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ESA VEGA-C LAUNCH COMPLEX WATER INJECTION SYSTEM – DESIGN OF DELUGE SYSTEM FOR AN OPERATIONAL LAUNCH SITE

Abstract

Following the increasing demand from the satellites market to reduce the acoustic levels at lift-off, a specific **deluge system** has been implemented on the **Vega** launch pad at the European Space port **Centre Spatiale Guyanese** (CSG) in French Guyana. The development of the **Water Injection System** (WIS), based on the injection of water mass onto the exhaust plume of the launcher 1st stage during lift-off, is driven by the European Space Agency (ESA) and Telespazio as prime contractor.

The development of Water Injection System is especially focused on massive new water networks to be installed on the Vega site in interface with operational systems. In order to minimise the impact on the existing infrastructures the Water Injection System is designed with an autonomous configuration based on tanks partially water loaded and pressurized with air in a closed system (i.e.: absence of constant pressurizing action during the system activation), allowing to deliver the required water flow rate under the launcher during the first seconds after ignition.

The activation of deluge valves during chronology generates an air expansion inside tanks creating a water flow through pipelines, and injecting water in the plume ejection zone during lift-off by a system of calibrated nozzles. Tanks and pipelines water loading and the need of capacities pressurization requested the implementation of a dedicated monitoring and control system to nominally manage these operations during a typical launch campaign.

Development of fluidic architecture, manufacturing and placement of main assemblies on launch complex are optimized in accordance with thermal and pressure loads generated during lift off on the **ground segment** and with performances to be achieved by the Water Injection System after his activation.

A dedicated test campaign has qualified the Water Injection System that will be exploited during the next launches of Vega and Vega-C rockets scheduled in 2024.