IAF SPACE EXPLORATION SYMPOSIUM (A3)
Mars Exploration – missions current and future (3A)

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PLANETARY PROTECTION ON COSPAR CATEGORY IVB EXOMARS MISSION 2020

Abstract

The ExoMars Mission2020 is a joint ESA-ROSCOSMOS mission including contributions from NASA, scheduled for launch in 2020 by a Proton–M/Breeze–M Launch Vehicle supplied by Roscosmos. The system architecture is a composite of several modules. An European Carrier Module (CM), is tasked of the transfer to Mars orbit of an European Rover Module (RM) including the European scientific Payload (Pasteur Payload, PPL) and a Descent Module (DM) under Russian responsibility. The COSPAR Planetary Protection Category defined for the mission is IVb. Thales Alenia Space Italy (TAS-I) is the Prime Contractor for the development of the European mission elements as well as for the Spacecraft Composite requirements and design. TAS-I contributes to the development of the Russian Descent Module with Lavochkin Association (LAV), which is the Prime of Russian industry. The scientific objectives of the European Mission elements part of the landed system, the Rover Module including the Pasteur Payload suite, are to search for signs of past and present life on Mars. Planetary Protection analyses and procedures are implemented to prevent contamination of the scientific payload, to be maintained in conditions to be in accordance with COSPAR policy. The implementation of the ExoMars Mission 2020 Planetary Protection requirements is based on restrictions on impact probabilities, on Mars sample contamination and bioburden contamination control for parts of the spacecraft, including demise, self-sterilization and bioburden reduction due to CM break-up/burn-up. Lessons learned from the ExoMars Mission 2016 are the foundation from which the ExoMars Mission 2020 Planetary Protection implementation is developed. In the ExoMars Mission 2020, however, there is an additional layer of complexity. The applicable Planetary Protection constraints for the Ultra-Clean Zone of the Analytical Laboratory Drawer are extremely stringent, both in terms of bioburden and of molecular contaminants, being the UCZ the core of the scientific mission of the Rover, where the Mars sample will be processed and analyzed by the Pasteur Payload. A contamination controlled aseptic environment, has been developed to allow the assembly and integration of this specific subsystem, in order to prevent any possible particulate, molecular or microbiological recontamination. Specific procedures are developed to perform handling of the H/W to the integration environment without breaking the sterility chain. The paper provides a description and gives the current status on the implementation of the Planetary Protection activities in the frame of ExoMars Mission 2020 european side.