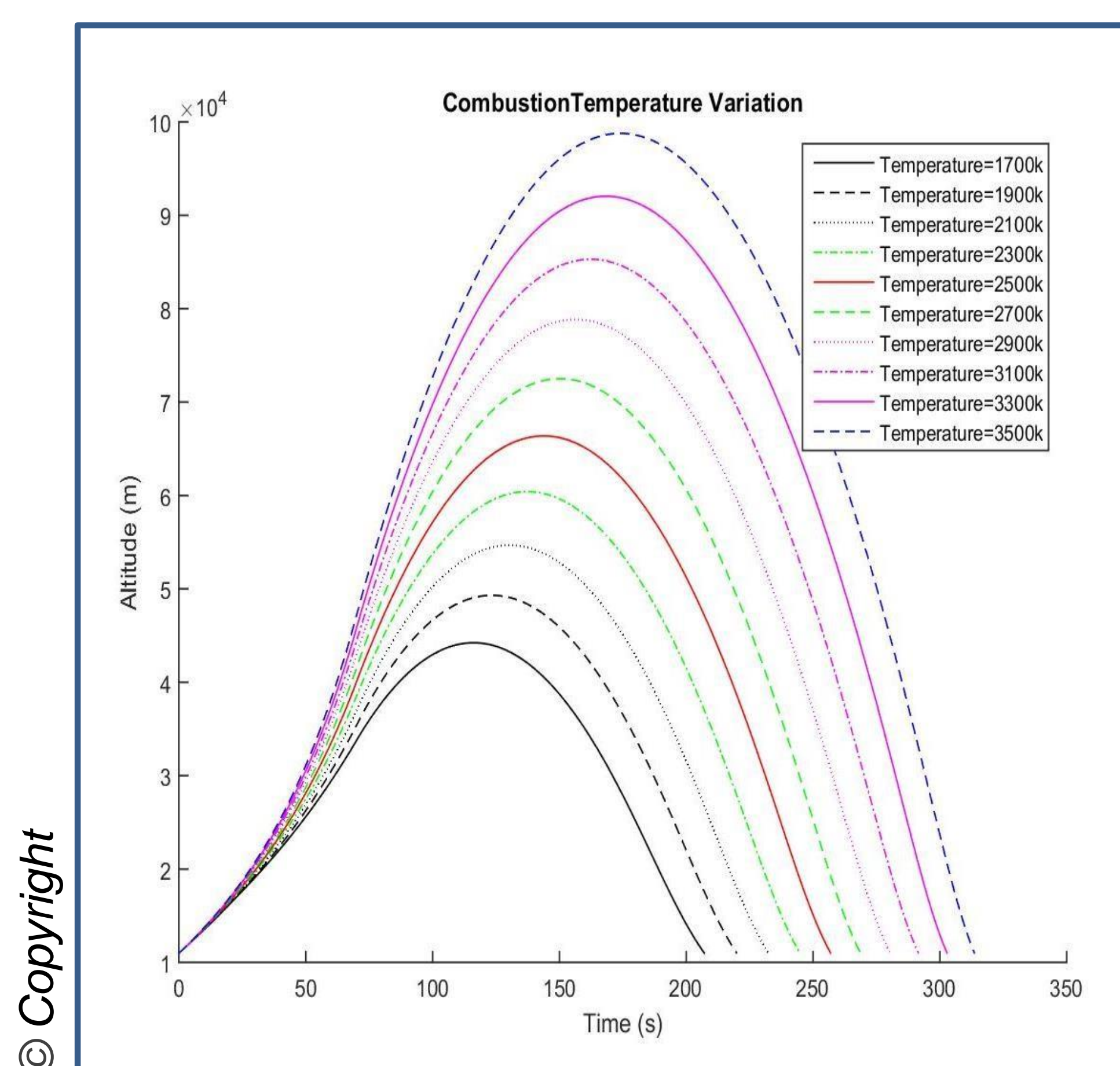
The design of the thrust chamber, cooling system and pressure fed system was initially made for the use of kerosene as a propellant. Eventually, taking into consideration operational aspects like reusability and maintenance we decided to change the fuel to methane.

