MiniPINS - Miniature Planetary In-situ Sensors

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MiniPINS is an ESA study led by the Finnish Meteorological Institute to develop and prototype miniaturised surface sensor packages (SSPs) for Mars and the Moon. The study aims at miniaturising the scientific sensors and subsystems, as well as identifying and utilizing commonalities of the packages, allowing to optimise the design, cut costs and reduce the development time. We present the Preliminary Mission Plan and possible concepts for the landers for this mission.

The Mars SSP will be a small 25 kg penetrator deployed from Mars orbit. Maximally four (4) penetrators will be carried to the Martian orbit by an Orbiter and the Orbiter will be oriented for deployment of each penetrator. In the Martian atmosphere the penetrators undergo aerodynamic braking until they reach the target velocity for entering the Martian surface.

The SSPs will start their scientific observations after landing and stay stationary throughout their mission (2 years). The SSPs have an ambitious science program to study for example the Martian atmosphere, seismology, magnetic field and chemistry. Their payloads consist of a camera, a visual spectrometer, a meteorological package, an accelerometer, thermoprobes, a magnetometer, a chemistry package and a radiation monitor. The SSP will also provide positioning signal and communications link to the Orbiter.

The Moon SSP will be a miniature 5 kg station deployed on the Moon surface by a rover. Maximum four (4) SSPs are deployed with low velocity and small impact depth (max. 0.05 m). All SSPs can be deployed from a single rover on the same sortie. The SSPs will start their scientific observations after landing and study for example radiation, seismology, magnetic field and chemistry. SSP will also provide communications link either to the rover or to a relay orbiter.

Both Mars and Moon SSPs will be miniaturised, light and robust, and still capable of surviving high
G loads and extreme thermal environments. SSPs are capable of working on the surface of Mars or Moon and to produce high quality science data with state of art instrumentation. The output of this work will enable ESA to prepare and plan for technology development programs required to implement such ambitious planetary missions.