cleansat

BB#15
Electrostatic tether plasma brake
Finnish Meteorological Institute

24/05/2016

AIRBUS DEFENCE & SPACE

OHB

ThalesAlenia Space
A Thales / Finmeccanica Company

Description of proposed technology Building Block

- Like electrodynamic tether, except:
  - Lower mass per thrust
  - Safe to other space assets because tether wires hair-thin
  - Only weak dependence on orbit inclination
- Low power consumption, Thrust is controllable
- Baseline + design options
  - Baseline: Single tether, Gravity-stabilised
  - Options: Multi-tether, Rotating
- Trade-offs to be performed
  - Duration of deorbiting versus tether length
  - Up to ~300kg mass → single tether
  - Beyond ~300kg mass → need multiple tethers

Description of proposed technology Building Block

- Applicability range (satellite class and target orbits in LEO)
  - Primary applicability (single-tether device): Small and medium mass satellites (mass up to ~300 kg, assuming 2-4 years deorbiting time)
  - Secondary applicability (multi-tether device): >~300 kg satellites
  - Applicable up to ~900 km altitude (beyond that, efficiency decreases)
- Discussion of the system level impacts (risk, mass budget, power budget and link budget)
  - In deployment phase, needs at least rudimentary ACS
  - Needs small amount of power throughout deorbiting phase
  - Needs some amount of conducting surface area, either from host satellite or if not available, dedicated metal foil or equivalent

Development

- Main technical challenges during development
  - Test in orbit (Aalto-1 CubeSat: launch July 2016)
  - Increase tether production capability
  - Find optimal tether material for LEO (thus far using material solutions developed for electric solar wind sail)
  - Find first application, get experience from integration to host satellite