

# REACTIVE AND ADAPTABLE LAUNCH: MESANGE SUBORBITAL ROCKET GROUND SYSTEMS DEVELOPMENT

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## Abstract:

Mesange demonstrator is a suborbital rocket designed to be the initial technical pillar for the STERNE launchers project. By using our brand-new TORGOS bi-propellant engine, powered by hydrogen peroxide and propane, we plan to reach 100 km height from the Guyana Space Centre. Apart from reaching the gates of space, this launch campaign focuses on various objectives:

- Test & validation of a resilient electrical architecture in flight conditions
- Test & validation of GNC architecture system
- Test & validation of altitude control using RCS in microgravity
- Test & validation of ground systems and operations
- Becoming the first French new space startup to successfully conclude a suborbital flight

Following Mesange's launching objectives, ground-based operations must be in accordance with bi-propellant problematics. All ground-based operations are separated into three main guidelines: transportation, launch operations (ground & launch) and safety.

Transportation actions mean designing a mobile launch pad, that allows ground operations team to adapt Mesange's launch to any launch facility and/or terrain. This structure is meant to carry the rocket as well as moving it from an assembly zone to a launch one. It is also meant to carry Mesange's launcher. The launcher must be put in three different directions:

- Horizontal for transport operations
- Vertical for filling operations
- At an adaptable angle for the launch considering weather conditions

Launch operations are the term used to describe every operation leading to Mesange's launch. Our purpose is being able to work simply, fast, and safe on any launch site. These operations include the tank's filling from ground to the rocket, using simple pumps or pressurization from the saturation vapor pressure. It also includes making our own electronical control modules, that are similar for Mesange and for the ground systems. Developing such a generic design using COTS (Commercial Off The Shelf) components, makes our operations more reliable, safer and adaptable.

Although the propellant quantity that will be used is small, the security of our operators is crucial. Therefore, each filling operation is operated from afar, using our control and sensor modules. Ground propellant tanks, as a safety measure, will be placed on site individually, at a distance following the ATEX guidelines. In addition to the respect of these guidelines, each ground-based station operation is discussed with the launch facility safety operators.

## References:

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3. Lt Col Wheeler D J, *Range safety user requirements manual – Launch vehicles, payloads and ground support systems requirements*, 2004, Volume 3