The E.T.PACK Initiative

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23th May, 2025

Electrodynamic Tethers (ET).

ETs are long conductors that provide an in-orbit propulsion force by interacting with the ambient plasma and magnetic field.

1. Propellantless

ETs use the space environment (ambient plasma + geomagnetic field)

2. Bidirectional

De-orbit (lower altitude) while producing power for onboard use

Re-boost (increase altitude) by using onboard power

3. Scalable

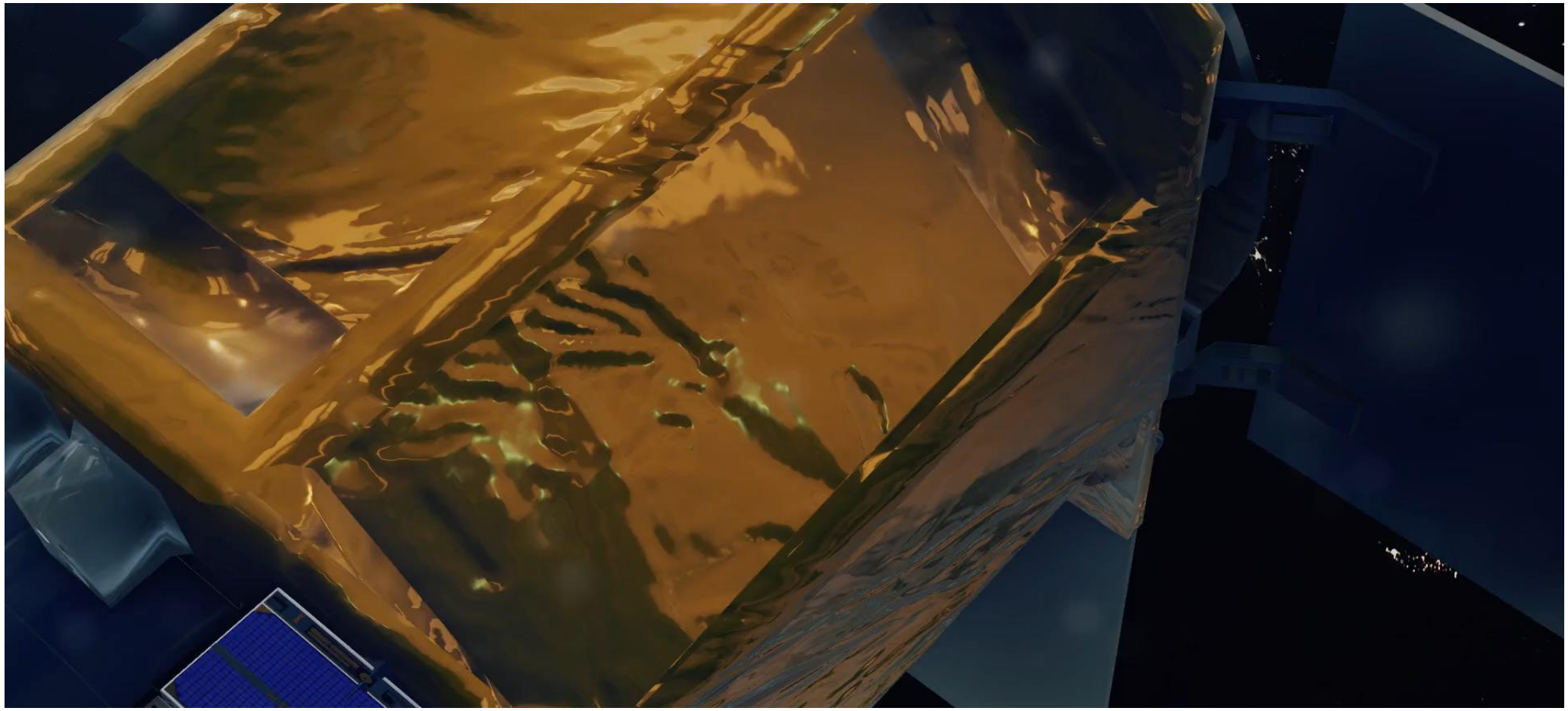
ET tape is ultra-light. Its length can simply be extended to meet any customer's needs

