

SPACE EXPLORATION SYMPOSIUM (A3)
Moon Exploration – Part 3 (2C)

Author: Dr. Claudia Facchinetti
Italian Space Agency (ASI), Italy, claudia.facchinetti@asi.it

Mr. Carlo Del Vecchio Blanco
Italian Space Agency (ASI), Italy, bcdelve@unina.it

Dr. Elisa Duca
Agenzia Spaziale Italiana (ASI), Italy, assegnista4.ipc@est.asi.it

Mr. Claudio Portelli
Italian Space Agency (ASI), Italy, claudio.portelli@asi.it

Mr. Rocco C. Pellegrini
Italian Space Agency (ASI), Italy, assegnista6.tris@est.asi.it

Mr. Mario Salatti
Italian Space Agency (ASI), Italy, assegnoricerca2.OSU@est.asi.it

Dr. Simone Pirrotta
Italian Space Agency (ASI), Italy, simone.pirrotta@est.asi.it

UNMANNED LUNAR EXPLORATION: FROM SCIENTIFIC NEEDS TO A PRELIMINARY MISSION
STUDY FOR THE ITALIAN LUNAR ROVER

Abstract

In 2005 the Italian Space Agency (ASI) funded 16 technological and scientific studies to evaluate the interest of the national scientific community in possible exploration missions to the Moon taking into account scientific, programmatic, technological and strategic matters. Those studies analysed different aspects of lunar science focussing on the Exploration of the Moon (in-situ or from orbiter), search for resources, Observation of the Universe and Observation of the Earth from the Moon. In 2009 a renewed interest in the Moon, from National and International communities, has provided new incentives for a Moon in-situ exploration mission: in-situ analyses of the Moon are significantly relevant not only from the scientific point of view, but also to assess opportunities for its exploitation, both economic and strategic, in support of future human exploration missions. The study of a lunar mission, presented in this paper, has been developed through five study areas (WPs) in order to identify: main scientific goals; knowledge level in the robotics field within the Italian community; international interest towards Lunar missions; choice of the landing site; a preliminary set of requirements for a future Moon in-situ exploration mission to be assessed within the Concurrent Engineering Facility (CEF). While the first WP is an up-to-date summary of the above mentioned studies, the second was reviewed during the dedicated workshop “Mobile robotics for Unmanned Lunar Exploration”, organized by ASI in Rome in July 2009. There, the Research Development capabilities of the national robotic research groups were evaluated to potentially contribute to the Italian Lunar Rover design and development. Important information about landing sites has been obtained through a bibliographic research and the statistical analysis of the collected data. This process led to the issue of a preliminary requirements document [1] that has been used as an input for the following phases. A further step has been achieved performing a phase zero study of the Italian Lunar Rover within the Concurrent Engineering Facility (CEF) at ASI by a team of experts (disciplines and subsystems: thermal, power, locomotion, structures, communication, mission, data handling, cost, risk programmatic, payload, guidance and navigation). The CEF study aims to define a set of consistent

requirements and a preliminary baseline for the next initiatives (industrial studies, phase A study). A short description of preliminary design results about every subsystem, considered as part of the Italian Lunar Rover, are reported at the end of the document.