

ArgoMoon, a multipurpose CubeSat platform for missions in Moon vicinity and orbit

Mr. Valerio Di Tana (1), Carlo Fiori (2), Simone Simonetti (3), S. Pirrotta (4).

- (1) Argotec Srl, Italy (valerio.ditana@argotec.it)
(2) Argotec Srl, Italy (carlo.fiori@argotec.it)
(3) Argotec Srl, Italy (simone.simonetti@argotec.it)
(4) Italian Space Agency, ASI, Italy

Abstract

ArgoMoon is an Italian 6U CubeSat, to be launched at the end of 2019 during the maiden flight of the NASA Space Launch System (SLS), and injected in a high elliptic – high apogee orbit, so that in the following months several Moon fly-bys and imaging of the surface will be performed. Together with its own scientific objectives, the ArgoMoon mission will allow the in orbit and deep space environment validation of specific technologies for nanosats.

1. Introduction

The Moon has recently consolidated and enhanced its importance in the main international Exploration Roadmaps, both as intermediate step on the mid-long term way to the human presence on Mars surface, both as celestial target for scientific investigation and technologies validation. In particular, the lunar vicinity is considered as the most promising environment for a human-tended facility, based on principles of sustainability, affordability, accessibility, that will allow and support human and robotic exploration of the Moon surface both from orbit and in situ. The so-called Deep Space Gateway will be the next key element, following the ISS, to enable human space exploration, allowing for scientific observations and contributing to test of readiness for Mars missions [1]. Then, Lunar surface will host lander, rovers and permanent outposts, based on key enabling technologies like in-situ resources utilization, communication device and power generation systems. In this scenario, small satellites in the class of CubeSats can be considered as very suitable and promising tools for a flexible and sustainable approach to modular validation of specific functionalities and to support the main elements of the architectures. Several of the next challenging missions will include CubeSats that are

demonstrating their suitability to operate in Deep Space. In this sense, the Moon vicinity environment offers a new operational framework that fits all the characteristic of this small satellites.

2. ArgoMoon mission

ArgoMoon is a new generation 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 during its travel towards the Moon. The pictures will be collected by ArgoMoon during a proximity maneuvering phase, which 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. The highly demanding mission environment required tailored design strategies, while COTS components have been implemented in the design, some key systems have been developed or customized by Argotec to increase their performance and reliability qualifying the satellite for the operation from lunar orbit.

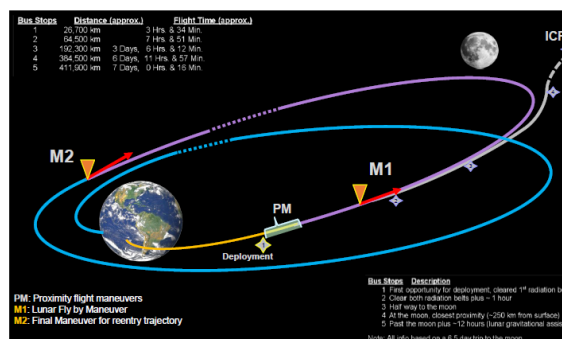


Fig. 1: ArgoMoon mission profile.

3. Design status description

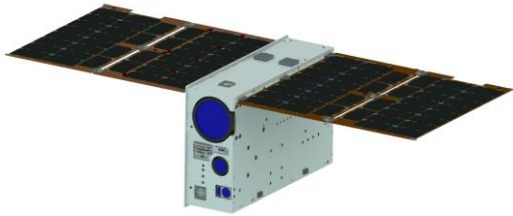


Fig. 2: ArgoMoon external configuration.

4. Summary and Conclusions

This paper provides an overview on ArgoMoon mission profile and satellite design in support of SLS EMI mission and, later, with own scientific objectives. Moreover, it drafts possible future applications in Moon orbit of the ArgoMoon platform, considered as a multipurpose Space-Drone. In fact, its modular and flexible architecture can be easily adapted to accommodate different scientific instruments without strong impacts and thus significantly reducing the development costs.

Acknowledgements

We thank the Italian Space Agency (ASI) for funding and fully supporting ArgoMoon mission (ASI/Argotec grant n. 2016-10-I.0 and n. 2017-14-I.0).

References

[1]International Space Exploration Coordination Group ISECG
“The Global Exploration Roadmap” January 2018.