

TEC for a Clean Space

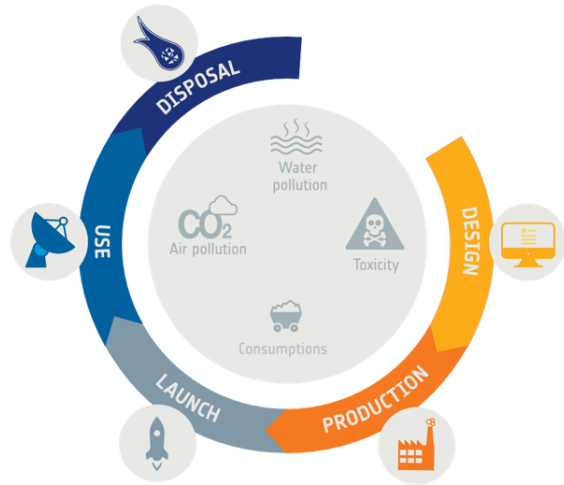
10 October 2022

Riccardo de Gaudenzi, Head of ESA Electrical Department

The **Directorate of Technology, Engineering and Quality** supports the development of various **Clean Space cross-cutting technologies**, through **TDE** and **GSTP**, for:

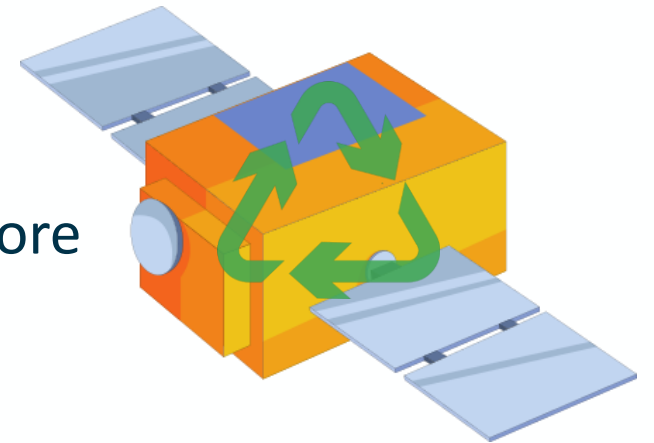
- Ecodesign
- Space debris mitigation
- In-orbit servicing

One of ESA's Technology Strategy main goals is
***“Inverting Europe’s contribution to
space debris by 2030”***



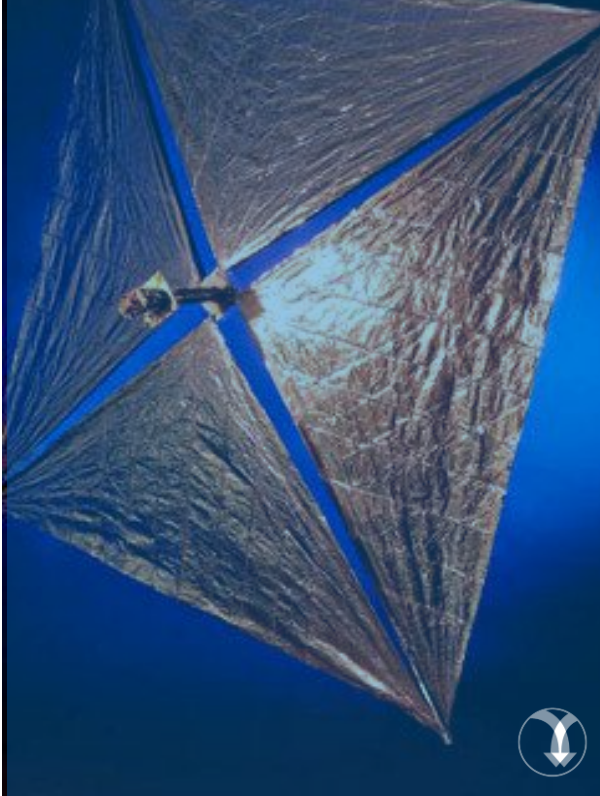
Life Cycle Assessment: quantify the environmental impacts of subsystems

Green technologies: based on the LCA results, come up with more sustainable solutions, e.g. Germanium recycling



Framework: develop an LCA handbook and database to support space industries in applying sustainable practices

ADEO DRAG SAIL by HPS



- Already in orbit, embedded on the ION platform (D-Orbit)

DEMISABLE MAGNETORQUER by LusoSpace



- Selected to fly for the first time in the Space Rider
- Enabling a new MTQ supplier to enter the EU market

