Propulsion Business Development – Customer Success

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Project Scope

- Help develop the business and market opportunities for the wide range wide range of products under development for AVS UK
- Steer strategic decisions along the way to obtain the highest return of investment

Background

- AVS UK is an EN9100 certified technology development company based on the Harwell campus that develops bespoke solutions for a wide range of space markets – notably propulsion
- In propulsion market develop technologies in ECR, MET, EPT, PET, ICE, HET, etc.
- Also develop variety of secondary equipment (radiators, TPM, deployable structures etc.)

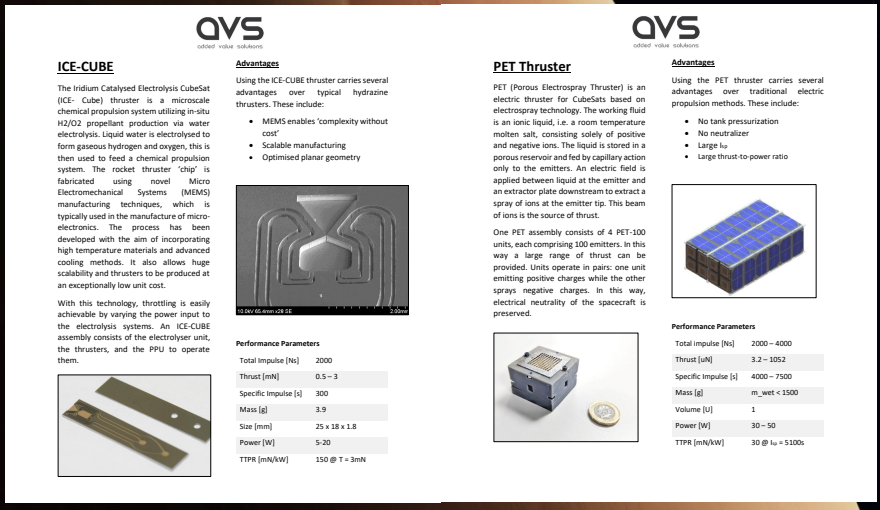
Success Criteria

- Understand key market drivers in propulsion industry
- Gain an understanding of main customers of AVS
- Prepare basic marketing material for key technologies

Market Drivers

- Significant funding comes from public sources, understanding the future needs of this sector is the best predictor for project direction
- General trend is heading towards removing reliance on hydrazine and xenon due to environmental and cost issues

Product overviews: ICE-CUBE & PET Thrusters



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ICE-CUBE

The Iridium Catalysed Electrolysis CubeSat (ICE- Cube) thruster is a microscale chemical propulsion system utilizing in-situ H2/O2 propellant production via water electrolysis. Liquid water is electrolysed to form gaseous hydrogen and oxygen, this is then used to feed a chemical propulsion system. The rocket thruster 'chip' is fabricated using novel Micro Electromechanical Systems (MEMS) manufacturing techniques, which is typically used in the manufacture of micro-electronics. The process has been developed with the aim of incorporating high temperature materials and advanced cooling methods. It also allows huge scalability and thrusters to be produced at an exceptionally low unit cost.

With this technology, throttling is easily achievable by varying the power input to the electrolysis systems. An ICE-CUBE assembly consists of the electrolyser unit, the thrusters, and the PPU to operate them.

Advantages

Using the ICE-CUBE thruster carries several advantages over typical hydrazine thrusters. These include:

- MEMS enables 'complexity without cost'
- Scalable manufacturing
- Optimised planar geometry

Performance Parameters

Total Impulse [Ns]	2000
Thrust [mN]	0.5 – 3
Specific Impulse [s]	300
Mass [g]	3.9
Size [mm]	25 x 18 x 1.8
Power [W]	5-20
TTPR [mN/kW]	150 @ T = 3mN

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PET Thruster

PET (Porous Electrospray Thruster) is an electric thruster for CubeSats based on electrospray technology. The working fluid is an ionic liquid, i.e. a room temperature molten salt, consisting solely of positive and negative ions. The liquid is stored in a porous reservoir and fed by capillary action only to the emitters. An electric field is applied between liquid at the emitter and an extractor plate downstream to extract a spray of ions at the emitter tip. This beam of ions is the source of thrust.

One PET assembly consists of 4 PET-100 units, each comprising 100 emitters. In this way a large range of thrust can be provided. Units operate in pairs: one unit emitting positive charges while the other sprays negative charges. In this way, electrical neutrality of the spacecraft is preserved.

Advantages

Using the PET thruster carries several advantages over traditional electric propulsion methods. These include:

- No tank pressurization
- No neutralizer
- Large I_{sp}
- Large thrust-to-power ratio

Performance Parameters

Total Impulse [Ns]	2000 – 4000
Thrust [uN]	3.2 – 1052
Specific Impulse [s]	4000 – 7500
Mass [g]	m_wet < 1500
Volume [U]	1
Power [W]	30 – 50
TTPR [mN/kW]	30 @ I_{sp} = 5100s

Key Customers

- In the space propulsion industry key players are the space primes, both traditional + CubeSat
- Grant awarders such as UKSA, ESA, etc. also play key funding role

Conclusion

- AVS have a wide range of propulsion projects under funding from a variety of sources
- Future steps will be to bring in further commercial customers for the next generation of design being carried out

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