4. Autonomy

Compact and autonomous system can be prepared based on ET technology (value differentiation against other systems)

Source: PERSEI SPACE

ET Operation



Video prepared in the E.T.PACK Project

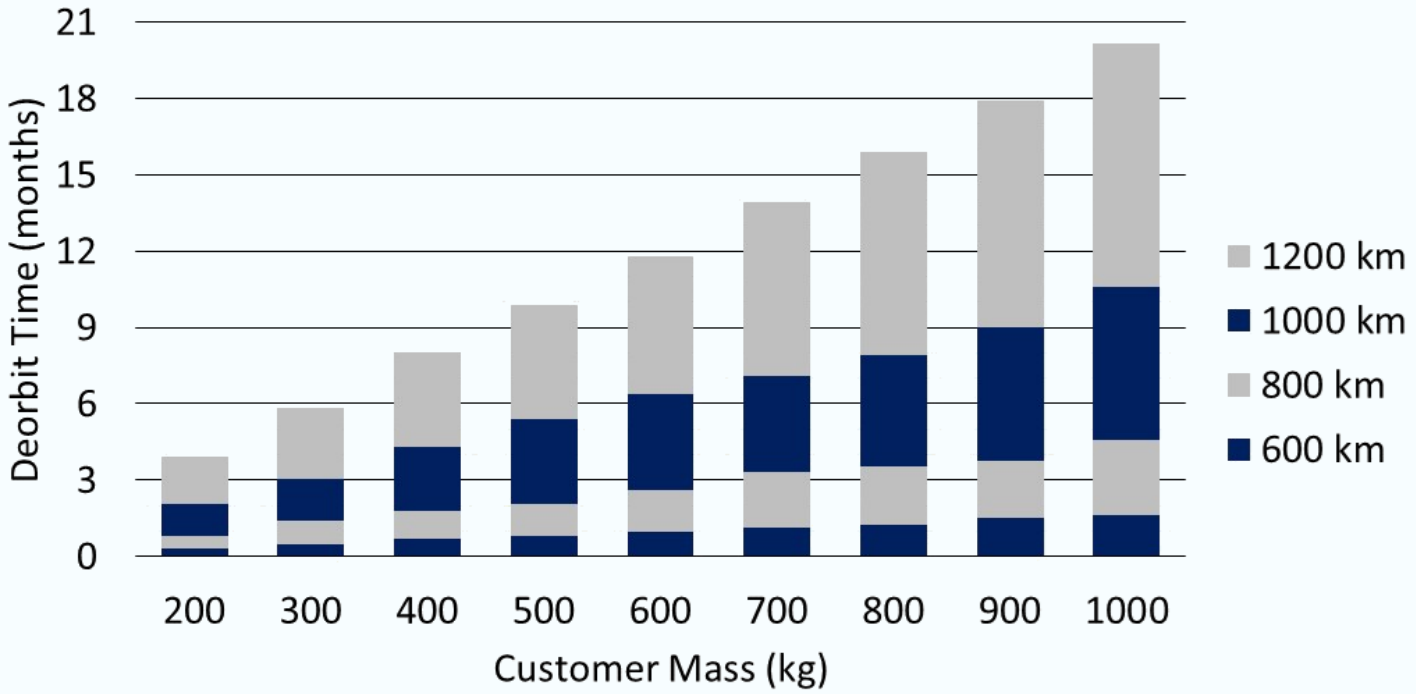
Example of deorbit device product performance

Autonomous Deorbit Device Characteristics

- Volume: 12U
- Mass: 20 kg

- ETs can deorbit hundreds of kg within a few months
- ET dimensions can be selected according to customer's needs and orbit.

