

IAF SPACE EXPLORATION SYMPOSIUM (A3)  
Moon Exploration – Part 1 (2A)

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## CUBESAT MOON LANDER OMOTENASHI, JUST BEFORE LAUNCH

**Abstract**

OMOTENASHI (Outstanding MOon exploration TEchnologies demonstrated by NAno Semi-Hard Impactor) will be the world's smallest moon lander. It will be launched by NASA's Space Launch System (SLS) Artemis-1 with Orion spaceship in 2021. The mission objectives of OMOTENASHI are (1) demonstration of nano-lander technology and (2) observation of radiation environment in Cis-lunar region. Since it must be within 14 kg mass and 6U CubeSat size, some new technologies have to be developed.

The spacecraft consists of three parts, Orbiting Module (OM), Rocket Motor (RM), and Surface Probe (SP), because the separation in orbit is essential to reduce deceleration mass for landing. To decelerate the orbital velocity from 2500 m/s, a small solid rocket motor is employed. By the ignition of the RM, RM+SP will be separated from the OM. Since the deceleration is conducted by the solid rocket motor, roughly 50 m/s velocity error at the impact on the moon surface will remain. To withstand the high-speed impact, a crushable material which is sandwiched between the SP and the RM, will be used. It will reduce the impact acceleration within 10,000 G. Epoxy filling of the instrument box of the SP will cope with the impact shock.

We have already completed spacecraft and are currently conducting operational rehearsal using a spacecraft simulator. At the presentation, we will report the mission objectives, spacecraft design, in orbit operation plan, and its simulator.