

SMALL BODY EXPLORATION WITH NEXT ION PROPULSION. S. W. Benson¹, M. J. Patterson¹ and John. W. Dankanich², ¹NASA Glenn Research Center, 21000 Brookpark Rd, Cleveland OH 44135, ²Gray Research, Inc., NASA Glenn Research Center, 21000 Brookpark Rd, Cleveland OH 44135

Introduction: The NASA's Evolutionary Xenon Thruster (NEXT) ion propulsion system is completing advanced technology development with the objective of expanding the science reach of solar-powered robotic planetary spacecraft. The capabilities of the NEXT thruster, the key element of the system, provide the opportunity to reach difficult solar system destinations with simple propulsion system configurations. The thruster has a broad throttling range, 0.54 – 6.9 kW, to allow effective use across a wide range of heliocentric distances. A flexible throttling approach allows optimization of specific impulse, to minimize total propellant load, or optimization of thrust-to-power, to support the higher delta-V phases of small-body closure and rendezvous. The NEXT thruster was designed with conservative margins to ensure that the thruster has extensive life capability. Through testing and analyses to date, the first wear-related failure is projected to occur beyond 730 kg of xenon throughput, the standard measure of ion thruster life capability. This provides a qualification-rating of over 480 kg xenon throughput per NEXT thruster [1], [2], translating into a total impulse per thruster of 15–20 x 10⁶ N-s, depending on the mission throttling profile.

This paper illustrates the mission capabilities provided by the NEXT ion propulsion system. Simple propulsion system configurations, consisting of two and three thruster strings are described. The related solar power system sizing considerations are addressed. Sample mission performance to a range of small bodies is described. Fly-bys, orbiters, and sample returns are characterized, including multiple object missions.

References: [1] Van Noord J.L. (2007), *43rd Joint Propulsion Conference*, AIAA 2007-5274. [2] Herman D.A. et al. (2007), *30th International Electric Propulsion Conference*, IEPC-2007-033.