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SUBJECT: Authorization for Release of Technical Information, Control Number: **AFRL-PR-ED-AB-2003-089**
Daron Bromaghim, James Singleton, Stewart Bushman, Ron Spores (all AFRL/PRSS); Lee Johnson & Dave Conroy (Jet Propulsion Lab); Ricardo Gorecki & Dong Tan (Northrop-Grumman Space Technologies); Bruce Pote, Larry Byrne, Bill Connolly, Vlad Hruby (Busek Inc); Joe Barbarits (Moog); and Dave White & Diana Collins & Brian Blaine & Garrett Reed (all W.E. Research), "Propulsion Technologies for MicroSatellite Missions"

AIAA Space 2003 Conference **(Statement A)**
(Long Beach, CA, 23-25 Sep 2003) (Deadline: 15 May 2003)

Abstract: AIAA Space Technologies Conference 2003

Propulsion Technologies for MicroSatellite Missions

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ABSTRACT

Many near, to mid-term satellite missions have been identified for 200 kg class spacecraft. For many of these applications, significant delta-v capability is desired in order to perform orbit transfer, on-orbit repositioning and formation flying. Several of these systems are in advanced engineering development and could be ready to support flight opportunities as early as summer 2004. A 200 W Hall Effect Thruster (HET) system is being developed to satisfy traditional high specific impulse (I_{SP}) missions such as stationkeeping and orbit transfer, and has demonstrated I_{SP} of 1,370 sec, thrust of 12.2 mN and 35% total efficiency. This system, however, has also demonstrated the ability to produce very small impulse bits, as low as 1.5 mN-sec, for formations flying applications that require precise maneuvers. To complement this system, a suite of miniaturized sensors is also in development that will enable a full description of the integration impacts of HETs on Department of Defense (DoD), National Aeronautic and Space Administration (NASA), and commercial satellites. This instrumentation package consists of a xenon ion energy analyzer, electron (Langmuir) probes, radiometric and photometric sensors, and a solar array experiment. The combined package, including the instruments, electronics, harness, chassis, etc., is less than 2 kg total mass - representing a significant improvement in capability vs. mass and cost. The third system in advanced development is a micro pulsed plasma thruster (MPPT) for applications in propulsive attitude control, which can reduce a 150-kg class microsatellite's attitude control system mass by 90%. This thruster, based on traditional pulsed plasma thrusters, weighs approximately 1.5 kg, and has three orthogonal thrust axes, each of which can be fired to produce impulse about any spacecraft axis. MPPT performance is now being optimized, but is expected to be from 25-100 microN, with an estimated I_{SP} of 500-800 sec.