

PREPARATIONS FOR ESA'S FIRST LUNAR LANDER. S. Espinasse*, J.D. Carpenter, R. Fisackerly, B. Gardini, B. Houdou, S. Di Pippo, A. Pradier, ESA-ESTEC, HSF-E, Keplerlaan 1, 2201 AZ, Noordwijk (*e-mail: Sylvie.Espinasse@esa.int)

Introduction: Recent years have seen a resurgence of interest in lunar exploration and the emergence of countries like China and India as space fairing nations. In 2004 the US announced a new Vision for Space Exploration [1], whose objectives were focused on human missions to the Moon and Mars. Recent international missions have included the Japanese Kaguya orbiter in 2007, the Chinese Chang'e mission, India's Chandrayaan (2008) and the US LRO/LCROSS mission (2009). All these orbital missions are advancing our understanding of the Moon and preparing for future surface and manned missions.

At its 2008 ministerial council meeting the European Space Agency (ESA) proposed to engage Europe in lunar human exploration [2]. This proposal was made in the context of the considerable potential for international cooperation, extensively formulated in "The Global Exploration Strategy" [3] and with the goal to guarantee a possibility for a European astronaut to walk on the Moon in the early stages of the return of humans to the Moon.

As a first step current lunar exploration activities at ESA are focussed on the development of European technologies and capabilities, to enable significant European participation in future international human exploration of the Moon. A major element in this contribution has been identified as a large lunar cargo lander, which would fulfill an ATV-like function, providing logistical support to human activities on the Moon, extending the duration and the capabilities of sorties and extended stays of human explorers and accelerating the establishment of a lunar outpost.

To meet this ultimate goal, ESA is currently considering various possible development approaches, involving lunar landers of different sizes.

Lunar Lander Mission Options: A high capacity cargo lander able to deliver consumables, equipment and small infrastructure, in both sortie and outpost mission scenarios, would use a full Ariane 5 launch and is foreseen in the 2020-2025 timeframe.

To achieve this objective, ESA is considering an intermediate, smaller-scale precursor mission, to mature the necessary landing technologies, to demonstrate human-related capabilities in preparation of human presence on the Moon and to gain experience in landing and operating on the lunar surface.

Within this frame, ESA has recently concluded several feasibility studies of a small lunar lander mission, also called "MoonNEXT", which assumed a

launch from Kourou with a Soyuz in the 2016-2018 timeframe. This mission would be a first step towards mastering the automated precision landing with hazard avoidance required for the future cargo lander and essential for landing at the South Pole Aitken basin (SPA), the provisional MoonNEXT landing site. For the purpose of the studies, a preliminary strawman payload with several technology demonstration and testing packages to investigate advanced fuel cell and life support technologies was considered.

To complete these first studies, additional investigations based on a medium-size lander to be launched in a shared Ariane 5 configuration are soon to begin. Such a configuration is expected to provide a significantly increased payload mass to the surface.

The candidate mission options will be traded off to find the best balance of cost, mission timeframe, development effort and representability. The reference intermediate lunar lander mission will be established so as to proceed with industrial Phase B1 activities early in 2010.

Mission Objectives and Payload:

In the meantime, a Lander Exploration Definition Team has been established to identify the objectives and requirements for the mission considering the following priorities:

1. demonstrate capabilities and perform technology enabling research for future human exploration;
2. characterisation of the lunar environment and potential resources in advance of human exploration;
3. Perform fundamental research of, on and from the Moon.

Based on the responses received to a Request For Information issued early this year to the broad European community, this Team will identify the mission objectives and requirements from which the model payload considered for the phase B1 study will be derived.

References: [1] National Aeronautics and Space Administration (NASA), The Vision for Space Exploration, NP-2004-01-334-HQ, NASA, Washington D.C, (2004). [2] ESA declaration on Transposition and Human Exploration (2008). [3] The Global Exploration Strategy, available at http://www.esa.int/SPECIALS/Space_Exploration_Strategy/SEMDAM0YUFF_0.html.