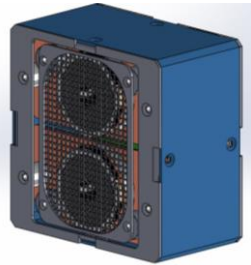
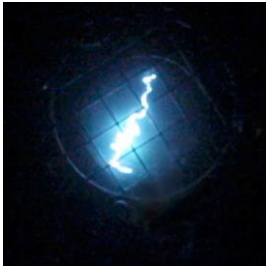




Alameda Applied Sciences Corporation

Metal Plasma Thruster for Small Satellites



PRODUCT INFORMATION

Technical Description:

Alameda Applied Sciences Corporation (AASC) has developed a patented metal plasma thruster (MPT) for attitude keeping and orbit raising or lowering of Nano- and Micro-SATs. A vacuum arc generates a metal plasma plume that accelerates into space at 8.1 – 23.5 km/s to generate thrust (10 – 15 $\mu\text{N/W}$). Different metals provide a range of Specific Impulse (I_{sp}) from 826 s (Pt) up to 2400 s (Al). Standard design uses Mo which has an I_{sp} of 1757 s.

Advantages

- Non-toxic solid metal propellant
- No moving parts, no plumbing, no liquid or gaseous fuel
- 3x more fuel efficient than the Teflon[®] PPT, lower cost and higher reliability than the Electro spray (ESP) thruster
- <50 V capacitor and fast switch in PPU

Design Characteristics/Performance

- Size: Thruster & PPU: 1/2-U for 3U Nano-SATS, multiple 1U for >6U Micro-SATS
- Power: up to 100 W/U
- Interfaces directly to 7-28 V spacecraft bus
- Impulse Bits: 1 μNs – 1 mNs
- Total Impulse: 3500 Ns/U

Relevance to Customer / End User:

Thousands of Nano- and Micro-Satellites will be launched into Low Earth Orbit (LEO) over the next decade for resource/disaster management, weather and internet coverage. AASC's MPTs provide a low-mass propulsion system for 3U – 100U SATS, for attitude keeping, drag compensation, and orbital maneuvers.

The Power Processor Unit (PPU) consists of an inductive switching circuit that transforms the on-board DC power into a pulse format that *both ignites the arc discharge and sustains the plasma plume*. The processor can be programmed to operate in a wide dynamic range producing μNs to mNs impulse bits.

The simple control and the range of operation make the MPT an ideal propulsion system for missions that require fine positioning or for missions using small, power-limited (<100 W) satellites. The modular design makes the MPT scalable for larger satellites and higher powers.

Relevance to Other Applications:

The modular MPT may be scaled for larger spacecraft or higher ΔV orbital changes. The flexibility and performance of the MPT gives mission engineers a variety of options to meet requirements for unique small SAT applications.

COMPANY INFORMATION

Company: Incorporated in 1994, AASC focuses on pulsed plasma devices. Customers include large multinational companies and research organizations.

President: Mahadevan Krishnan **Phone:** 510-761-9654

URL: www.aasc.net

APPLICATION/INSERTION INFORMATION

Technology Readiness Level (TRL): 5.

1/2-U modules under life tests in vacuum; 4 M pulse (≈ 1700 Ns total impulse) runs are ongoing; integration into a 1U module with ≈ 3500 Ns total impulse and system development to TRL-7 are next steps.

Transition/Insertion Issues:

TRL-5 prototypes may be qualified to TRL-8 in 6 months, with one or two LEO launches

IP:

US 7,518,085; US 7,053,333; US 6,818,853: Vacuum arc plasma thrusters with inductive energy storage driver.