SMA PASSIVATION VALVES by ArianeGroup



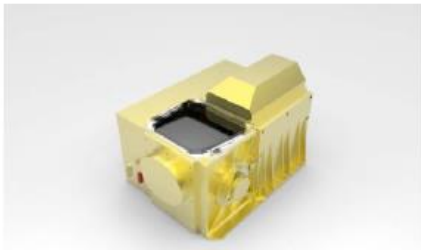
- Already installed and integrated on H2sat (DLR/OHB)
- Integration ongoing within two JAXA missions

PCDU PASSIVATION by TAS-B



- Selected to fly on some Copernicus Expansion missions
- All TAS-B PCDUs will have the option to passivate at EOL

Technology development, e.g.
GNC elements for servicing spacecraft



LIDAR
Credits: Jena-Optronik

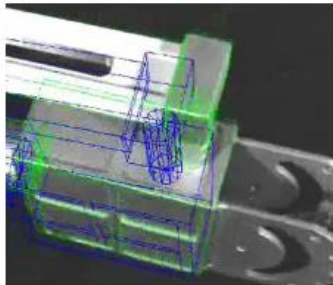


Image Recognition
Credits: TRASYS



Multi-Spectral Camera
Credits: Cosine



Close Proximity Operations Working Group, that published the
Guidelines for Safe Close-Proximity Operations

A new area of concern – RF spectrum pollution

NGSO (LEO/MEO) Megaconstellations of hundreds/thousands of satellite are rapidly building up

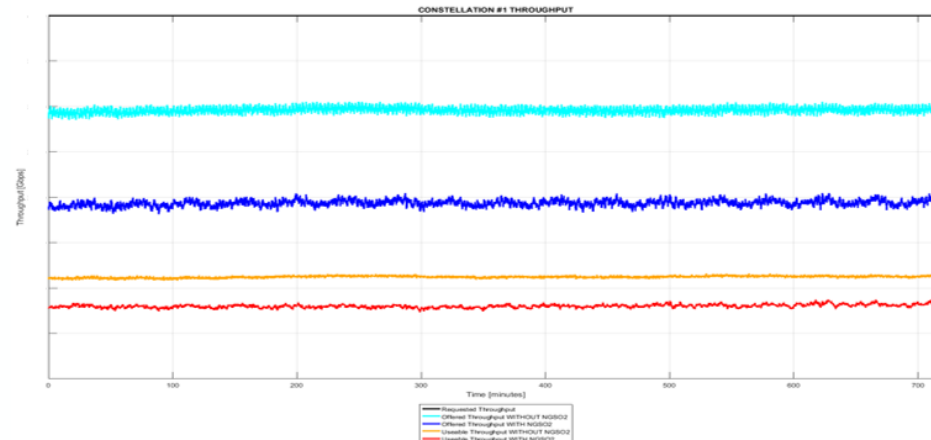
Is this creating a new type of space pollution? Yes Radio Frequency spectrum cleanliness is impacted

For mm-wave bands the main issue is related to:

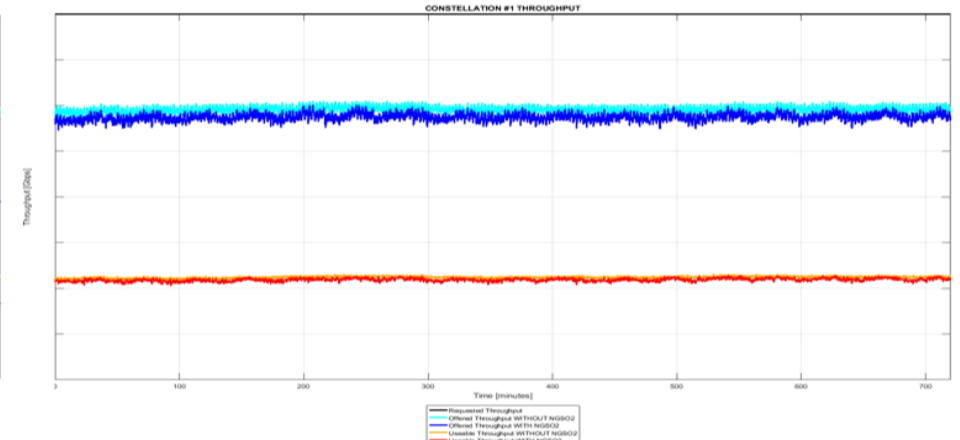
- **GSO to NGSO interference** – countermeasures are in place and enforced by ITU
- **NGSO to NGSO interference** – FCC calls to avoid in-line interference (10 degrees min sat angle separation)
 - Without operators coordination there will be a large waste of spectrum resources in mm-wave bands
 - For mobile direct access a single global constellation will block worldwide usage of the selected band



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We are proud to host the Clean Space Industry Days in ESTEC, the European Space Research and Technology Centre!