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THE ADAPTER AND SEPARATION SYSTEMS SERIES FOR THE VEGA LAUNCH VEHICLE

Abstract

The success of the VEGA Maiden Flight represents an important milestones in the market of micro/mini-satellites in view of the possibility to operate a dedicated launch vehicle exclusively for low mass spacecrafts. In addition to the LARES satellite, main payload of the VEGA Maiden Flight, eight secondary passengers were embarked, among which the ALMASat-1 microsatellite, an educational project entirely developed by students and researchers of the Microsatellites and Space Microsystems Lab of the University of Bologna in Forlì, with the technical support of its spin-off company ALMASpace.

In the frame of the ALMASat-1 mission, ALMASpace has been in charge of the design, manufacturing, testing and qualification for launch of the ALMASat-1 ADapter and Separation System (AD-SS), that will retain the spacecraft during the early launch phases and will provide the correct separation dynamics once the separation command will be given by the onboard avionics. The device is based on a classical 2-clamps architecture, providing for the satellite release by means of two Non-Explosive Actuators (NEA) instead of pyrotechnic bolts, and the correct detachment by four calibrated separation springs. The ALMASpace AD-SS has been sized and successively qualified for the launch according to the VEGA requirements and the standard ECSS procedure, therefore being hitherto the real benchmark for future missions onboard the VEGA flights for satellites up to 35 kg.

In order to extend the ALMASpace AD-SS capabilities to larger spacecraft, the European Space Agency has undertaken an activity aimed at the development and qualification of a wider series of products, achieving the goal of supporting satellites missions up to 200 kg, thanks to an overall set of three different AD-SS models (namely AD-SS 35 – ALMASat-1 case – , AD-SS 150 and AD-SS 200, according to the maximum allowed spacecraft mass).

The main goal of ALMASpace activities is to achieve a short delivery time in order to strictly follow the future VEGA launches schedule, starting immediately with the next VERTA-1 mission. Technological and functional improvements were introduced in the design and manufacturing workflow, being evaluated by means of dedicated numerical and experimental tools as well as by dedicated test campaigns. This paper presents the results of the design and MAIT phases, started in late 2011, aimed at the completion of three different models of ALMASpace AD-SS and their delivery to ESA for the integration on the next VERTA-1 mission, currently scheduled in early 2013.