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

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# EXOMARS MISSION 2016: EDL TECHNOLOGY DEMONSTRATOR MODULE FOR LANDING ON MARS SURFACE

**Abstract**

ExoMars is the first European mission of the Aurora program led by European Space Agency. ExoMars will demonstrate key flight and in situ enabling technologies including Entry Descent and Landing (EDL) for semi-soft landing on Mars surface.

The ExoMars architecture and design is currently undergoing its B2X-Advance C/D phases with Thales Alenia Space Italy as Industrial Prime Contractor that is also responsible of the Entry Descent Landing Demonstrator Module (EDM), including its Guidance Navigation Control (GNC)system and the so-called EDL End-to-End (E2E) Simulator for a safe land on Mars. The major consequence of the reformed Exomars mission is the introduction of the DM-EDL Demonstrator with the objective to: - Demonstrate European capability to land on Mars - Use as much as possible Exomars Descent Module design heritage - Embark and validate technologies with growth potential and suitable for delivering different science surface payloads. The EDL Demonstrator is expected to survive on the surface of Mars for at least 8 sols by using the excess energy capacity of its batteries. A set of scientific sensors is planned to be embarked on the EDM Surface Platform without adding additional systems for solar power generation or for thermal control, such as Radioisotope Heater Units.

The selected EDL technologies includes Heatshield with ablative materials, Disk Gap Band parachute, Inertial Measurement Unit, 1 Radar Dopple Altimeter and liquid propulsion based on pulse thrusters for implementing precise controlled final braking in order to achieve safe landing in presence of a severe dust storm since the EDM will land during Mars Global Dust Storm season. In this respect fruitful cooperation between TAS-I and European university and research centers have been set-up to characterize the atmospheric environment at the epoch of entry in term of Global Circulation Model and Mesoscale Model as well as the terrain topography of the selected Meridiani landing site.

This paper describes the consolidation of the Exomars EDM EDL in the light of the engineering, atmospheric and terrain constraints and illustrates the GNC algorithms and control loops implemented for a safe landing on Mars based on the Descent Module design definition presented to the Agency in view of the System PDR to be held in the December 2010.