

Modular regolith transport solution for the moon. M. Rejón López¹, O. Milian², C. Bourdarie³, C. Lesenne³, F. Terranova⁴, J. Chaussard³, C. Conway⁵ and F. Ghaffari⁶. ¹TU Delft (M.RejonLopez@student.tudelft.nl), ²International Space University (oriol.m.adriazola@community.isunet.edu), ³University of Lorraine (camille.bourdarie8@etu.univ-lorraine.fr, colin.lesenne8@etu.univ-lorraine.fr, joseph.chaussard-barbel@etu.univ-lorraine.fr), ⁴University of Pisa (f.terranova2@studenti.unipi.it), ⁵KTH (ciaranc@kth.se) and ⁶RWTH Aachen (fardin.ghaffari@rwth-aachen.de)

Technical Abstract: Lunar conditions pose challenges for handling and transporting regolith, for which current technologies fall short. To address this issue, a modular regolith transport solution comprising vertical and horizontal sections is presented.



Fig. 1: Horizontal transport system render (top) and downscaled mock-up (bottom)

Fig. 1 shows the horizontal system, which features an enclosed conveyor belt that effectively transports regolith up to 5 m, followed by a container with a rotating sieve mesh that filters out rocks larger than 3.5 cm. The vertical system is presented in Fig. 2 together with a mock-up model and consist of a tube with a fixed screw and scoops attached at the lower end that transports the regolith upwards for 2.5 meters. The rotation of the tube generates friction between the regolith and tube walls, that together with the inner screw propels the regolith upwards while the scoops push the regolith into the tube. The system benefits greatly from the lunar gravity conditions, and its confinement mitigates dust generation. An IoT-based system allows for intelligent telemetry and control to monitor dust generation, mass flow, and inflow of larger rocks. The system aims to transport one ton of material per day on Earth, with a power requirement of about 800 W and an approximated weight of 225 kg. The full-scale model of the system was designed and fabricated by the student team Spaceship EAC to participate in the Over the Dusty Moon Challenge hosted by the Colorado School of Mines. This innovative solution effectively addresses the key challenges of transporting large amounts of regolith under lunar conditions, while minimizing dust generation and discarding large rocks.

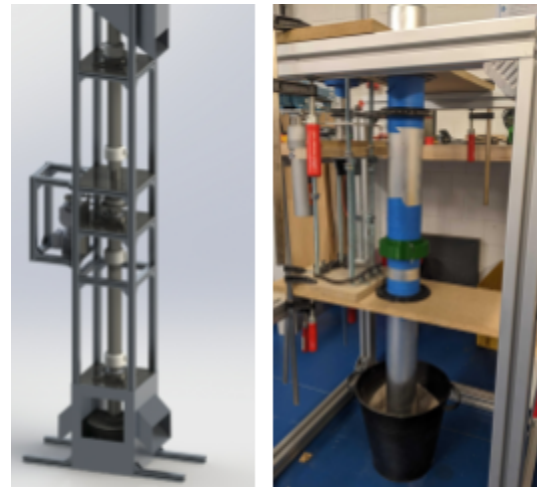


Fig. 2: Vertical regolith transport system render (left) and downscaled model (right)