Tether dimensions: 1.5 km x 2.5 cm x 40 µm. Orbit inclination 50º



Source: PERSEI SPACE

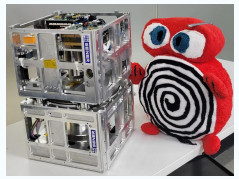
E.T.PACK Initiative's History and Roadmap

2019 European Innovation Council

E.T.PACK project:

FET-OPEN, 3 M€, 2019-2022

Goal**: Autonomous deorbit device with **TRL 4



2021 European Innovation Council

BMOM project

EIC Launchpad, 100 k€, 2021-2022

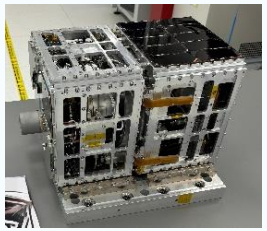
***Goal**: Market Analysis & Business Model*

2022 European Innovation Council

E.T.PACK-F project:

EIC Transition, 2.5 M€, 2022-2025).

Goal**: Autonomous deorbit device with **TRL 8



Sep. 2023

PERSEI Space

Founded by *E.T.PACK-F team members*.

2024 esa

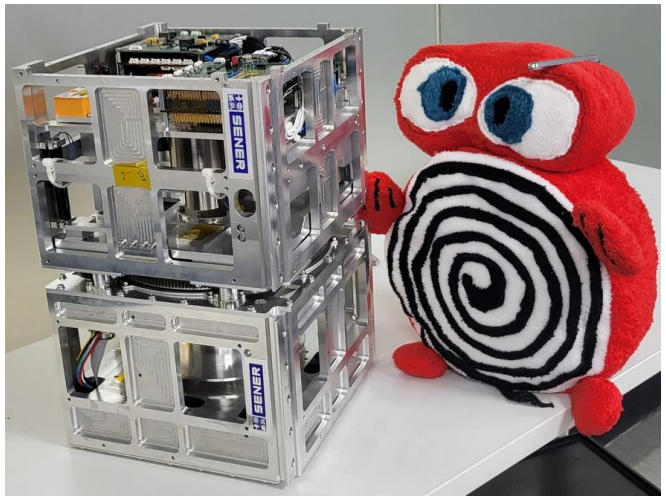
PERSEI Space incubated through the **ESA-BIC** programme

Q2 2026 European Commission esa

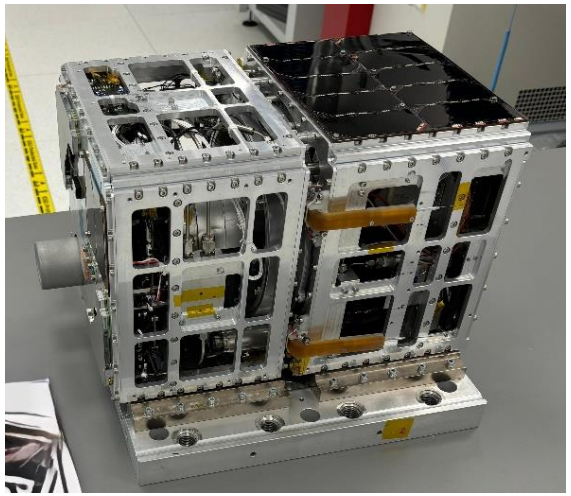
In-orbit demonstration of ***E.T.PACK-F Autonomous deorbit device*** through ESA-EC Flight Ticket Initiative

The Deorbit Device

- Stand-Alone, 12U and 20kg system with a bare ET (430 m) + Hollow Cathode
- 2 Modules: Electron Emitter Module (EEM) & the Deployment Mechanism Module (DMM).
- Detumbling + attitude control capability.
- TM & TC capabilities at both modules & Collission avoidance capability.



