ESA Clean Space Presentation

ESA Clean Space Team
UNOOSA Austria Symposium – Panel 1
14/09/2022
Objective of the Clean Space

"Guaranteeing the future of space activities by protecting the environment"
Clean Space

- Effect on the atmosphere
- Environmental regulation
- Life cycle assessment
- Reentry
- Capture
- Rendezvous
- Discharge energy
- Deorbit
- Design for demise
- Design for servicing

management of end of life

ecodesign

+ REDUCING IMPACTS

in-orbit servicing

+ ACTIVE DEBRIS REMOVAL

THE EUROPEAN SPACE AGENCY
EcoDesign Scope

**EcoDesign**
Is necessary to understand how much space activities pollute on Earth and to identify alternatives to reduce the environmental impacts

**LCA (Life Cycle Assessment)**
Assessing the environmental impacts of the whole life cycle of the space missions

**Eco-design**
Identifying alternative processes or technologies that can be used to reduce these impacts

**Environmental regulation**
Finding alternatives to abide by legislations and avoid costly disruptions
Life Cycle Assessment – Definition

LCA is an ISO-standardised tool to quantitatively assess the potential environmental impacts of product, process or service.

✓ Multi-step analysis
The environmental impacts are assessed across all stages of existence.

✓ Multi-criteria analysis
The outcomes are expressed with several quantified environmental indicators (impact categories).
Space Mission Life Cycle

- Design
- Production
- Launch
- Use
- Disposal

- CO₂ pollution
- Water pollution
- Air pollution
- Toxicity
- Consumptions
ESA’s eco-design vision

→ GREEN TECHNOLOGIES

Environmental Footprint
- Ex: Efficient use of Ge

Environmental Regulation
- Ex: Replacement of pyrotechnic powders

→ ESA PROJECTS

- Ariane 6
- Earth Explorer 9
- Copernicus Missions
- Galileo 2nd generation
- ...

➔ GREEN TECHNOLOGIES

➔ ESA PROJECTS
Let’s stay in touch!

Recordings of previous Clean Space webinars
https://blogs.esa.int/cleanspace/clean-space-webinars/

LCA and Ecodesign training for Space
16 September @ online

Follow us and contact us!
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Back up slides
ESA Director General's Agenda 2025 reiterated that **making ESA “a greener organisation” is a priority**, to support the implementation of the Paris Agreement and the European Green Deal to the fullest extent.
Management of end of life
Current orbital environment

36,500 objects greater than 10 cm

130 million objects from 1 mm to 1 cm

1 million objects from 1 cm to 10 cm
Design for Demise

Legend

- TRL 6
- TRL 4
- TRL 3/4

DESIGN FOR DEMISE

- Early break up technologies
- Demisable joints
- Electric propulsion
- Chemical propulsion
- Demisable Tanks
- Demisable Reaction wheels
- Demisable SADM
- Demisable Magnetorquers
- Containment technologies
Zero Debris Approach

Zero Debris Approach requires **transversal action** - the 4 pillars:

1. **Evolution of ESA Policy**
   - Introduce a requirement for removal in case a spacecraft fails

2. **Upgrade platforms**
   - System level development and integration of innovative technology

3. **Removal services**
   - Demonstrate reliable services, establish standard interfaces

4. **Improving operations**
   - Expanding monitoring and operational capabilities