

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

Author: Ms. Lisa Peacocke
Airbus Defence and Space Ltd, United Kingdom, lisa.peacocke@airbus.com

Mrs. Marie-Claire Perkinson
Astrium UK, United Kingdom, marie-claire.perkinson@airbus.com

PHOBOS SAMPLE RETURN: MISSION AND SPACECRAFT DESIGN

Abstract

The Phobos Sample Return mission is currently under study by ESA and European industry as a follow on mission to ExoMars. The mission aims to orbit and characterise the Mars moon Phobos, land and obtain a 100 g sample of Phobos surface material, and return it safely to the Earth. Airbus Defence and Space is one of two industrial contractors studying the mission to Phase A level, and has been investigating all aspects of the mission and spacecraft design to ensure its feasibility.

Phobos is a prime target for Mars science due to its spectral similarity to primitive D-type asteroids, its unknown origins, and its position as a witness plate to the formation and evolution of the Martian system. A sample return mission would allow detailed analyses using complex terrestrial instrumentation, and would provide significant insight into these and other still unknown subjects.

The mission would launch between 2024 and 2026 on an Ariane 5 ECA launch vehicle from Kourou. A chemical propulsion module would transfer the spacecraft composite to the Martian system, and would then be separated at Phobos. A full characterisation campaign of Phobos would follow, including quasi-satellite orbits and flybys, using a payload suite of cameras and spectrometers.

When the preferred landing site is identified, a controlled descent and touchdown onto the surface of Phobos would be performed, with a touchdown accuracy of 50m. A robotic arm and sampling mechanism would obtain and verify a sample of surface regolith, and insert it into the Earth re-entry capsule. Part of the composite would then ascend from the Phobos surface, and perform the return to Earth. The Earth re-entry capsule would enter the Earth's atmosphere and hard land in Woomera, Australia, to be recovered and transferred to a sample curation facility for sample extraction and analyses.

This presentation will summarise the results of the Airbus Phobos Sample Return mission and spacecraft design, with a focus on the key cost and mass drivers.