Prototype (E.T.PACK, 2022)



Engineering Qualification Model (E.T.PACK-F, 2025)

The results of the EQM Qualification Campaign

- ✓ Proof Pressure Test
- ✓ Leakage Test
- ✓ Tank Design Burst Pressure Test
- ✓ Functional Coupling Test

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- ✓ Proof Pressure Test
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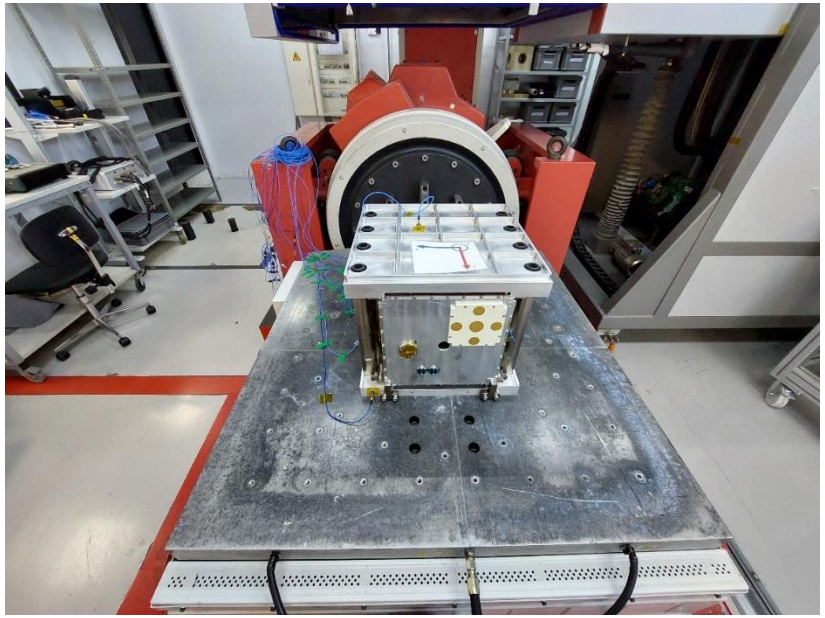
- Vibration Test



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- ✓ Proof Pressure Test
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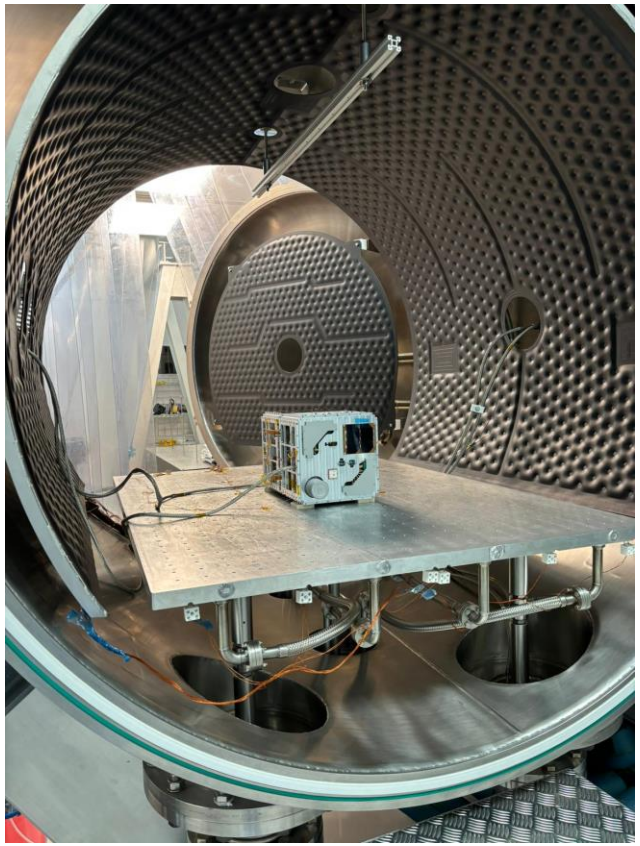
- ✓ Shock Test
- ✓ Themal-Vacuum Cycling



