MARS SAMPLE RETURN – EARTH RETURN ORBITER MISSION OVERVIEW. S. Vijendran, J. Huesing, F. Beyer, A. McSweeney, European Space Agency - European Space Research and Technology Centre (ESTEC), Keplerlaan 1, 2201 AZ Noordwijk, The Netherlands, sanjay.vijendran@esa.int.

Introduction: The international Mars Architecture for the Return of Samples (iMARS) report, published in 2008, detailed elements of a multi-mission campaign that would for the first time return to Earth a set of rigorously documented samples collected from Mars. Since the publication of the first iMARS report, NASA and ESA have together been exploring mission concepts for the delivery of such a campaign. In 2012, the Mars 2020 rover mission was approved by NASA with the goal of caching and depositing on Mars a scientifically valuable set of samples for eventual return to Earth. Two subsequent missions working in tandem are currently foreseen to achieve this next step .First, the Sample Return Lander mission, which deploys a landed platform to the Mars 2020 landing site, from which a small Sample Fetch Rover egresses and retrieves the cached samples. After returning to the lander, the samples would be transferred to an Orbiting Sample (OS) canister and loaded into a Mars Ascent Vehicle (MAV), which launches the OS into low Mars orbit.

The second mission foreseen is the Earth Return Orbiter (ERO) which locates, rendezvous with and captures the OS in Mars orbit and seals it into a biocontainer before inserting it into an Earth Entry Vehicle (EEV). The ERO would leave Mars orbit and return to Earth, releasing the EEV on an Earth-impacting trajectory before performing an Earth avoidance maneuver itself. The EEV then lands at a designated site and is transferred to a Sample Receiving Facility for storage, opening and evaluation.

ESA has conducted extensive industrial pre-Phase A studies on sample return mission concepts in recent years as part of the Mars Robotic Exploration Preparation (MREP) Programme. These activities, as well as two architectural assessment studies conducted in 2017 will form the basis of an upcoming parallel Phase A/B1 industrial study of the ERO mission. ESA aims to prepare a programme proposal for an implementation decision at the next Council of Ministers meeting, expected in December 2019.

This presentation will serve as an overview of the Mars Sample Return - Earth Return Orbiter mission and how it fits into the overall MSR campaign architecture, as well as discuss previous and recent studies that have highlighted the key challenges and criticalities of this mission.

References:

[1] Preliminary Planning for an International. Mars Sample Return Mission. Report of the International Mars Architecture for the Return of Samples (iMARS) Working Group. June 1, 2008

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