

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

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MISSION ARCHITECTURE AND DESIGN OF THE MARSNEXT MISSION

Abstract

In the frame of the General Studies Programme and in support of the Aurora Exploration Programme, ESA has initiated industrial Phase A studies in 2008 for two concepts of intermediate exploration missions, to be launched after Exomars, and in preparation to the Mars Sample Return mission. Astrium, leading a team of 6 industrial contractors, was awarded a contract to investigate the MarsNEXT mission concept. MarsNEXT is a Mars mission demonstrating aerobraking and rendezvous and capture in Mars orbit, and delivering a network of surface stations. The mission will be launched by a Soyuz 2.1b vehicle from Kourou within a launch window in 2017-2018. After a 2.5-year cruise to Mars, the spacecraft will deploy sequentially three probes that will enter into the Martian atmosphere, descend and then land by means of parachutes and airbags. The landers will constitute a network of stations on the Martian surface, enabling geophysical and meteorological investigations from different sites. After Mars Orbit Insertion, the orbiter will use aerobraking to reach a lower altitude orbit, where demonstration of in-orbit rendez-vous and capture can be initiated : for this aim, the orbiter will release and capture a dummy representative of the MSR sample container. In addition, the Orbiter will perform in-orbit scientific measurements, and will serve as a data relay between the surface probes and the Earth throughout their entire lifetime. This paper presents the proposed architecture, and the overall mission design. After presenting the sizing mission requirements and constraints, and the main architecture trade-offs, the solutions retained for the demonstrations of aerobraking on one side, and rendezvous and capture on the other side, will be presented. Finally the general characteristics of the spacecraft design, made of an orbiter and of three Network Science Probes, will be detailed, as well as the overall mission budgets.