THE EUROPEAN LUNAR LANDER: A HUMAN EXPLORATION PRECURSOR MISSION. J. D. Carpenter[1], A. Pradier[1], R. Fiackerly[1], B. Houdou[1], D. De Rosa[1], C. Philippe[1] and B. Gardini[1], [1]ESA-ESTEC (Keplerlaan 1, 2201 AZ, Noordwijk, The Netherlands, james.carpenter@esa.int).

Introduction: ESA's Human Space Flight and Operations Directorate is continuing with preparations for its Lunar Lander project. The Lunar Lander is an unmanned precursor mission to future human exploration. This mission will enable the development of technologies, capabilities and scientific knowledge that will allow Europe to participate in future international human exploration activities of the Moon and beyond. The primary objective of the mission is to demonstrate soft precision landing with hazard avoidance and once on the surface it provides an opportunity for payload operations and scientific measurements. The scientific objectives and requirements for the mission have been established to address the major unknowns for future exploration activities.

The Lunar Lander is currently engaged in Phase B1 under lead of the prime contractor Astrium GmbH (Bremen, Germany). Phase B1 includes mission definition, system & sub-system design and technology breadboarding activities. This Phase will be completed in mid 2012. The Phase B1 builds on work carried out in the preceding Phase A studes, following which some important decisions were taken. These include the use of a Soyuz 2-1b launch vehicle, the exclusion of radio-isotope devices (e.g. RHUs/RTGs) from the design, and the targeting of a southern polar landing site.

Mission Architecture: The mission targets a launch in 2018 from Centre Spatial Guyanais, Kourou on a Soyuz launcher. The Lander will then be injected into a transfer orbit to the Moon by the Fregat upper stage and several weeks later will insert its self into a lunar polar orbit.

The precision landing capability will then be applied to ensure a soft precise landing at the Lunar South Pole. The targeted landing sites are located at peaks where the high altitude relative to the surrounding topology, coupled with the slight inclination of the Moon's rotational axis, lead to extended periods of illumination. Landing at these sites potentially allows surface operations to continue for a period of several months using solar power, without the need for radio-isotope based power or thermal control.

Hazards and Illumination: A key factor in ensuring a robust mission design is a complete understanding of the illumination duration at the anticipated landing sites, the areas of the sites and the extent of surface hazards such as boulders, slopes and craters. To this end work is ongoing to fully characterize these aspects of the Lunar surface in the areas around these peaks. For this work we draw heavily on the extensive data sets now available from the LOLA altimeter and LROC cameras on board LRO.

Scientific investigations: The scientific topics that have been defined for the mission emphasise a number of key areas: the integrated dusty plasma environment at the surface of the Moon and its effects on systems; lunar dust as a potential hazard to systems and human explorers; potential resources which can be utilised in the future; and radiation as a potential hazard for human activities. Each of these topics is supported by an independent science Topical Team. These Topical Teams continuously review the science requirements and activities of the mission and are investigating the potential for measurements using existing facilities that can support the objectives of exploration preparation and the activities of the Lunar Lander on the surface of the Moon.

Payload Studies: In addition, a number of payload study activities have been initiated to define candidate payloads for the Lunar Lander. As well as detailing the scientific measurements to be made at the surface of the moon, the payload studies will provide preliminary designs for payloads, identify the major challenges for their development and ensure that the mission study properly accounts for the payload and its interfaces.

Conclusions: We report on the status of the European Lunar Lander mission and the ongoing work on the system design, technology development, characterization of potential landing sites and on science and payload activities in support of the mission.