SPACE EXPLORATION SYMPOSIUM (A3)
Moon Exploration - Part 1 (2A)

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THE CONCEPTUAL DESIGN OF THE TEAM ITALIA AMALIA MISSION ROVER, CANDIDATE FOR GOOGLE LUNAR X PRIZE CHALLENGE

Abstract

The proposed paper provides an overview of the conceptual design of the Lunar Rover conceived by Team Italia for the AMALIA Mission, candidate for the Google Lunar X Prize Challenge. With this initiative the X Prize Foundation intends to promote the involvement of private actors in the access to space, by endowing a prize to the first privately funded lunar mission covering a certain minimum distance on the Moon surface. Additional prizes are also available in case of achievement of more challenging goals, like surviving lunar night, travelling for a longer distance, visiting areas of the first Apollo Missions. Although the AMALIA Rover Subsystems are the typical ones of an Exploration Rover, their design is highly influenced by the above depicted mission context. The followed design approach is more close to the one of a commercial mission than to an Institutional Space Exploration Mission one. It has to be noted that, for being compliant with Google Lunar X Prize rules, at least 90% of funds required for competing in the Prize has to come from private or non-governmental sources. The main AMALIA Rover design drivers include: • The Google Lunar X Prize requirements, i.e. the requirements to be satisfied for winning the challenge. • The optimization of the engineering budgets, (size, weight, power) for minimizing the requirements on the Launcher (and eventually also the ones on the Transfer Vehicle/Lander) in terms of Payload mass to be brought onto Lunar Surface, lowering the Launch procurement costs. • The optimization of the overall Rover lifecycle costs and schedule. The achievement of such goals requires in some cases to adopt smarter solutions with respect to the ones adopted in Institutional Missions, having the need to optimize costs and schedule while still maximizing the probability of success. For achieving these challenging Mission objectives the team has adopted the following main provisions: • Careful selection of units/components, privileging the ones featuring reduced engineering budgets. • Maximum reuse of experience and products available at the team members, and in general of off-the-shelf items compatible with the required operations environment and mission lifetime. Ad-hoc developments will be minimized and applied only in case off-the-shelf solutions are not feasible or available to the team. • Careful selection of physical and functional redundancies, supported by a suitable risk analysis. • Maximization of the synergies with the Lander configuration, avoiding unnecessary duplication of functions/units where not strictly required.