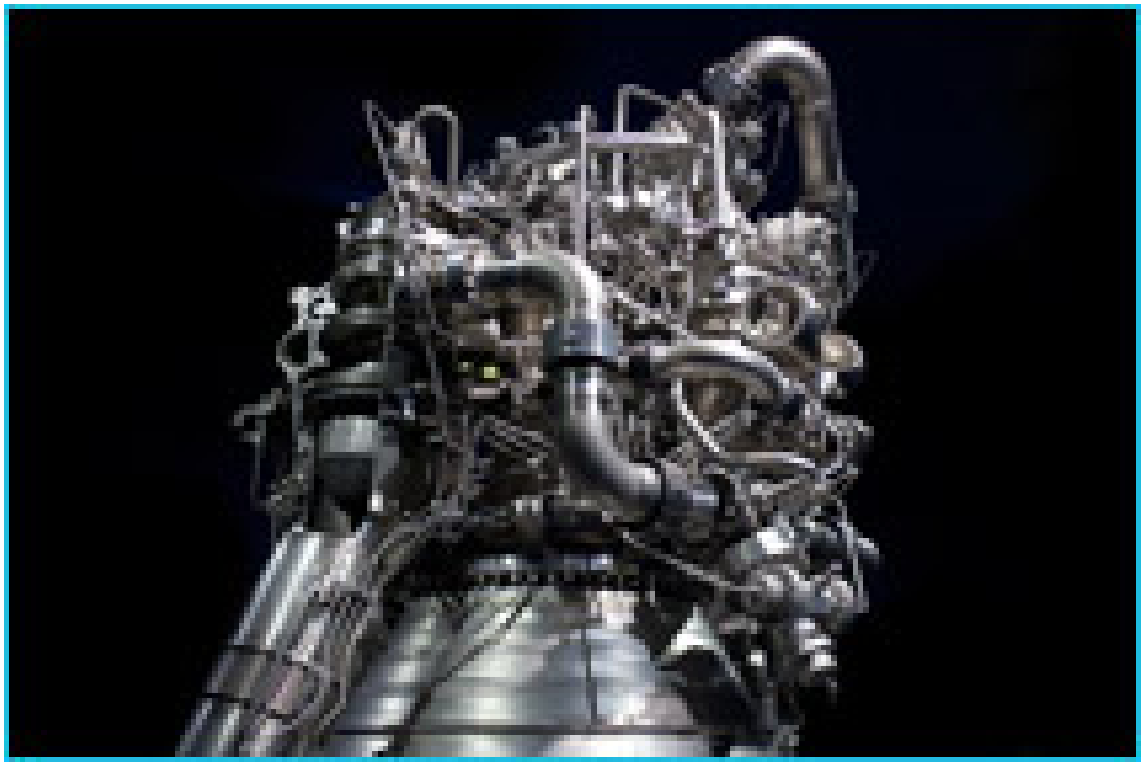

The first step of the study consists in choosing the vehicle you will work on: either 1- suborbital vehicle for high-speed long-range transportation
or
2- vehicle servicing Low Earth Orbit
.

You will pay particular attention to solutions that minimise environmental impact, and to the impacts (including maintenance) caused by the need for the rocket propulsion system to be ‘reusable’. It is welcome to refer to, and pursue, work done by previous teams.

You will then address one of the following topics:

1.

Propulsion system:

- In case of use of an existing engine and propulsion system: analysis of suitability with respect of safety needs, to the environmental impacts, and to the whole commercial life time, and of the ability for high reusability and affordable economic performance. Maintenance aspects shall be analysed. For type 1 vehicle, alternatives to the use of rocket engines only will be analysed,
- **Or** Adaptation of a rocket engine which is the « image » of an existing one (via the change of propellant, or change of operating condition / of the thrust, …) and existing propulsion system, to be adapted to the needs of a sub-orbital vehicle transporting passengers. The safety needs, the operation cost, the environmental impact, the maintenance related to reusability, will be analysed,
- **Or** Study and pre-dimension, and issue the identified high level requirement, for a propulsion system specifically defined by the student team,

Or

-

Analysis of take-off phase of a suborbital vehicle using an innovative technological system (for example: magnetic rail Maglev type, other solution, ...) for assistance to the foreseen on-board propulsion, and of the benefit / constraints that it brings to vehicle design and performance,

Or

- For type 2 vehicle, analysis of a concept, including the pre-dimensioning,(for its main elements) of an Attitude Control System for in-orbit evolution (dubbed « SCAB »), to be used for flight phases where the aerodynamic surfaces are inefficient (no atmosphere, or flight domains with too low aerodynamic pressure): explain technological choice, list the elements of the SCAB, installation and lay-out in the sub-orbital vehicle, assessment of the total mass (at take-off).

Input data: the analysis shall be done by taking into account a needed control torque of 1200Nm around each of the 3 control axis of the vehicle, and a total duration (cumulated) of operating , for each control axis, of 100s.

Definition: the wording “Propulsion system” means the whole system delivering a propulsive

force, and it encompasses: Rocket Engine(s), propellant and fluid Tanks, the propellant Feeding Circuit, the Pressurization System, the Loading/Unloading circuits, the propulsion system Controller, all other elements necessary for the proper operating of rocket propulsion.

General characteristics of reference vehicles:

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