Educational Series & Academy

TETHERS IN SPACE: DEORBITING AND POWER GENERATION

The Space Tether consists of a complex structure where there are three main parts: 1) the primary satellite; 2) a secondary satellite; 3) a cable (of variable lengths) that is used to join the two spacecraft together. This cable allows the transfer of energy and momentum between the two spacecraft, and this transfer can be present in both directions and, in some cases, can switch direction.
The Space tethers can be classified in two different areas: Passive tethers, which are used simply for mechanical connection and mainly transfer momentum from one part to the other; and Electrodynamic tethers, conductive wires or tapes or more complex structures), in which an electric current can flow and pass from one end to the other.
The simplest application involves using the tether system as a de-orbit system; a drag Force is induced on the tether due to its relative motion with respect to the rotating plasma and the satellite.
An opposite application is the injection of electric current from one satellite and has an effect opposite to the de-orbiting; this effect can be used to increase the SMA of the system or produce movements in the orbital plane.
The Electrodynamic tether is a system that can act as an orbital control for small and relatively big structures (depending on the tether length and on the produced current).
Even if the tethers' dynamics (passive or electrodynamic) are complex and not at all completely understood, the current knowledge in materials and technology is bridging the gap between theory and extensive application in current Space missions.

Learning objectives: dynamics of tethers; bare and electrodynamic differences; space mission possibilities.
Target audience: doctoral students, non-academic professionals, and undergraduate students.
Dates and time: 21 and 22 April 2021, 10:00-12:00 CEST

Speaker
Giacomo Colombatti - Ph.D., CISAS G. Colombo, University of Padova - is an expert in space sensor development (from designing to realization to testing) and in planetary atmospheric data analysis. He was the Lead CoI for the MarsTem temperature sensor for the Exomars2016 mission and was involved in testing campaigns conducted in a Mars-like environment, both in a laboratory (Aarhus wind tunnel facility) and on-site (Ibn Battuta Space Center in Moroccan desert).
He is an expert in data analysis for planetary probe trajectory reconstruction using Kalman filtering techniques; he is also an expert in space tether modeling and in the analysis of the dynamics of the system (particularly on two EU projects: Bets and ETPack, still undergoing).
He also studies the dynamics of lighter-than-air vehicles, both for earth and space applications. He is involved in developing control algorithms and techniques for different types of airships. He is also interested in probes' dynamics in the framework of SLAM (Simultaneous Localisation and Mapping) research.
Recently he is involved in several projects aiming at earth environment analysis using UAV (quad and esacopters) for the analysis of Pollution due to different sources (artificial light, air, and soil pollution).

Registration and Webinar Platform

The registration is mandatory via the online form.
Deadline: 15 April 2021
Fees: there are no registration fees for AIDAA members. Instructions to become a member can be found here: https://www.aidaa.it/become-a-member/
Webinar platform: Webex, a link will be sent via email a few days before the event.