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Electric Propulsion (1) (5)

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Abstract

Electric propulsion (EP) is an extremely important technology for NASA. It has played a major role on several missions, most notably the ion propulsion system on NASA's Dawn mission which provided a Delta-V of over 11 km/s to the spacecraft. As a result of these successes, solar electric propulsion (SEP) is now broadly recognized as an important technology for future exploration endeavors. NASA currently has many projects focused on research and development of EP for a range of applications. All three of NASA's mission directorates that deal directly with space exploration are actively engaged in supporting work in this area.

NASA's Science Mission Directorate (SMD), which conducts a wide range of robotic planetary science missions, continues to support EP technology development for future applications. SMD's primary focus is on the flight development of NASA's Evolutionary Xenon Thruster - Commercial (NEXT-C). This project is developing and flight qualifying gridded-ion thrusters and power processing units (PPU), based on the NEXT technology development work completed in 2012. NEXT-C hardware is baselined for the Double Asteroid and Redirection Test (DART) mission led by the Applied Physics Laboratory (APL) and is being considered for multiple other science missions.

Most of NASA's EP projects are being conducted by programs within NASA's Space Technology Mission Directorate (STMD). The largest of these is the Advanced Electric Propulsion System (AEPS), which is developing and flight qualifying four 13.3-kW Hall thruster/PPU strings. These strings are a part of the 40 kW electric propulsion system that will be flown on the Power and Propulsion Element (PPE) that is the first element of NASA's Gateway; a key enabling capability of the cislunar exploration architecture.

NASA is also conducting several other research and development activities through internal investments, and partnerships with U.S. industry and other government agencies. These cover several areas, including sub-kilowatt Hall-based EP for small spacecraft and advanced gridded ion thruster technology capable of higher thrust-to-power operation.

This paper describes these projects in more detail, including the specific technical activities being conducted at NASA's main centers for EP technology and development, namely Glenn Research Center (GRC) and the Jet Propulsion Laboratory (JPL).