The results of the EQM Qualification Campaign

- ✓ Proof Pressure Test
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- ✓ Functional Coupling Test
- ✓ Tether Partial Deployment Test
- Vibration Test
- ✓ Shock Test
- ✓ Themal-Vacuum Cycling
- ✓ EMC Test
- ✓ Magnetic Dipole Test

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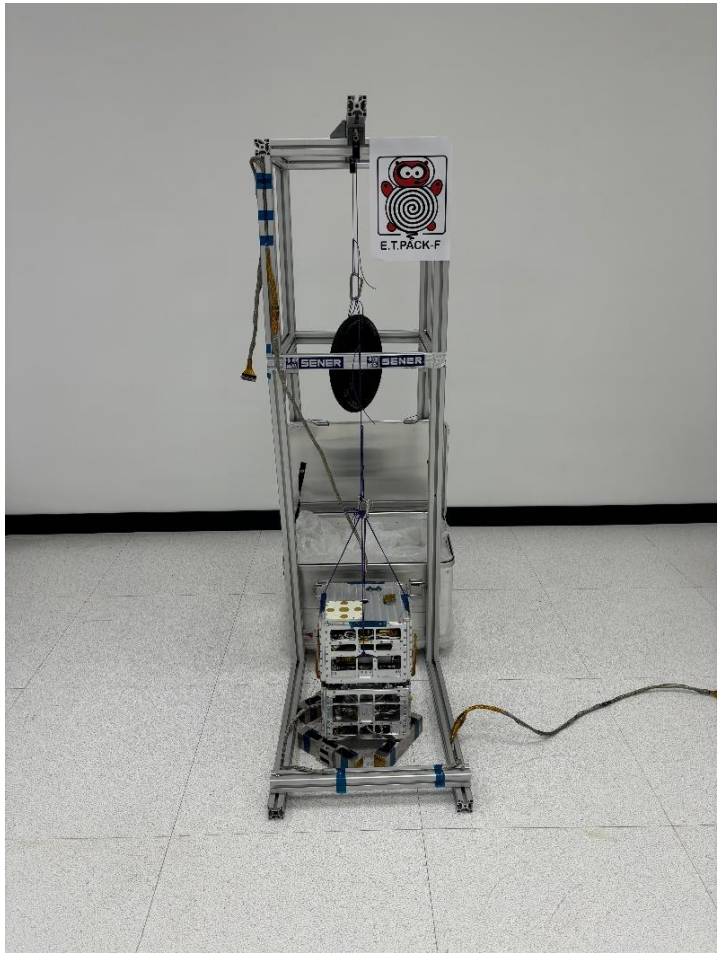
- HDRM Test



