IAF SPACE EXPLORATION SYMPOSIUM (A3)
Interactive Presentations - IAF SPACE EXPLORATION SYMPOSIUM (IP)

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DEVELOPMENT OF LUBRICATION AND COOLING SYSTEMS FOR TRANSAXLES IN LUNAR ENVIRONMENTS

Abstract

A means of transportation for extensive exploration of the lunar surface is essential. The Japanese government has agreed to supply a pressurized rover for the ARTEMIS program, with Toyota responsible for its development. One of the technical challenges in developing the pressurized rover is the creation of a transaxle that can traverse the lunar terrain. The transaxle of the pressurized rover consists of a drive motor and a reduction gear, which amplifies the torque generated by the drive motor and transmits it to the tires via a drive shaft. Since the drive motor and reduction gear are used under high rotation and high load conditions, conventional greases and solid lubricants typically used in spacecraft are not suitable. Therefore, a lubrication and cooling system using oil is necessary. An oil pump is used to supply the required oil flow to necessary parts, even under low gravity. Additionally, to suppress oil vaporization in a vacuum environment, oil seals are used to seal the interior of the transaxle. Each component, such as the oil pump and oil seal, has been tested in a vacuum environment to confirm the feasibility of the lubrication and cooling system using oil.