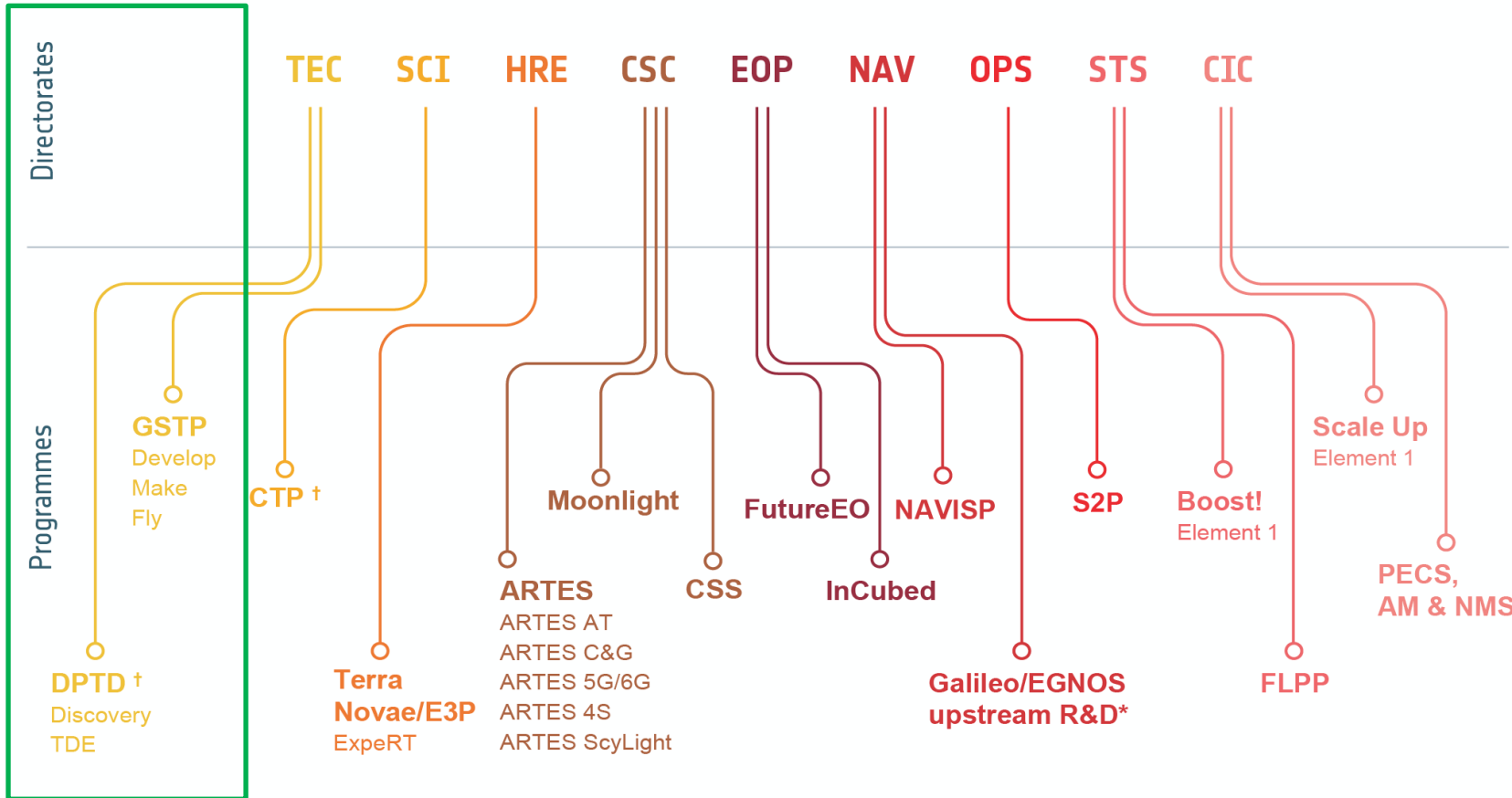




Discovery, Preparation, TDE & GSTP

Technology Programmes Office | TEC-RT

ESA Directorates & Technology Programmes



TEC Technology, Engineering and Quality

SCI Science

HRE Human and Robotic Exploration

CSC Connectivity and Secure Communications

EOP Earth Observation Programmes

NAV Navigation

OPS Operations

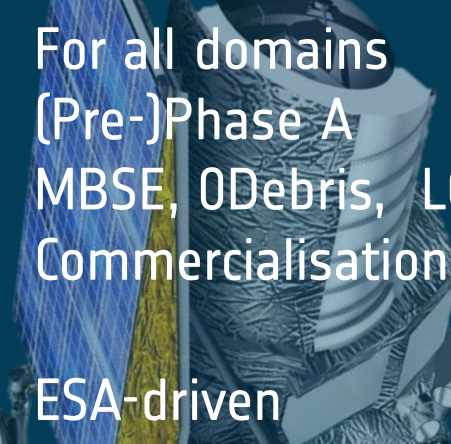
STS Space Transportation

CIC Commercialisation, Industry and Competitiveness.

**Discovery, Preparation, Technology Dev & GSTP @CM25 **



Future Missions

- 
- Solid baselines
 - For all domains
 - (Pre-)Phase A
 - MBSE, ODebris, LCA
 - Commercialisation
 - ESA-driven
 - Open competitive

Preparation

- Low TRL
- All ESA applications
- Enabling missions
- 2yr work plans
- ESA driven
- Open competition

- 
- Higher TRL
 - Support Competitiveness
 - Enabling missions
 - WP and industry-driven proposals
 - SME focus
 - Delegation support
 - 3 Elements & components

GSTP

- Taking risks
- Low budget
- Fast and Open
- Novelty driven
- Commercialisation
- Research, studies and tech.dev.
- Outside driven (OSIP)
- Open competitive

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- Support Competitiveness
- Enabling missions
- Work plans and industry-driven proposals
- SME focus
- Delegation support
- 3 Elements

GSTP

Discovery Element