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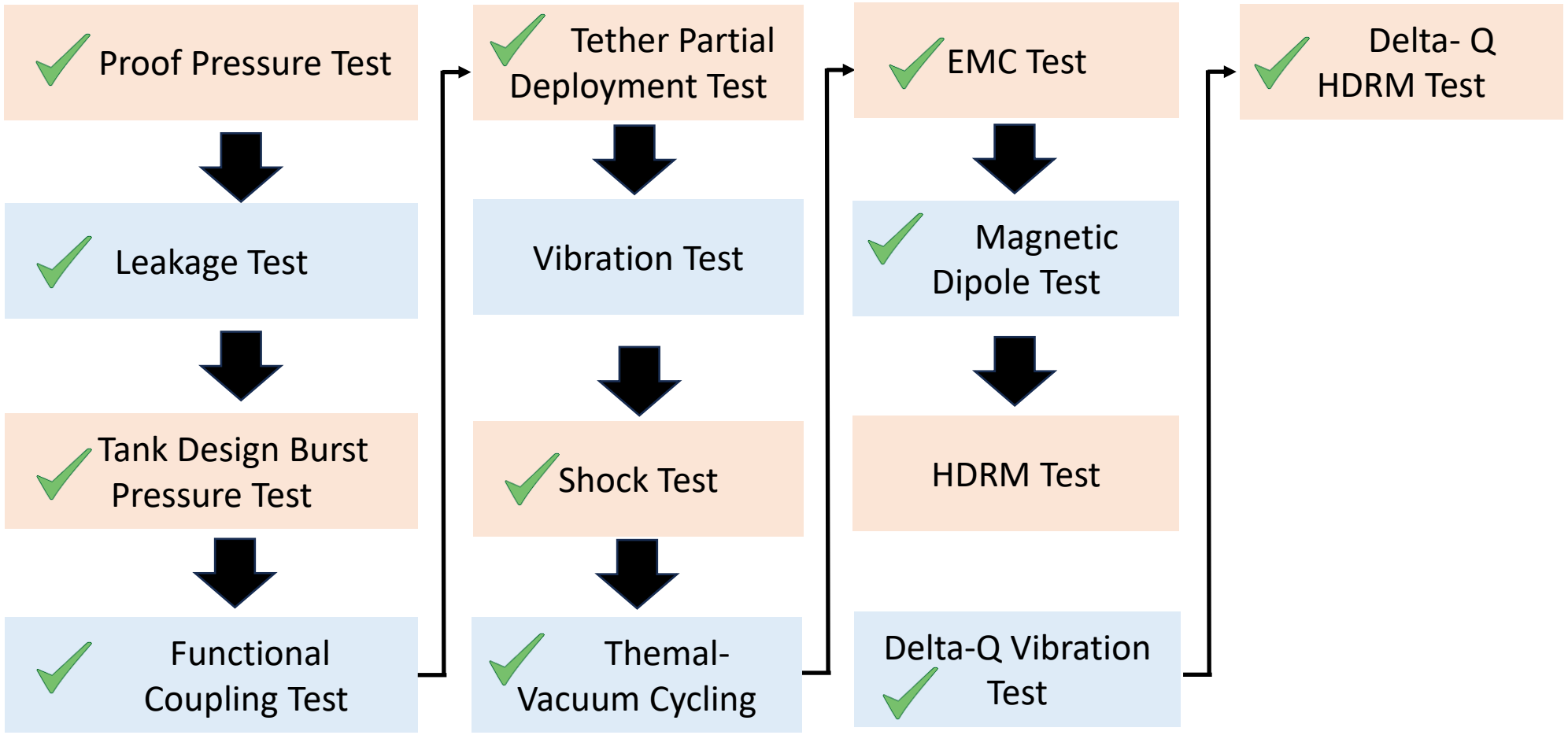

