

IAF SPACE PROPULSION SYMPOSIUM (C4)  
Electric Propulsion (4)

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## STATUS OF ADVANCED ELECTRIC PROPULSION SYSTEMS FOR EXPLORATION MISSIONS

**Abstract**

NASA is moving forward with plans to send humans beyond low Earth orbit to explore the Moon and Mars. To prepare for this ambitious activity, technology development of a 13 kW class electric thruster has been underway for several years to improve the ability to support human exploration with an advanced power and propulsion capability. The technology development will culminate in a demonstration of a 50 kW class Solar Electric Propulsion (SEP) system in 2022 on the Power and Propulsion Element (PPE) of the Lunar Orbiting Platform - Gateway. In addition, NASA is preparing for future transportation of crew and cargo to Mars. These Deep Space Transport (DST) vehicles will operate at power levels up to 500 kW and so NASA is pursuing development of 100 kW class electric thrusters for future needs.

Development is underway at Aerojet Rocketdyne on a pair of Hall thruster systems that are intended to bracket the needs of future NASA Solar Electric Propulsion (SEP) missions in support of human exploration of deep space. The Advanced Electric Propulsion System (AEPS) program is designing, testing, and qualifying a 13 kW Hall thruster system to be demonstrated on the PPE in cis-lunar space. The NextSTEP program is integrating a nested Hall thruster into a 100 kW system (thruster, PPU, and xenon feed system) and testing it for a minimum of 100 hours. These two programs will provide a path to efficient in-space propulsion that will allow NASA to transfer the large amounts of cargo and equipment that are needed to support human missions – first in the vicinity of the moon and then by the 2030s to Mars. Details of the technology development status and key accomplishments of these programs will be described in this paper.