

A COMPREHENSIVE RISK ASSESSMENT OF THE PROPOSED NASA LUNAR ORBITAL PLATFORM-GATEWAY. M. Lacerda^{1,2} and D. Park², ¹ NASA – National Aeronautics and Space Administration - Ames Research Center (michel.usp@gmail.com) , ² School of Aerospace Engineering, Georgia Institute of Technology (mal7@gatech.edu).

Introduction: This study presents a comprehensive risk assessment of the proposed NASA Lunar Orbital Platform Gateway. Planned for 2024, the Gateway is a platform that will orbit the cislunar space to serve as a bridge for manned missions to the moon surface. It was proposed by NASA and stated as a priority with a 2024 start date by the President of the United States. This Study will perform a detailed risk assessment of the main element of the Gateway and the different levels of risk that it presents to the manned missions, its hardware and its occupants.

The Gateway[1] will be composed of the following elements: Power and Propulsion Element, European Service Module, International Habitation Module, Robotics, U.S. Habitation Module, Logistics Resupply, Multi-purpose Module , Orion Crew Module and Orion Service Module. NASA plans to begin operations of its Gateway in 2024 with assistance of different international partners. Its operation will be performed on cislunar orbit by astronauts and by Mission Control on Earth. The figure 1 shows the planned Gateway platform. The figure 2 shows a mockup of the Habitat module of the Gateway.

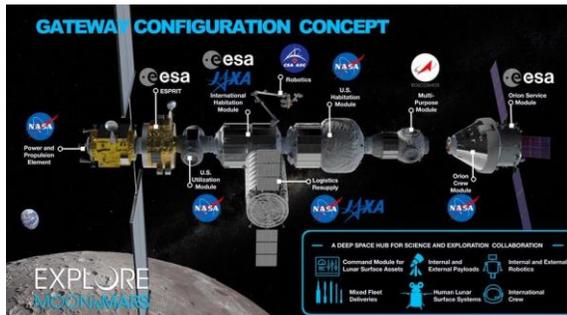


Figure 1: NASA Lunar Orbital Platform Gateway[1]

The conjunction of different factors such as the radiation characteristics of the cislunar space[2], the microgravity, the assembly and the human operation of that platform makes the case for this study. The Risk Assessment of the Gateway includes several risks by different stakeholder, occupants, assemblers, manufacturers and environmental agents as well

. The figure 3 shows the radiation on the International Space Station as an example of environmental hazard.



Figure 2: Mockup of the Gateway Habitat Module (Source: Lockheed Martin)

This study presents a complex study to include the cited elements to assess the different levels of risk. This study also presents a risk matrix[3] and a risk mitigation matrix to reduce/eliminate the unacceptable risks for the operation of the Gateway.

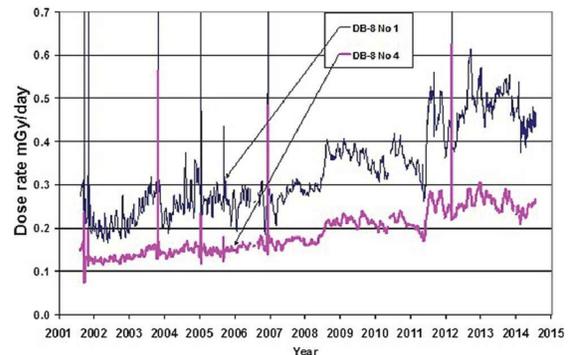


Figure 3: Environmental Hazard: Radiation on the International Space Station [2]

Overall, this study presents a comprehensive risk assessment of the NASA Gateway to begin operations in 2024 to pave the way to manned missions to the surface of the moon.

References:

- [1] NASA – Moon to Mars – Mission Planning – www.nasa.gov. Accessed on Apr-02-2019
- [2]Panasyuk et all. Near-Earth Radiation Environment for Extreme Solar Geomagnetic conditions. Book: Extreme Events in Geospace. Pp349-372. 2018
- [3] Stamatelatos et all. – Probabilistic Risk Assessment Procedures Guide for NASA managers. NASA NTRS. 2011. – SP-2011-3421