19th IAA SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND DEVELOPMENT (D3)
Strategies & Architectures as the Framework for Future Building Blocks in Space Exploration and Development (1)

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LUNAR LAVA TUBE MAPPING MISSIONS FOR HUMAN HABITATION ASSESSMENT USING SMALL ROBOTIC SWARMS

Abstract

Spacebit Global is now completing development of its first robotic surface exploration rover scheduled to land on the Moon in Q4 2021 on the Astrobotic Peregrine lander for their NASA CLPS first mission. The Asagumo rover will deploy from the Peregrine lander and move at least 10 meters from the lander using its unique leg system of locomotion under tele-operation control through the WIFI system resources on the lander. This technology demonstration mission will last for up to 8 days on the lunar surface, and validate the key systems including the legs, the wide field cameras and the 3D LIDAR scanners as well as the ability to tele-operate the rover. The ultimate goal of Spacebit is to use a swarm of Asagumo walking rovers deployed from a wheeled Mother Ship rover to climb down into the surface opening of a lunar lava tube and map the interior of the cave system using its HD cameras and 3D LIDAR surface scanners. In addition to terrain mapping and photography, the rovers will also carry temperature and radiation sensors that will provide ground truth validation of the current assumptions that the lunar subsurface environment is much more suitable for human habitation compared to surface habitation. The Mother Ship rover will carry four to six of the 1U sized Asagumo rovers and deploy them in sequence at the cave mouth or drop them through a skylight using a deployer cable. The Asagumo rovers will descend into the lava tube cave system one at a time, with each rover maintaining a wireless data communication link to the rover behind it in order to relay the data and command and control functions from the Mother Ship forward into the cave system. The Mother Ship in turn relays the data and commands back to the lander, where a high speed laser com relay system will connect back to Earth. An inductive coil charger will also be deployed into the cave for recharging the rovers. After several sorties have been completed, the Asagumo swarm will attempt a final one-way descent as far as they can go on a battery charge while maintaining the wireless data links back to the surface. This paper will describe the Asagumo walking rover and Mother Ship engineering and operations plans, and the current status of development and testing of the initial Asagumo rover prototype which will fly in 2021.