Implementation and Continued Development of High Performance Green Propulsion (HPGP) in the United States

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Over a period of 15 years, ECAPS has been developing High Performance Green Propulsion (HPGP) propellants and thrusters. In 2010 a major milestone was reached through the successful flight qualification of the technology on the PRISMA satellite mission, which continues to operate in orbit today.

ECAPS' flight-proven HPGP technology (which utilizes the Aminonium DiNitraniide-based monopropellant LMP-103S) is environmentally benign and significantly easier to both transport and handle than monopropellant hydrazine. Because LMP-103S propellant is significantly less toxic than hydrazine, users benefit through the reduction in both labor and launch site infrastructure required to protect personnel from exposure during fueling as well as in the disposal of any resulting propellant waste. Since there is no need to evacuate the area during payload fueling, parallel operations can be performed; thus reducing the overall duration of launch campaign operations. In fact, Range Safety officials for the PRISMA launch characterized the fueling to be a "non-hazardous operation", allowing other activities to continue in the same facility while performing the fueling with LMP-103S. In addition to these handling benefits, the propellant provides 6 - 10% higher specific impulse and has a 24% higher density than hydrazine, resulting in the ability to satisfy mission requirements with reduced tank volumes. The net result is a combination of both increased performance and reduced life-cycle costs.

Approximately 5 years ago, ATK entered into an agreement with ECAPS to serve as the U.S. agent for the import of HPGP technologies. Since that time, with the support of some key customers, ATK has invested to bring the propellant blending capabilities to its Elkton facility, performed hazard classification testing to obtain a Department of Transportation (DOT) certification to ship the propellant and has now set up a vacuum chamber test stand to perform hot-fire testing of HPGP thrusters. Most importantly, ATK has also established the capability to develop HPGP rocket engines for a variety of applications of interest to NASA, DoD and Commercial customers. To date, customer response has been excellent, with needs for thrusters ranging from mN up to about 2kN of force for applications ranging from spacecraft, launch vehicle and missile interceptor attitude control systems to apogee kick motors for orbit adjustment.

Skybox Imaging recently became the first commercial company to baseline ECAPS' High Performance Green Propulsion (HPGP) technology, implementing a propulsion system design with four 1N thrusters in their small satellite platform (<150 kg). The initial propulsion module, to be delivered in 2013 will serve to qualify the system design for use in an entire constellation of small satellites intended to provide global customers easy access to reliable and frequent high-resolution images of the Earth. Two key technical requirements for the propulsion system were to provide the maximum delta-v achievable (for continued orbit maintenance) within a considerably limited internal volume. Additionally, in light of the commercial nature of the project, the overall life-cycle cost was also considered to be of utmost importance. As part of the mission design phase, multiple different propulsion technologies were evaluated from the standpoints of both technical performance and commercial competitiveness. The results of that analysis projected that the HPGP solution selected will provide nearly twice the on-orbit delta-v of the more traditional monopropellant

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