ESA's framework to **discover** and **explore** the disruptive **innovation** of tomorrow

- Via the **Open Space Innovation Platform (OSIP)**
- **External driven**: Reaching out for ideas from anybody
- **Lowest entrance barrier** to ESA
- **Fast, simple and transparent**
- Research, studies and early technology development



→ DISCOVERING TOMORROW'S INNOVATION

esa.int/discovery

ideas.esa.int

activities.esa.int

ESA UNCLASSIFIED – For ESA Official Use Only

Discovery year in numbers:

~160
activities

100%
Industry/Academia
driven
Open Competition

~18m€
contracts

~80%
SME's, R&D inst.
and academia



→ THE EUROPEAN SPACE AGENCY

Discovery Element – Implementation Schemes

Co-sponsored Research

50% co-funded up to 90k

PhDs, PostDocs

Study

100k

Feasibility studies, paper studies

Early Technology Development

175k

Hardware-in-the-loop, PoCs

Co-sponsored Research: Starweave: Sensing-enabled flame-resistant smart textiles for the next generation of space garments



Application area: Exploration

Prime Contractor: AGH University of Krakow

Country: Poland

"ESA's funding has given me the freedom to explore ideas that wouldn't be possible with standard university funding. As a young researcher, it's an exciting opportunity to lead a project I care deeply about and push the boundaries of smart textiles for space." - Prof. Piotr Szewczyk, AGH University of Krakow

