

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

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PROSPECT DRILLING AND INSTRUMENTATION PACKAGE: DEVELOPMENT AND
ENGINEERING MODELS ACTIVITIES**Abstract**

The PROSPECT package has been defined to address scientific and exploration objectives, with a particular focus on volatiles at the lunar polar regions. Development of the package is underway for accommodation aboard a lander platform selected in the frame of the NASA-CLPS programme. In this context, the launch, flight, landing and operations of PROSPECT will be enabled via this commercial partnership, and in the frame of ESA-NASA cooperation. The ProSEED drill and the ProSPA sample interface are currently accommodated on a separate payload balcony. For this reason, and specifically considering the small size of sampling push-tube and ProSPA oven, a dedicated alignment collet is integrated into the SIS, which allows for active control and alignment of the targeted oven beneath the ProSEED drill during sample transfer. During the PROSPECT project the team has already implemented development and engineering models of both the drilling system and core elements of the ProSPA instrument, which have supported the establishment of the detailed design now undergoing consolidation through the Critical Design Review (CDR) process.

Development Model: During early stages of testing, in which disturbances of dry regolith simulant on the surface of the sample container led to severely dusty working conditions, the ProSEED mechanisms have demonstrated a significant robustness to those dust effects, with no noticeable effects on performance. This Development Model (DM) test campaign has successfully demonstrated ProSEED functionality and performance under representative temperatures and mechanical conditions, including in particular drilling, acquisition and successful transfer of: loose dry regolith simulant, simulant containing layers of medium size inclusions, and simulant with water ice contents of 6

Engineering Model: As part of the development flow, the drill development model has been refurbished to an Engineering Model (EM). The drill EM integrates the missing mechanisms of the DM, leading to a full form, fit and functional hardware. The drill EM has undergone several functional, lifetime and mechanical tests, including sine, random and self-generated shock tests, which confirmed the structural robustness of the design presented at CDR. In the near future additional activities at higher level are foreseen, including the integration of the ProSEED Control Electronics Unit (CEU) EM, which will drive the EM drill and the ProSPA Interface Emulator, for a full PROSPECT Engineering Model.