31st IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
Small Satellite Operations (3)

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A CHALLENGING CONCEPT OF OPERATIONS: THE HENON MISSION

Abstract

The paper describes the various mission phases and planned operations for a CubeSat 12 U in the context of a space weather demonstration mission. HENON (HEliospheric pioNeer for sOlar and interplanetary threats defeNce) mission phases A and B have been conducted by a consortium led by Argotec under European Space Agency contracts within the General Support Technology Programme, through

the financial support of the Italian Space Agency. The mission aims to monitor phenomena such as Solar Flares, Geomagnetic Storms and Coronal Mass Ejections. These can significantly impact human life and technology, both on Earth and in space. This is why it is important to refine the models that describe them, as well as to monitor them in real time due to their high unpredictability. HENON was created to demonstrate the feasibility of such technical challenges. The mission consists of a 12U platform equipped with a payload suite comprising a radiation monitor, a solar wind monitor and a magnetometer. The satellite will operate in a never explored before Distant Retrograde Orbit (DRO) in the Sun- Earth System. The mission consists of three main phases. The first is defined as what happens from the release from the launcher until the end of platform commissioning. Once ready to operate, the platform begins its transfer from the release orbit to the operational orbit. This phase is tackled by the spacecraft using an on-board electric thruster, following a strategy that alternates thrust phases and coasting arcs with scheduled communication windows. Once in DRO, the satellite begins scientific measurements. The operational phase is divided into two sub-phases, depending on the orbit region where the spacecraft is located. The first region, called KR1, is dedicated to the demonstration of a near real time alert service. It consists of the simultaneous measurement of radiation phenomena accompanied by generation and sending of alert messages to the ground should these phenomena exceed a certain threshold in intensity. The second region, called KR2, is instead dedicated to the collection of scientific measurements with transmission of scientific data in dedicated communication windows. During this phase, the spacecraft will also perform spinning manoeuvres to measure the radiation field anisotropy upon detection of specific phenomena. The paper sets out to describe the various phases in detail, emphasising the particular operations that the platform will have to cope with, especially for the transfer phase and the demonstration of the alert service in near real time.