Development of tether-in-space technology for propellant-less propulsion and artificial gravity

Anese Giovanni - 39th Cycle

Meeting - 19/10/2023

Tethered satellites

Two modules connected by a tether.

Propellant-less propulsion.

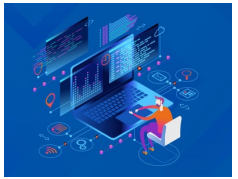
Different types:

- Electro Dynamic Tethers (EDTs).
- Momentum Exchange Tethers (METs).
- Artificial Gravity Spinning System (AGSS).

Main objectives

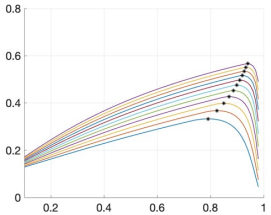
Tethered satellites

1. Development of software for simulation.



2. Study systems performances.

3. Optimize systems characteristics.



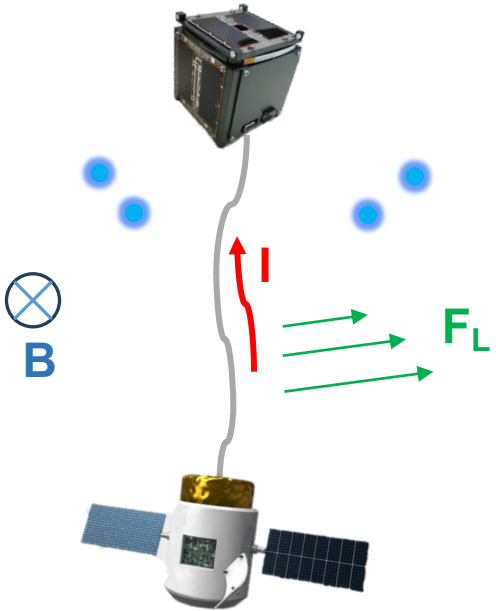
4. Study different applications.

Electro Dynamic Tethers

Tethered satellites

EDTs

- Conductive tether able to collect electrons from the ionosphere.
- Lorentz Force.
- Passive and active systems.
- Deorbiting and thrust.
- Orbital Maneuvers.

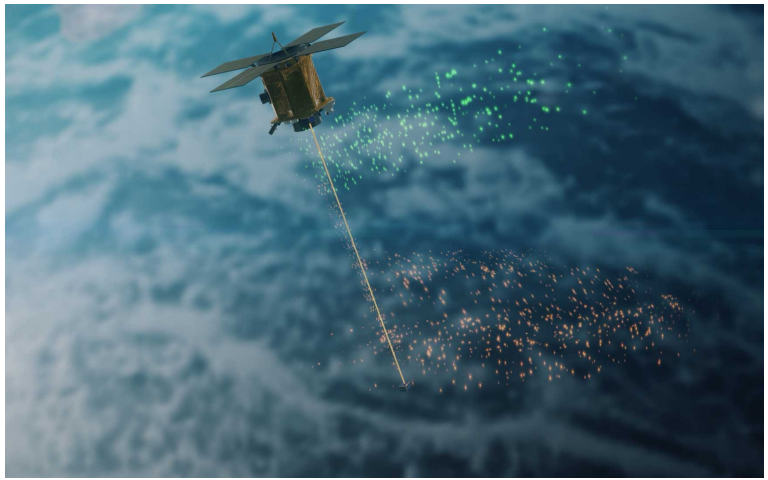


Electro Dynamic Tethers

Tethered satellites

EDTs

- E.T.PACK-F project.
- FLEXSIM and FLEX software packages.
- Test the system.
- Demonstration flight in 2025.



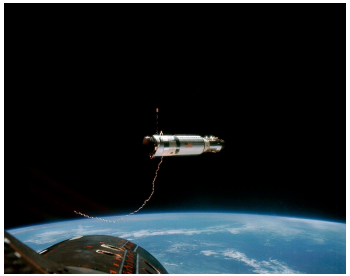
Artificial Gravity Spinning Systems

Tethered satellites

EDTs

AGSS

- Slow spinning system (1-2 rpm).
- Generation of a centripetal acceleration similar to the gravity on the Earth.
- Improve comfort for the astronauts.
- Reduce the non desired health effects due to wheigthlessness.



Momentum Exchange Tethers

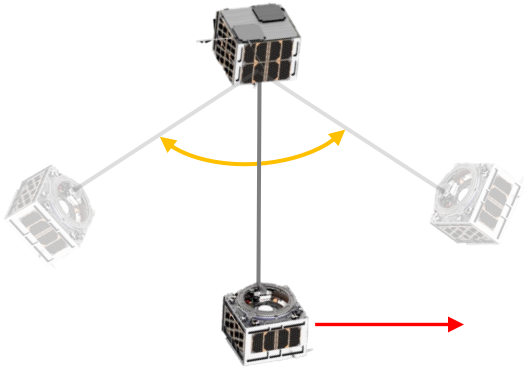
Tethered satellites

EDTs

AGSS

METs

- Conservation of angular momentum.
- Generation of ΔV.
- Orbital maneuvers.



Research activity

Development of tether-in-space technology for propellant-less propulsion and artificial gravity

Year of PhD	Activity	Goals
First year	Electro Dynamic Tethers	• Software development • Passive and active EDTs • Orbital maneuvers
Second year	Artificial Gravity Spinning Systems	• Software development • System optimizations
Third year	Momentum Exchange Tethers	• Software development • Orbital maneuvers

Thanks for the attention