Several optimizations were made in order to increase the microgravity duration without further fuel consumption and to create a more efficient nozzle for high exit velocities.

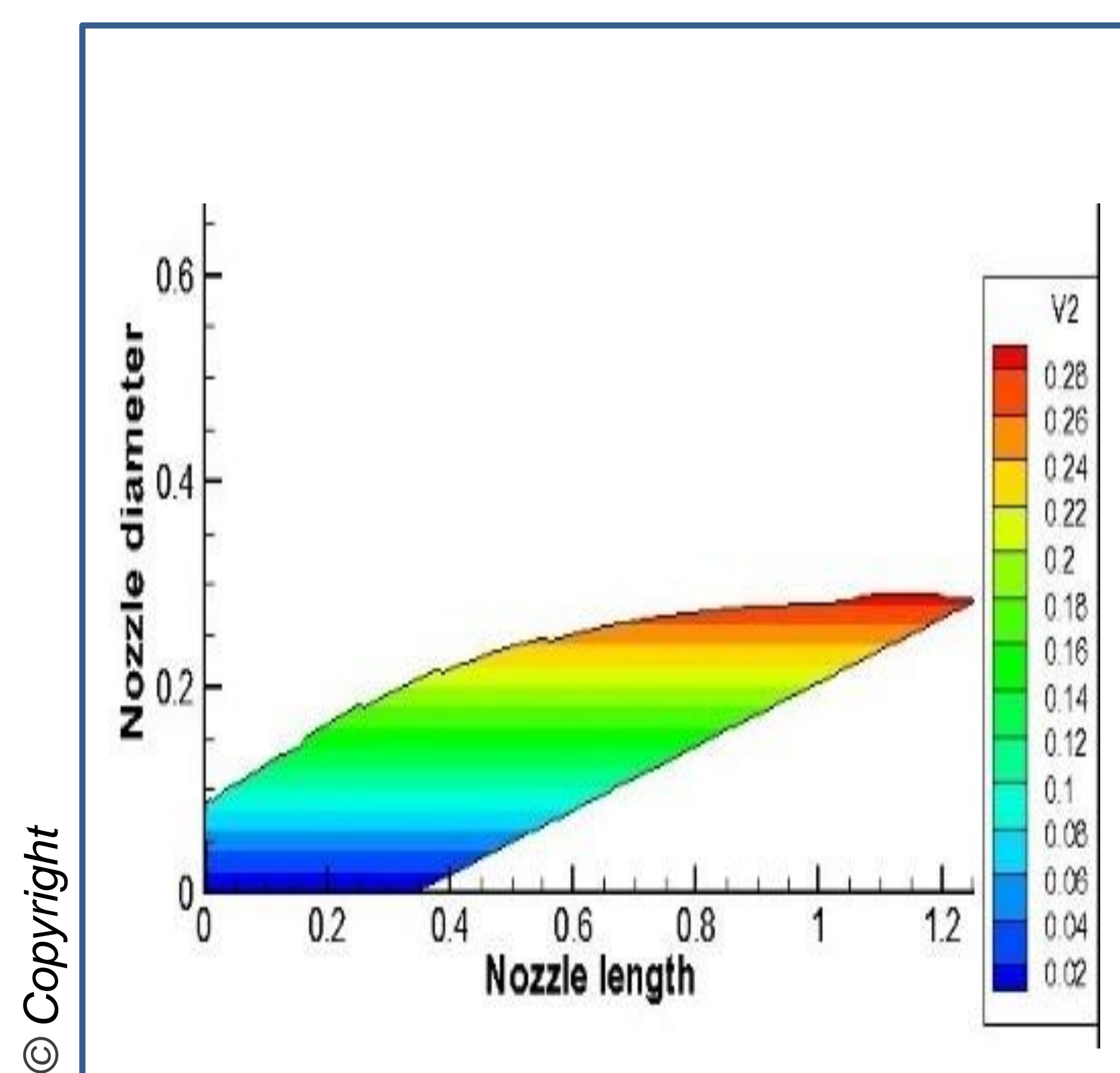
It is our belief that pressure fed engines propelled by green fuels are one of the best and safest options for the development on a large scale of space tourism.

