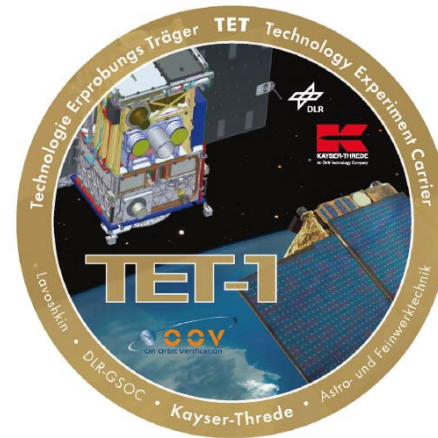


On-Orbit-Verification of Small Satellite Propulsion System AQUAJET on TET-1

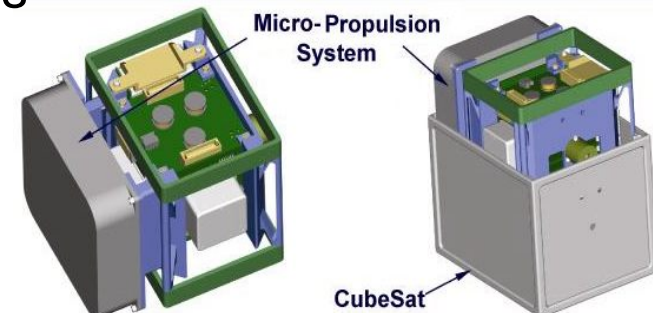


2nd TET Customer Day
Kayser-Threde, Munich, 05./06.07.2010

Dr. Harry Adirim, Norbert Pilz, Matthias Kreil, Michael Kron, Andrei Mitrofanow
AI: Aerospace Innovation GmbH

Introduction

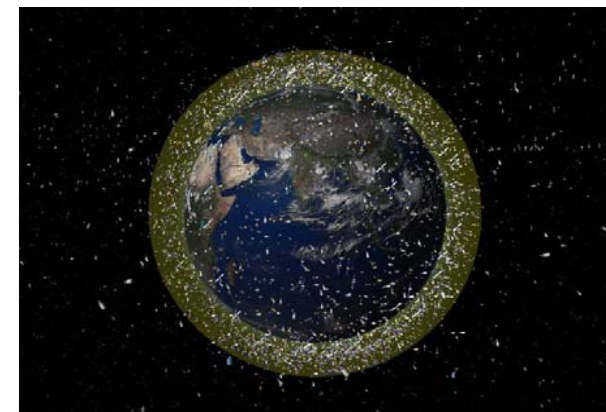
- Aerospace Innovation GmbH develops **Propulsion Systems for Small Satellites** in close cooperation with Aerospace Institute and Berlin's University of Technology
- **Market:** Considerable **Increase in Worldwide Activities on Small Satellite Sector** during past years:
 - Pico- and Nano-Satellites currently primarily developed by Institutional Organisations (Agencies, Universities etc.)
 - Micro-Satellites meanwhile much more powerful due to Technological Breakthroughs in Miniaturisation in recent years
→ Enabling of Commercial Applications



Schematic for Modular Small Satellite Propulsion System

Motivation for Small Satellite Propulsion Technology Development

- Small Satellite Propulsion allows for **Significant Enhancement of Mission Spectrum**:
 - Build-up of Satellite Constellations and Swarms
 - Inspection and Maintenance of Orbital Systems
 - De-Orbiting after Mission Completion
 - Life-Time Extension of Satellites in Very Low Orbits
- Increasing Significance of Small Satellite Propulsion due to **Growing Demand for Space Debris Mitigation** („Code of Conduct“)



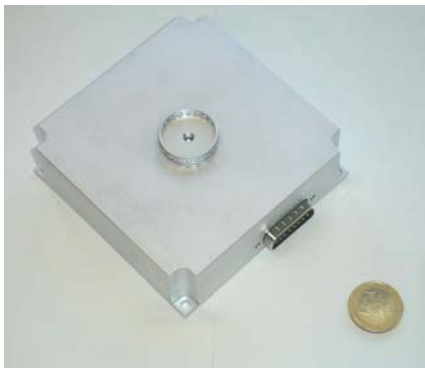
Simulation of Orbital Space Debris [ESA]

