IAF MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Space Vehicles – Mechanical/Robotic/Thermal/Fluidic Systems (7)

Author: Mr. Salim Al Mulla
MBRSC, United Arab Emirates

Mr. Abdulla AlShehhi
Mohammed Bin Rashid Space Centre (MBRSC), United Arab Emirates
Mr. SARATH P MOHAN
Mohammed Bin Rashid Space Centre (MBRSC), United Arab Emirates

MECHANICAL STRUCTURE DESIGN AND ANALYSIS OF RASHID ROVER

Abstract

Rashid Rover is the first rover developed by UAE nationals to discover and transverse on Lunar surface. It is part of the Emirates Lunar Mission (ELM) that will continue the previous space missions to investigate the Moon further. Rashid is equipped with different science instruments and will perform science experiment. Rashid will also take high resolution imagery of the Moon using two cameras mounted on different heights. The design of Rashid structure is very critical. It should insure that all carried instruments are protected against the challenging space mission. Also, the design should meet the mass, launch, cruise and landing loads during the mission.

The total mass budget for Rashid (not more than 10Kg) is one of the main constraints that affected the design. This mass requirement allows the mechanical structure to have only 2 kg's (excluding the Mobility subsystem). Therefore, various designs were explored and analyzed to optimize the structure performance and survivability. Multiple materials are also used to stiffen the structure to survive the launch and on Moon surface. From power generation point of view, the solar incidence and mounting angles of the solar panels are designed carefully based on the proposed landing site which is a mid-latitude mission.

A series of analysis iteration was done upon the selection of the mechanical subsystem material. Different material thickness was analyzed as well to meet all mechanical and thermal requirements. Different types of analysis were conducted such as stiffness, strength, random and sine analysis to confirm that Rashid can survive the launch environment. This paper will discuss the designing phase and mechanical constraints that affected Rashid's design and material selection as well as addressing future work to validate the mechanical analysis.