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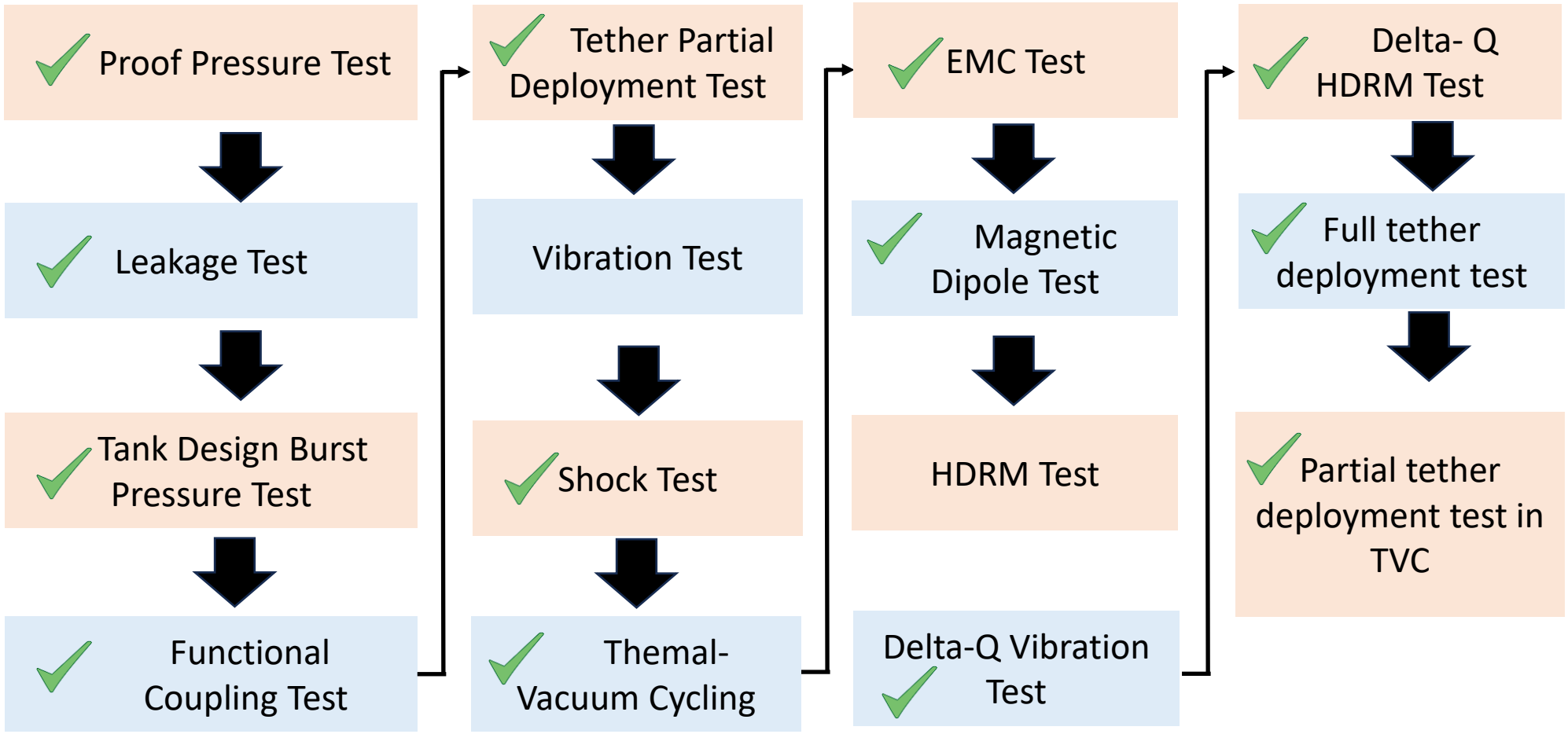

IOD led by PERSEI Space

- **Goal**: in-orbit demontration of E.T.PACK-F deorbit device led by PERSEI Space
- **Expected Date**: Q2 2026.
- **Characteristics**: 12 U, 20 kg, current level about 0.3 Amp, TM&TC.
- **Tether**: 430m long (410 m bare + 20 m inert) with a tape-like cross-section (2.5 cm x 40 microns).
- **Duration**: about 3 months.
- **Orbit**: circular orbit with 550 km of altitude and 49º of inclination.
- **Phases**: LEOP + Commissioning + Tether Deployment Preparation Phase + Tether Deployment + Nominal Operation

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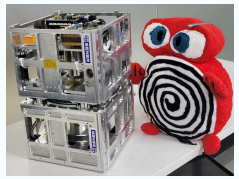

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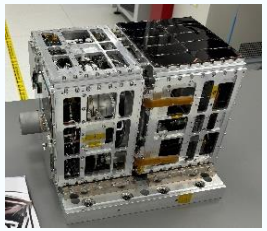
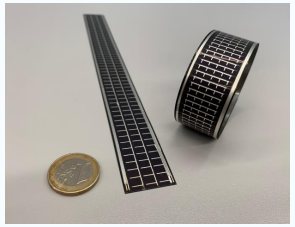


2022 esa

Pro-BPT project:

ESA Early Tech. Dev., 175 k€, 2022-2023).

