



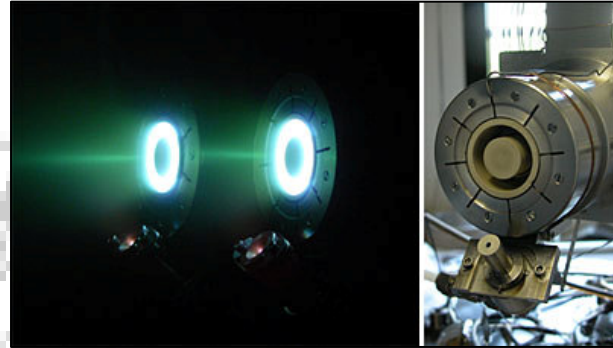
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## The Puget Sound Chapter of AESS presents *Electric propulsion for Lunar missions*

Mr Christian Carpenter—Senior Project Engineer, Aerojet.  
6:00-7:00pm, Tuesday, June 30, 2009

During the Apollo era, studies were performed which showed that lunar cargo delivery systems using electrically propelled cargo spacecraft could deliver payloads of more mass than systems using only chemically propelled spacecraft. These studies also showed that this mass could be delivered at a fraction of the cost when compared with the cost of chemically propelled spacecraft missions. Over forty years later, this concept is revisited from the perspective of NASA's Vision for Space Exploration and present technology capabilities. Cargo delivery systems using both chemically and electrically propelled cargo spacecraft are compared for sustained lunar supply campaigns. The results of these analyses show that due to increases in technology capabilities over the past forty years, now more than ever, electrically propelled cargo spacecraft provide a cost effective, near optimal mass transport solution for lunar cargo supply operations.



Hall effect thruster  
[www.esa.int](http://www.esa.int)

To attend this virtual meeting, **please RSVP no later than 29 June 2009** to  
Reece Lumsden at [reece.h.lumsden@boeing.com](mailto:reece.h.lumsden@boeing.com)

***Speaker Bio:*** Mr Carpenter received his Bachelor of Science in Aerospace Engineering from Auburn University in 2000. After graduation he was hired as a support service contractor at the NASA Glenn Research Center in Cleveland Ohio where he worked for five years developing gridded ion thrusters and supporting operations of the International Space Station. While at NASA, Mr. Carpenter was involved with support of the ISS plasma contactor operations and many cutting edge programs including the NASA Evolutionary Xenon Thruster (NEXT) and the High Power Electric Propulsion (HiPEP) thruster for the Jupiter Icy Moons Orbiter (JIMO) program.



In 2005 Mr. Carpenter left NASA for a career at Aerojet in Redmond Washington where he continued work on the NEXT gridded ion thruster. Mr. Carpenter is currently a Senior Project Engineer in Aerojet's Advanced Development and Missile Defense group. Mr. Carpenter's recent programs included support of NASA's Exploration Systems Mission Directorate developing high power Hall thruster systems for lunar missions and most recently on the Orion Service Module in support of NASA's Constellation program to return humans to the Moon. Mr. Carpenter has been a member of the American Institute of Aeronautics and Astronautics for over ten years and has authored many technical publications on advanced propulsion systems and architectures.