1 January 2025

1 January 2028

Study: Enhancing CubeSat Communication: A Study on Beam Steering Antenna Systems



Application area: Telecom

Prime Contractor: Silicon Austria Labs GmbH

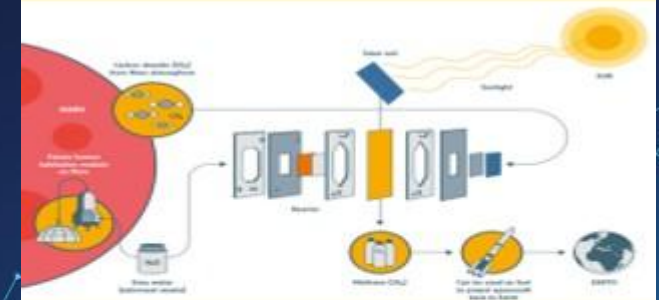
Country: Austria

"The support from ESA Discovery through OSIP has given us the resources to test bold ideas and move our research forward faster, opening doors to collaborate with experts and push our technology closer to real-world use." – Saeid Karamzadeh, Silicon Austria Labs GmbH

8 July 2024

8 March 2025

Early Technology Development: Photoelectrochemical system for CO2 reduction to produce fuels and sewage



Application area: Generic for multiple applications

Prime Contractor: Tekniker

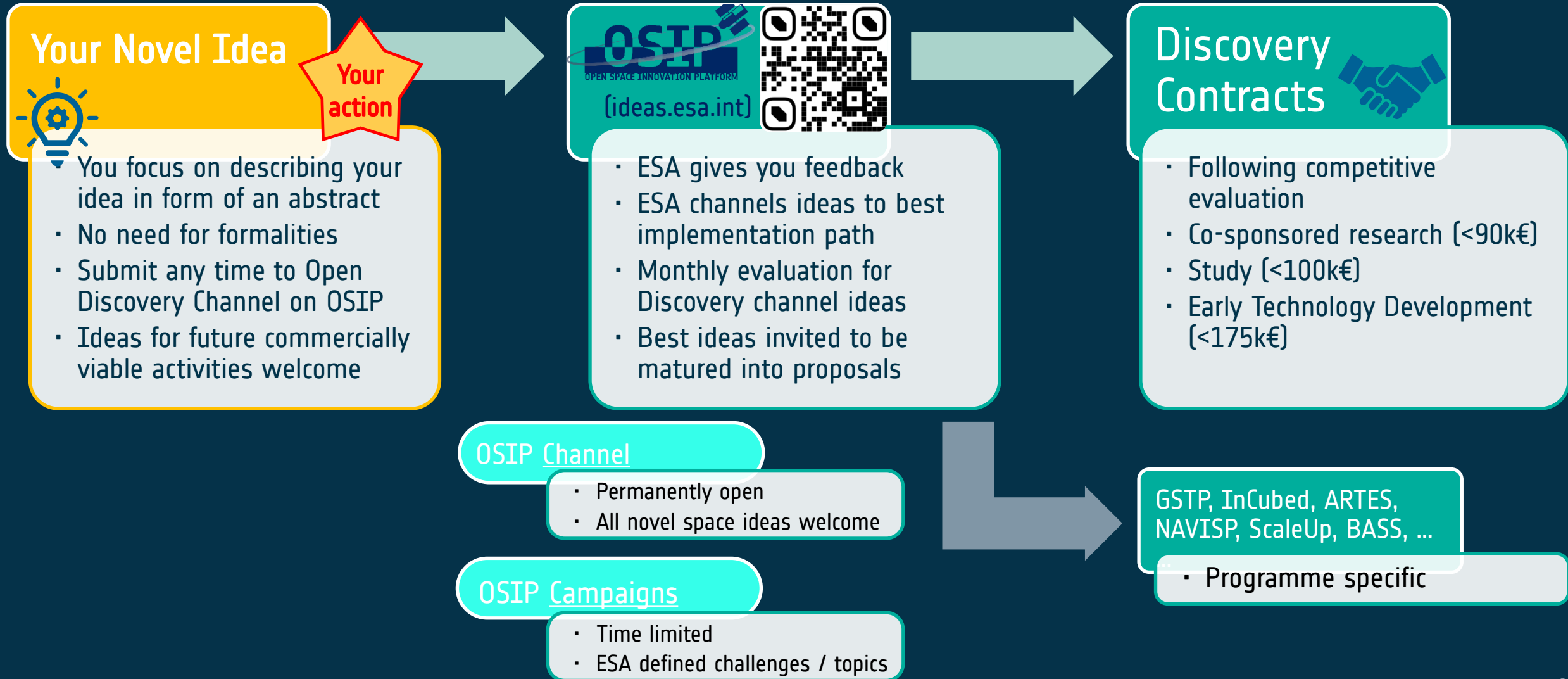
Country: Spain

"This activity represents a significant leap forward in space exploration and sustainable carbon dioxide conversion technologies." – Elena Garcia, Tekniker's lead for the project

