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HIGH-MATURITY ELECTRIC PROPULSION SYSTEM FOR ENABLING DEEP SPACE CUBESAT MISSIONS

Abstract

In 2018 the first two interplanetary CubeSats flew to Mars on JPL's MarCO mission. In late 2020, NASA's SLS EM-1 vehicle will launch 13 CubeSats to the Moon. Advances in small satellite technologies are enabling these missions and allow increasingly complex CubeSat operation in deep space. Either individually in larger U-form factors, in constellations, or as supplements to large-scale missions, CubeSats are ushering in a new paradigm in solar system exploration. One key enabling technology is the miniaturization of highly sophisticated electric propulsion (EP). Busek has developed a groundbreaking, solid-iodine fueled CubeSat ion engine that enables high-deltaV (>2km/s) missions for >6U bus. The engine, known as "BIT-3", is capable of up to 1.25mN thrust and 2,300sec specific impulse, while requiring 55-80W throttleable input power. Two BIT-3 flight systems are scheduled to be delivered to two SLS EM-1 secondary payloads in Q1 CY2019: Morehead State University's Lunar IceCube and Arizona State University's LunaH-Map. Additional flight systems are being delivered to undisclosed customers beginning Q3 CY2019. This presentation will be structured in two parts. The first part will give an overview of the BIT-3 engine and describe its capability. The second part will give some examples of applicable deep space missions and trajectories, including lunar orbit capture and descent, asteroid/NEO rendezvous, and Mars/Martian moon orbit insertion.