Innovations

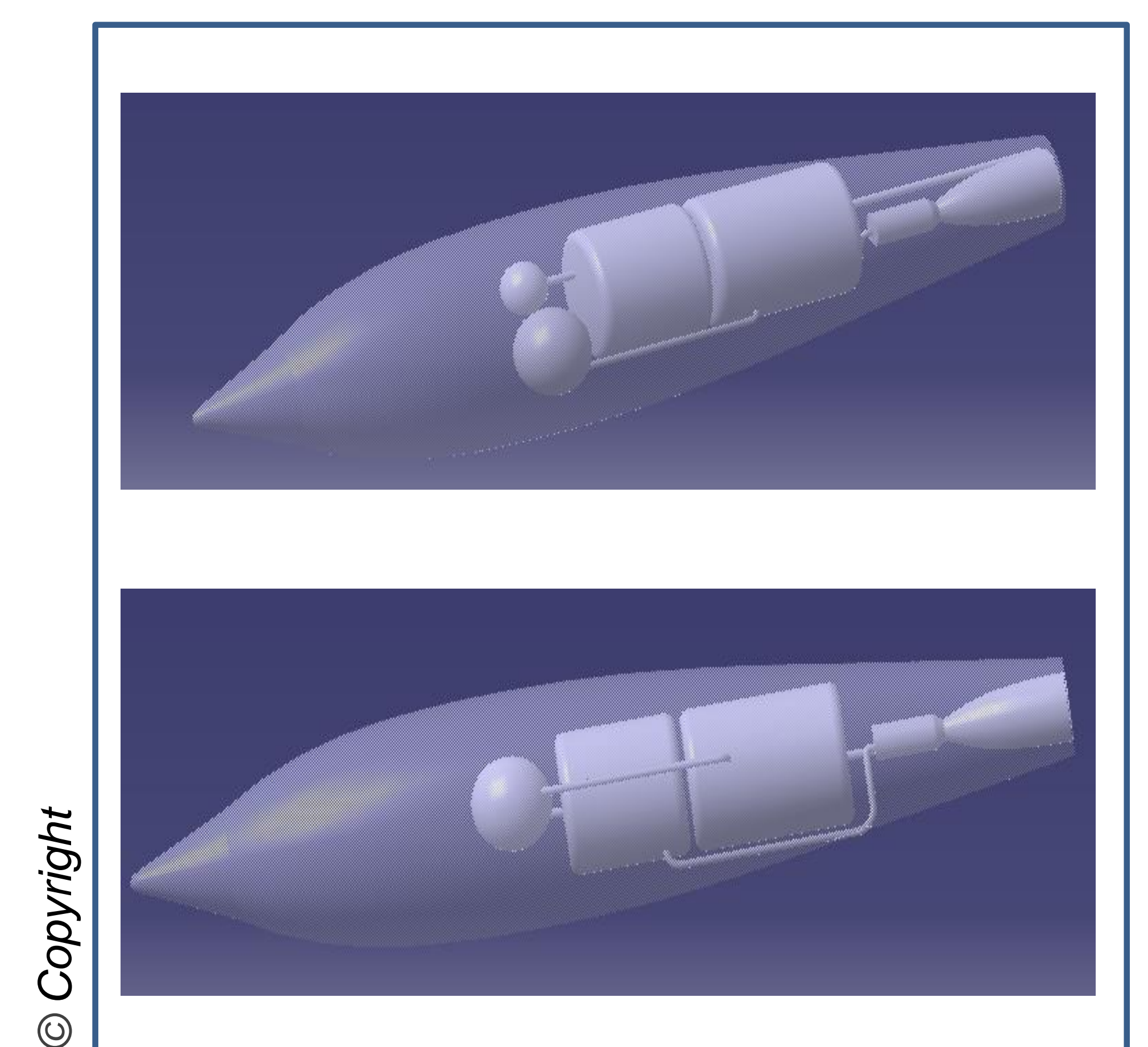
A reusable kerosene/LOx and methane/LOx pressure fed engine, with pressurized helium and regenerative cooling, adapted with a bell nozzle.



MSV reached altitude depending on combustion temperature



Variation of Mach number along bell nozzle



3D configuration of tanks for methane