19 March 2023

19 September 2024

First steps for novel ideas – Discovery Element Process Steps



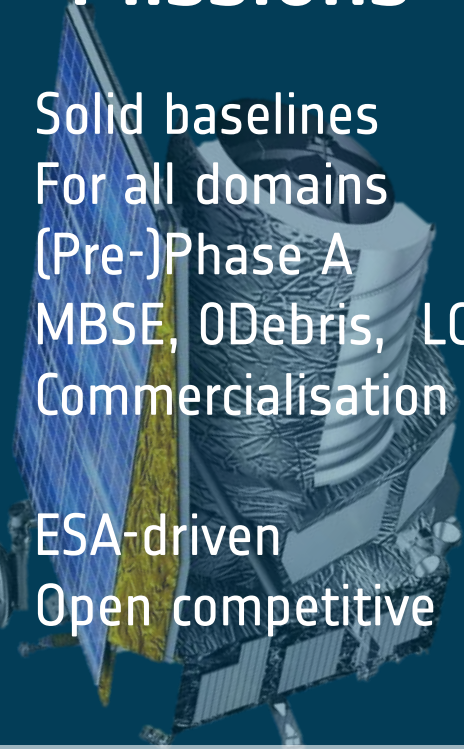
Research And Development

Disruptive Ideas

- Taking risks
- Low budget
- Fast and Open
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- Outside driven (OSIP)
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Discovery

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Preparation

Technology Raising

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- All ESA applications
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TDE

- Higher TRL
- Support Competitiveness
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- 3 Elements

GSTP

Preparation Element

ESA's framework for **preparing** and **enabling** **future missions** and **programmes**

- **Open competitive, parallel system studies** to establish robust trade-offs without geo-return constraints
- Across **all ESA activity domains**

Mission Def.