Small Satellite Propulsion System AQUAJET for Pico- and Nano-Satellites

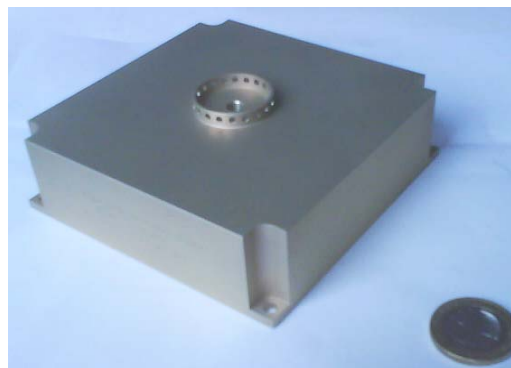
- **Resistojet Propulsion System** based on environmentally benign (“**Green**“) and **Safe Propellant** (Water & Anti-Freeze)
- **ECSS Compliant Development and Testing**
- **Dimensions: 100 x 100 x 30 mm, Mass: ca. 500 g**
- **Highly Integrated Propulsion Module** including Propellant Management Device (PMD), redundant sensor systems and space qualified interface electronics
- **Modular Design** leads to **flexible, easy-to-handle** and “**Plug and Play**” Application
- **Customised Design** of propulsion module also possible, **AQUAJET Version for Micro-Satellites** currently under development (Development Model finished, EM in preparation)

AQUAJET Qualification Status

- **AQUAJET Ground Qualification finished in 2009:**
 - Successful ECSS compliant Ground Qualification: 08/2008 to 08/2009
 - Delivery STM: 05/2008
 - Delivery EM: 05/2009
 - Delivery PFM: 09/2009
- **Flight Spare Model (FSM) currently in Integration Process** for parallel **Ground Testing** and **Marketing Purposes**



Structural/Thermal Model



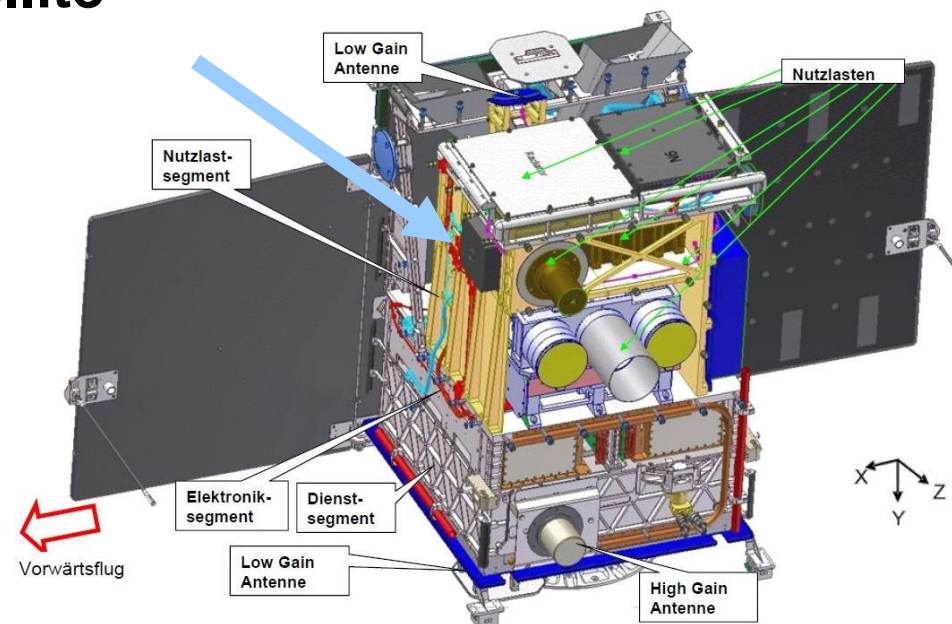
Engineering Model (EM)



Proto Flight Model (PFM)

On-Orbit-Verification of Small Satellite Propulsion System AQUAJET on TET-1

- **Orbital Impulse Bit Verification** for permanent and pulsed mode operation
- **Verification of impulse by Measurement of Momentum on TET-1 Satellite**



AQUAJET Accommodation on TET-1 [KT]

Thank you for your attention !

For further questions, please contact:

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