

Exploring Mars by a Small Satellite Mission Consisting of an Orbiter and Lander

HARALD HOFFMANN¹, BERND BISCHOF², URBAN FRISK³,
ARI-MATTI HARRI⁴, PETRI MAKKONEN⁴, FREDRIK VON SCHEELE³,
TERRI SIILI⁴, STEPHAN WALTHER²

¹*DLR Berlin, Institute of Planetary Research, Germany*

²*EADS Space Transportation, Bremen, Germany*

³*Swedish Space Corporation, Solna, Sweden*

⁴*Finnish Meteorological Institute, Helsinki, Finland*

Three independent small Mars Mission concepts had been developed in Finland, Sweden and Germany. The high degree of commonality resulted in a unified small mission concept for a combined orbiter and lander mission which will carry an overall payload mass of up to 60 kg including the lander to Mars. The baseline scenario is a launch in 2011. Two different alternatives have been analyzed with a launch by Ariane ASAP 5 and a direct injection into Mars transfer orbit by a small dedicated launcher (Rockot). A trade-off between the different scenarios favors the direct launch which reduces the overall mission duration and complexity and would provide more volume. The key objective of the mission is to perform simultaneous measurements from the orbit and on ground of the Martian atmosphere, the magnetic field, and the radiation environment. The orbiter payload with an overall mass up to 30 kg consists of a magnetometer, a camera instrument, a microwave sounder, a plasma package, and a dosimeter. The telecommunication system is equipped with an ultra-stable oscillator for radio science investigations. The orbiter experiments thus combine new atmospheric science, detailed geophysical and surface observations, and measurements of the space environment around Mars, something that will not be provided by any other present or planned mission. A small landing device is foreseen to carry payloads down to the Martian ground for in-situ measurements of the Martian environment and its lower atmosphere. The baseline payload package consists of sensors to measure the magnetic field, charged particles and UV radiation, and thermal radiation. A suite of atmospheric sensors shall measure pressure, temperature, humidity, wind and atmospheric optical depth. A small panoramic camera will image the surrounding landing site. The landing device weighs about 30 kg overall including the entry, descent and landing systems and would serve as a technical demonstrator for several phases in landing.