

Mars Exploration (5)

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## EXOMARS: THE HERITAGE OF 2016 MISSION FOR THE ROVER SURFACE PLATFORM MISSION TO BE LAUNCHED IN 2020

### Abstract

ExoMars is the first step of the European Space Agency's Aurora Exploration Programme and is developed in a broad ESA and Roscosmos co-operation, with significant contribution from NASA. It addresses the scientific question of whether life ever existed on Mars and demonstrate key technologies for entry, descent, landing, drilling and roving on the Martian surface. Thales Alenia Space is the ESA prime contractor of the Exomars program leading a large industrial team. The Spacecraft Composite was launched with a Proton missile from the Baikonur Cosmodrome on 14 March 2016 and arrived at Mars on 16 October 2016, after a 7 months cruise. The EDM was released and, after a 3-day cruise, entered the Mars atmosphere performing correctly the Entry and Descent phases; however an unexpected high dynamics at parachute inflation led to the gyroscope saturation that remained for a time longer than specified thus causing an incorrect attitude reconstruction; due to this the vehicle could not complete the controlled landing. All results relevant to Schiaparelli flight are pending the conclusions of the Inquiry Board set-up by the Agency. The TGO was successfully injected into the 4-sol Mars capture orbit and performed preliminary science observations and data relay to Ground; the TGO is now acquiring the 1-sol orbit from which it will reach the final science orbit via an aerobraking phase lasting about 1 year. During the ED phases Schiaparelli correctly communicated its TM to the TGO, thus providing a good amount of flight data that will constitute an important database for the second Exomars mission, named Rover Surface Platform, that will be launched in July 2020. The RSP spacecraft is composed of a Carrier Module (CM) and a Descent Module (DM), whose Landing Platform (LP) will house a Rover, to be launched in July 2020. In 2021 the Descent Module will be separated from the Carrier, enter into the planet's atmosphere and subsequently deliver the Landing Platform and the Rover on the Mars surface. While the LP will measure the environmental parameters of the landing site, the Rover will explore the surface, for an expected duration of 218 Martian days (approx. 230 Earth days). During the exploration, the Rover will use the TGO-2016 for the communications with Earth. This paper describes the Exomars 2016 and 2020 missions with a special view to 2016 in-flight results that must be considered for the 2020 mission design and operations.