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VENUS - A SMART, VERSATILE AND GREEN SOLUTION PROVIDING SPACE ACCESS AND ORBITAL TRANSFER CAPABILITY TO SMALL PAYLOADS

Abstract

This paper presents the preliminary system and mission design of the VErsatile Next generation Upper Stage, VENUS, a cost-effective and versatile multi-mission platform able to provide a dedicated and reliable orbit injection service for either single or multiple satellites and a nominal payload mass of 150 kg. VENUS has been conceived to be an orbital stage compatible with multiple micro launch vehicle, including the future European air launch system ALTAIR. Furthermore, VENUS will also fit with more conventional large launchers in a shared launch configuration (Φ1194 mm adaptor) to provide orbital transfer and dispatch capability to satellites usually limited by "piggy back" constraints. An innovative approach relaying on a sustained use of Design to Cost (D2C) and Multidisciplinary Design Optimization (MDO) techniques has been applied from the very beginning of the design phase to meet both performances and cost requirements. Finally, a 150 kg class spacecraft has been conceived to assure high mission flexibility, allowing accommodation of more than ten payloads, and providing accurate and safe deployment in a range of LEO target orbits. The final reference design consists in a dedicated payload dispenser, lightweight anisogrid composite lattice structures, innovative COTS based avionics and dedicated monopropellant system based on environment friendly hydrogen peroxide. This H2O2 based propulsion system will provide about 450 m/s of deltaV, multiple burst capability for orbital transfer manoeuvring, 3-axis attitude control and End-Of-Life decommissioning complying with space debris mitigation requirements.