Goal**: **demonstrate the feasibility of the bare-photovoltaic tether concept



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2024 European Innovation Council

E.T.COMPACT Project

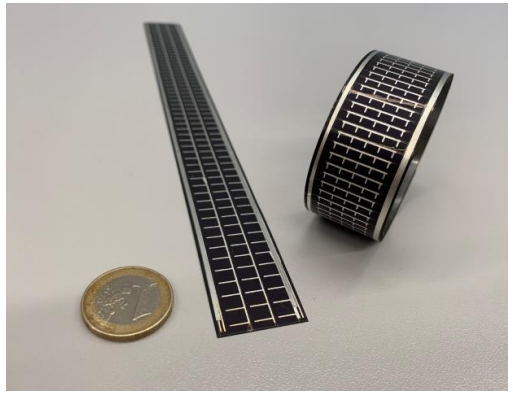
(4 M€, 2024-2027).

Goal**: **prepare an ultra compact ET system with TRL4

Bare-Photovoltaic Tether (BPT)

ESA ProBPT Project
(2022-2023, 175k€)

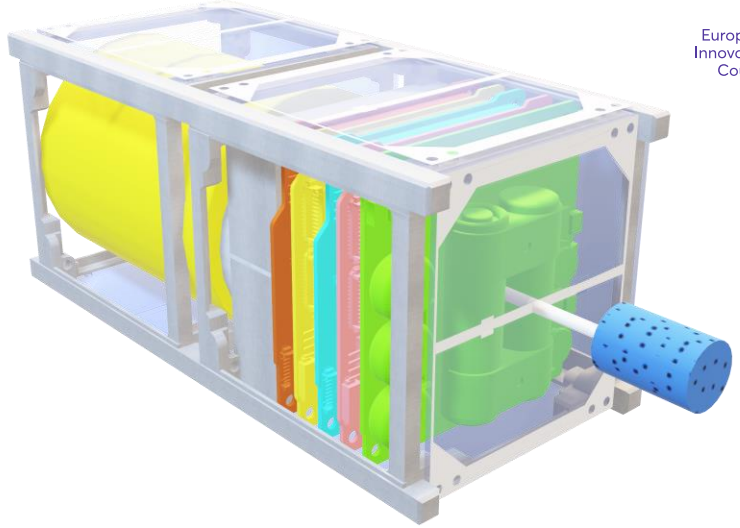
Demonstrate the feasibility of BPT (BPT samples prepared & characterized + simulation & analysis work.



esa

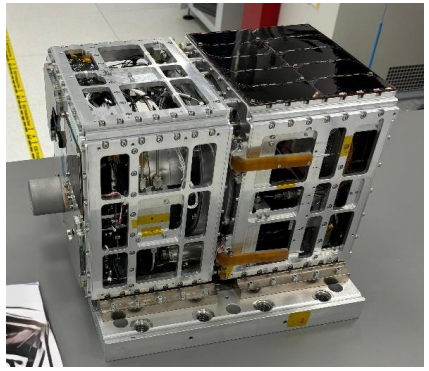
EIC Transition E.T.COMPACT Project
(2024-2027, 4M€)

Prepare a miniaturized device with capability for propellant-less propulsion and power generation based on BPT technology.



European Innovation Council

Team & Partners



Technology

The legacy of the EIC projects on Electrodynamic Tethers

Next steps:

- **Stabilize tether development in Europe**

¿ESA Program on propellant-less propulsion ?

- **Develop tether products**

Please contact us and give requirements

Go to Market vehicle and strategy

Thank you

www.etpack.eu

Contact: gonzalo.sanchez@uc3m.es

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E.T.PACK-F is an EIC Transition Project (101058166) funded by the European Innovation Council