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MoonNEXT: ESA Phase A Mission Study of a Lunar Lander with In-Situ Science and Mobility

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Between the ExoMars mission due for launch in 2013, and the Mars Sample Return (MSR) mission foreseen in the 2020 timeframe, the European Space Agency (ESA), in the frame of the Aurora Exploration Programme, is considering the opportunity for an intermediate mission, so called NEXT (Next Exploration Science and Technology). The NEXT mission would enhance and complement the capabilities acquired through ExoMars while preparing Europe for the MSR mission and future exploration missions in general. In addition to this technological objective, NEXT will also carry out important scientific investigations.

Two different missions were identified as promising candidates for NEXT: (1) a Mars orbiter with a rendezvous demonstration, delivering a network of several surface stations; and (2) a Moon lander with in-situ science and mobility, focus of the current abstract.

The MoonNEXT mission currently studied at Phase A level in the frame of two industrial parallel contracts foresees a launch window in the 2015-2018 timeframe and will use a Soyuz 2.1b launched from CSG (Kourou). After completing the Earth-to-Moon transfer, the spacecraft will insert into a low circular lunar orbit. From this orbit, an autonomous sequence will be initiated aiming to perform soft precision landing with hazard avoidance on a highly illuminated site at the Moon's South Pole, with a goal of better than 500m (TBC) accuracy. Safety criteria of the landing site such as slope and roughness will be mapped and analysed real-time, allowing retargeting if necessary. Due to the lunar environment, the braking function will be performed uniquely by propulsive means, paving the way for the capability of landing increased mass on

a partial gravity body.

A payload of 100kg (TBC, including the rover) will be delivered to the surface, then operated. Certain instruments will be accommodated on the lander or deployed from it; others will be carried by the rover, either for deployment at a certain distance from the lander, or for performing in-situ science and survey of various locations of interest around the landing site.

Direct communication from the Moon's Near Side to the Earth is assumed. The design has to be compliant with a specific illumination pattern (500h of illumination, 200h of darkness in a row per lunar day) and the envisaged mission duration is one year.

The MoonNEXT mission presents an interesting combination of technological, scientific and exploration-preparation objectives, which are in line with the recently agreed Global Exploration Strategy.