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ARGOMOON: CHALLENGES AND DESIGN SOLUTIONS FOR THE DEVELOPMENT OF A DEEP SPACE SMALL SATELLITE

Abstract

Small Satellites represent a flexible and affordable solution, complementary to the traditional large size probes, to push the boundaries of space exploration due to their small volumes and high capabilities. ArgoMoon is an innovative 6U CubeSat, developed for the Italian Space Agency by Argotec, that will be launched on the maiden flight of the NASA Space Launch System (SLS), named Exploration Mission 1 (EM-1). The primary goal of the mission is to take detailed photographs of the SLS secondary propulsion stage: the pictures will be collected by ArgoMoon during a proximity maneuvering phase, that will also allow to validate the tracking algorithm developed by Argotec. After that, orbital maneuvers will move the satellite in a geocentric highly elliptic orbit, whose apogee is so high to allow flybys and imaging of the Moon and surrounding environment. ArgoMoon has been designed to operate in Deep Space, while taking images of the Moon and Earth surfaces, performing multiple propulsive maneuvers and communicating with the Ground from long distances. The highly demanding mission environment required to implement design strategies driven by the newest trends and technologies available in the commercial space businesses along with new approaches focused on lean design and project development. While COTS components have been implemented in the design, some key systems have been developed or customized by Argotec to increase their performances and reliability. Several companies and International Partners from Europe and the U.S. have been involved in the project, under the ASI leadership. The overall result is a broad growth in experience and heritage on miniaturized space hardware which will represent a landmark and a guideline for the future of space exploration based on small satellite platforms. This paper provides an overview on the design of the satellite focusing on the main technological challenges and lessons learned during the development of a CubeSat for Deep Space mission.