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BB28
Deorbit of LEO Platforms by Advanced Arcjet Technologies for Clean Space
Institute of Space Systems (IRS)

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Institute of Space Systems

Description of proposed technology Building Block

Arcjets

- Arcjets are compatible with chemical propulsion systems (fuel flexibility).
- I_{sp} of arcjets closes the gap between chemical thrusters and HETs.
- High TPR (~100 mN/kW) + thrust compared to HETs and GITs.
- Better suited for collision avoidance, direct re-entry.

Baseline considerations	Design options for arcjets
Green propellants (ADN, HAN, H_2O_2, Helium):	– Limited comparability (many options contain oxygen). – Technical issues (electrode erosions) with oxygen must be resolved. – Already basic He storage and distribution infrastructure on many S/C (synergies)
HET / GIT:	– Arcjets compatible with Xenon, but very poor performance. – Ammonia-based stand-alone subsystem?
Hydrazine / ammonia:	– Arcjets fully compatible with either. – Sharing tanks, feed lines etc.

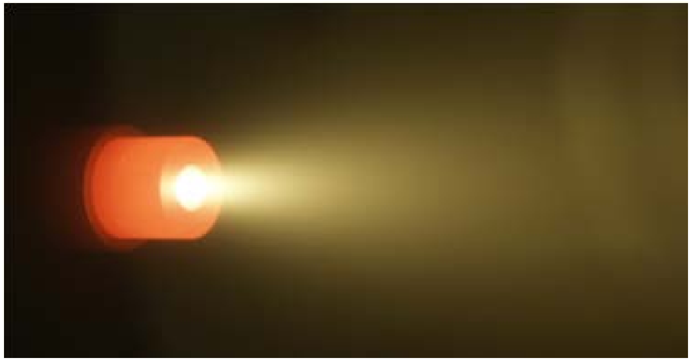
Description of proposed technology Building Block

Applicability range

- Collision avoidance for S/C in LEO.
- Direct, controlled re-entry for medium and heavy S/C from LEO.
- “Fast tasks” in general
- Deployment for operational + end-of-life manoeuvres (graveyarding / deorbit).

System level impacts

- Adapting arcjets to the existing infrastructure (He / green propellant).
- Using Helium: storage technologies already qualified, minor modifications to propellant-feeding system necessary, for economic use, higher tank pressures required than for mere pressurants.
- Alternative: ammonia or hydrazine arcjet subsystem.
- Additional PPU mass. Power budget constraints?



Development

Development

- Definition of mission requirements regarding “high-thrust” manoeuvers.
- Derivation of requirements for the propulsion subsystem.
- Systematic comparison with alternative approaches (i.e. HET-based deorbiting systems)
- Feasibility analysis of arcjets with respect to mission and system requirements.
  - Identification of maximum S/C mass for safe evasive manoeuvring.
  - Identification of maximum orbit altitude for direct re-entry.
  - Total mass and volume of the propulsion subsystem.
- Overall system mass of different configurations.

Main technical challenges

- He propellant storage.
- Operation test with hydrazine (safety).
- Operation with (oxygen-containing) green propellants.
  - Coated or
  - C/C cathodes