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

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THE EXOMARS 2016 MISSION FLIGHT PERFORMANCES UNTIL ACHIEVEMENT OF THE 1-SOL ORBIT.

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 . This ambitious program is implemented by means of two missions, the first launched in March 2016 and the second to be launched in July 2020, that will bring onto the Mars surface the European Rover, fitted with a complex suite of scientific instruments for the search of life and a lander developed in close cooperation between European and Russian Industry. Thales Alenia Space is the ESA prime contractor of both the missions. The 2016 mission Spacecraft Composite, made of the Trace Gas Orbiter and the Schiaparelli EDL Demonstrator, was launched with a Proton missile from the Baikonur Cosmodrome on 14 March 2016, afterwards it passed under the control of the European Space Operations Centre based in Darmstadt, from which all the subsequent operations have been carried on. During the 7-month long cruise, several activities on the TGO and the EDM were performed to prepare the arrival at Mars and a dry run of the separation was performed. DSM1 and DSM2 were implemented, followed by three small impulses to trim the trajectory for the EDM release. EDM separation took place successfully on 16 October at 14:42:00Z and, after a 3-day cruise, Schiaparelli reached the Mars atmosphere and was tracked by Pune radiotelescope and Mars Express during the Entry and Descent phases. It could not complete the controlled landing but collected a significant amount of flight data that are currently being used to improve the 2020 mission landing operations on Mars. The TGO performed the Mars avoidance and orbit raise manoeuvres and, on 19 October, achieved the 4-sol Mars capture orbit from which it performed demonstration science observations and data relay to Ground. In January and February this year manoeuvres were implemented

as planned to reach the 1-sol orbit, starting orbit for the 1-year Aero-Braking phase. During AB the NASA technical expertise on Mars orbiters will be made available to the project. This paper provides details of the above described mission operations, highlighting the SC performances and the aspects that may be used as a lesson learnt for the 2020 mission design and operations.