SPACE EXPLORATION SYMPOSIUM (A3)
Mars Exploration – Part 1 (3A)

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EXOMARS MISSION 2016: EDM SCIENCE OPPORTUNITIES

Abstract

ExoMars is the first step of the European Space Agency's Aurora Exploration Programme and will demonstrate a number of essential flight and in-situ enabling technologies that are necessary for future Mars exploration missions, as well as important science. Whereas the ExoMars 2018 Mission will focus on exobiology and geochemistry research using a Rover to provide key mission capabilities such as surface mobility and subsurface drilling, the ExoMars 2016 Mission consists of an Orbiter plus an Entry, Descent and Landing Demonstrator Module (EDM). Thales Alenia Space Italy (TAS-I) is the ExoMars Industrial Prime Contractor and is responsible in particular for the development of the EDM.

In the foreseen International Cooperation scenario with Russia, the EDM surface platform science operations lifetime is proposed to be extended to about a Martian year, by using a Russian provided Radioisotope Thermoelectric Generator while the previously selected EDM payload would be substantially augmented with additional sensors. In this scenario, the Orbiter will carry scientific instruments to detect and study atmospheric trace gases such as methane, and will act as a Data Relay Infrastructure to support the transmission to Earth of scientific data gathered by the EDM Surface Station during its one Martian year lifetime, and by the subsequent Rover Mission in 2018. Primarily designed as a technology demonstrator, the EDM scientific mission would become strongly enhanced with the following three main science opportunities:

• Measuring key features of the Mars atmosphere near the surface with the DREAMS meteorological station to sense atmospheric temperature, pressure, wind, humidity, optical depth and electric field. DREAMS is developed by an international consortium led by the Italian Space Agency (ASI).

• Conducting supplementary science with the instrumentation proposed by Roscosmos that include: a TV Camera/Spectrometer (IKI) for Surface imaging and spectrometry, a LIDAR (IKI) for Atmospheric dust and aerosol measurement, a Neutron spectrometer and radiation dosimeter ADRON (IKI), and the MicroMED instrument (Joint Russian-Italian) for Near-surface dust particle measurements.

• Reconstructing the EDL trajectory flown, using the data gathered by the foreseen set of engineering sensors for EDL subsystems performance measurement in order to derive scientific information such as the atmospheric density profile along the entry trajectory, helping to improve the understanding of the Martian atmosphere and improve models used for future missions.

This paper describes the EDM design consolidation for accommodating both engineering sensors and the proposed new scientific instrumentation, with a focus on mission, system and operational aspects.