- ESA directorates
- CDF Studies



- Preparation Workplan
- ITT on esa-star



Pre-Phase A/Phase A activities

Preparation Contract

- Competitive; all ESA MS
- Parallel contracts

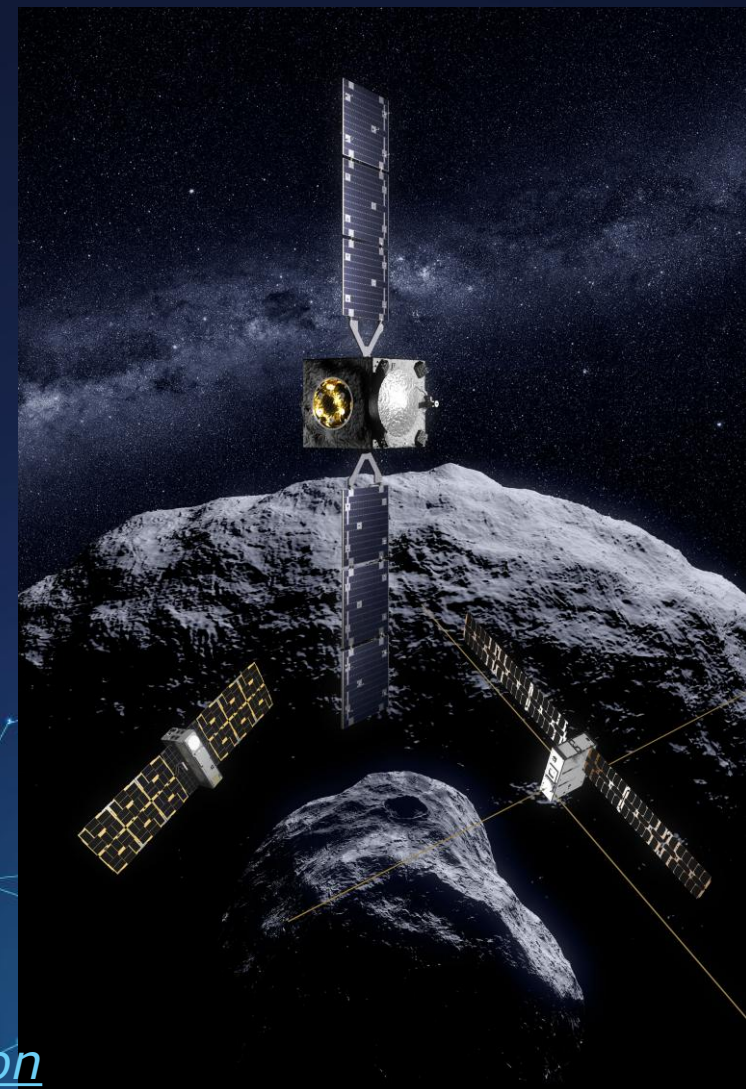
Industry proposed systems

- OSIP (e.g. SysNova)



