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NAVIGATION DEVELOPMENT PROGRAM FOR THE ADDASAT MICROSATELLITE

Abstract

The NERVA project is a Romanian RD program for creating a small orbital launcher which is accompanied by the ORVEAL project for developing the subsequent ADDASAT micro-satellite, both under the sponsorship of the Romanian Ministry of Education. The micro-launcher is under current undergoing experimental development, with the first flight test of the solid booster and of the guiding inertial platform performed at the NATO flight test range Cape Midia as part of the NERVA project. The design and experimental development of the third, orbital stage of the launcher and the microsatellite started in 2012 under the ORVEAL project coordinated by ADDA – Association Dedicated to Development in Astronautics, a private company. The payload for the launcher is ADDASAT, a small but advanced, recoverable robot. The first development steps are presented hereby with emphasis on the navigation control system and the autopilot, located on the satellite platform. The scale of miniaturization is given by the mass constraints of the satellite (1.9 kg), according to the performance of the carrier vehicle NERVA. The development of the ADDASAT platform involves the attitude control system powered by the gasdynamic thrusters inducing the aerodynamic control creating a controllable reentry corridor for a large maneuvering capacity. The requirements for the guidance system, derived from the circular orbit sensitivity are obviously high. Due to the short time of the ascent to orbit and descent from orbit the control requirements are conveniently fulfilled by low-cost electronic components that reduce the total cost of the system as the main goal of the NERVA-ADDASAT projects. The launcher itself consists of an upgrade of existing military vehicles through reconversion and multiplication of performance. The selection of attitude drivers for the satellite was decided by the terms of service of the orbital guidance and the reentry drivers requirements, obviously larger in impulse response. The absence of orbit correction objective and the very short orbital lifespan of ADDASAT (less than a day), due to the intentionally low ballistic density and to the low altitude of the nominal orbit, resulted in the adoption of a partial non-compensated system of six thrusters. The evolution and current state of the ADDASAT project is hereby presented.