

IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Launch Services, Missions, Operations, and Facilities (2)

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ESA VEGA-C LAUNCH COMPLEX WATER INJECTION SYSTEM – ACOUSTIC STUDIES,
SYSTEM ARCHITECTURE AND MONITORING AND CONTROL

Abstract

Telespazio, as prime contractor of the European Space Agency programme for the development of VEGA and VEGA-C Ground Support Means, has been involved in the assessment of launch pad infrastructures impacts on the lift-off environment and definition of modifications for the reduction of acoustic noise. The project started from pre-feasibility analysis, including studies, numerical simulations and measurement campaigns, supported by ESA and leading to the definition of alternatives concepts for the Launch Pad modifications, followed by the implementation of the most promising solutions. This article resumes the outcomes of the analysis of noise source's locations on the VEGA Launch Pad collecting an excursus on all considered mitigation solutions such as Launch Table and Flame Chutes covering and the water injection system possibles architectures. Considering water injection, the performed analysis includes the identification of the best position of water impingement within the Flame Chutes, in relation to the acoustic sources and the impacts of the considered architectures on the Launch Complex modifications. The results of trade-off, leading to the Launch Table Covering and Water Injection System implementation, are presented with a focus on the recent qualification of the Water Injection System (WIS). WIS architecture is based on a fluidic sub-system, developed with Telematic Solutions as sub-contractors, and composed by air pressurized tanks connected by means of piping to the discharge nozzles. A key role is played also by the controlling system and the civil works implemented minimizing the impacts on existing Launch Complex infrastructure. WIS is then described emphasising the relevant monitoring and control system (WIS MC), selected to synchronize the WIS activation with the launcher lift-off. WIS MC is based on the remote control of main fluidic equipment through the VEGA-housekeeping Monitoring and Control system (VMC), developed by Telespazio for the launch site housekeeping and qualified during the VEGA-C Maiden Flight. The automation system allows the remote management of main WIS operations, such as water tanks filling, pressurization and checks, together with the automatic synchronization of the water discharge with the launcher lift-off. VMC low level control system is a PLC-network based, exploiting the potential of a high-performance deterministic bus such the EtherCAT, adapted including a new SW module capable to open WIS valves in a high demanding performances sequence and synchronized with the final launch countdown.