

ARIANE 6 CRYOGENIC UPPER LIQUID PROPULSIVE MODULE MULTI-BOOST MISSION DEVELOPMENT, A SYSTEM INTER DISCIPLINARY CHALLENGE

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Ariane 6 Cryogenic Upper Liquid Propulsive Module currently under development is a real game changer thanks to the mission versatility it will offer.

Based on Liquid Hydrogen / liquid Oxygen propellant, two propulsive systems (VINCI Main engine and Auxiliary Power Unit), it will have a capability of four Main Engine ignition with long coasting phase in-between.

The present paper will provide an overview of the development status of these specific flight phases, the difficulties encountered and the way they have been managed.

The presentation will address the following main aspects:

- In-orbit Injected Mass

In order to maximize the P/L injected mass, the non-propulsive propellants have to be minimized and a balance has to be found in between those non-propulsive propellants and the devices potentially introduced to limit the detrimental phenomenon. Contributors are the following ones:

Boil-off mass in coasting phase,

Propellant reconditioning before VINCI ignition (depending on the pressure and temperature of the propellant at end of the coasting phase, some conditioning process could have to be applied in order to insure pressure in the tank and temperature of the propellant compatible with VINCI ignition),

Geometrical residuals,

Chill-down before VINCI ignition.

- Orbital accuracy

The accuracy on the orbital parameters at P/L injections are driven by several parameters depending on the strategy chosen for the Long Coasting Phase: Vinci tail off dispersion compensation, Navigation error, Guidance efficiency

- Mission Constrains

During Long Coasting Phases, the thermal fluxes applied on the P/L have to be mastered in order to remain in an acceptable range of temperature

- Resources availability : Power, Orbital control (using GH2 on ARIANE6)

Moreover, the presentation will highlight the collaborative way of working put in place between all technical disciplinary (Propellant Management, Propulsion, GNC...) to ensure a proper coherent development and qualification of these complex flight phases