Commercialisation work package

<https://esa.int/preparation>



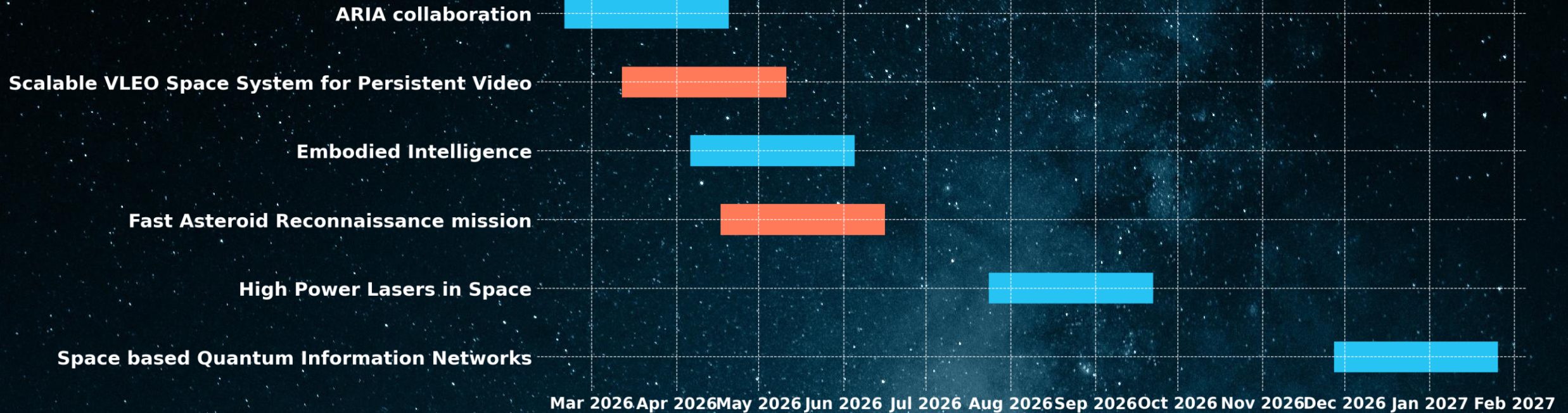
Upcoming Campaigns on OSIP

Novel Platforms and Technologies for Stratospheric and Mesospheric Observation

Submission ends on Mar 27

CAMPAIGN

Discovery Preparation



Please note this planning is indicative

Research And Development

Disruptive Ideas

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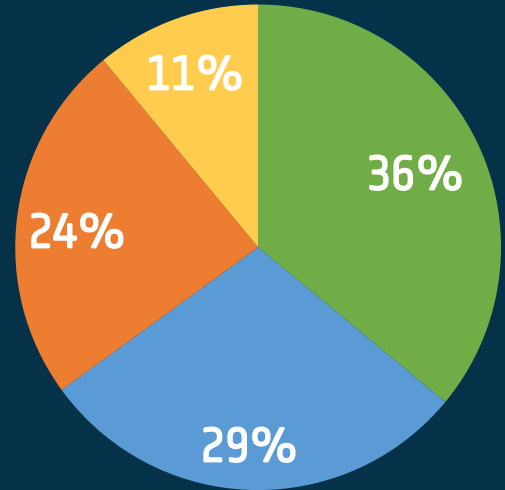
TDE

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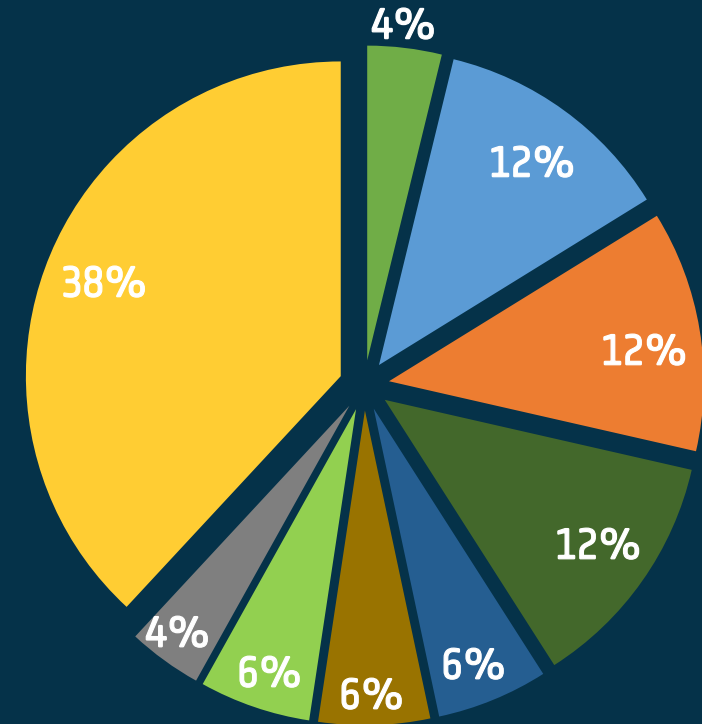
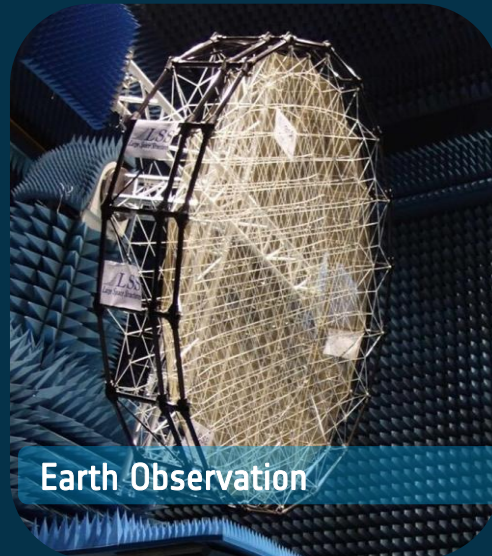
GSTP

Technology Development Element

- Part of ESA's **Mandatory Basic Activities**, **All ESA Member States** contribute
- Covers **all applications and technology domains**
- First step for the implementation of **ESA Technology Strategy**
- Relies on European Space Technology Harmonisation Roadmaps
- Based on **2-year work plans**, with yearly updates, TRL 1 - 4
- **94%** of all activities in **open competition**, 50% of the contracts are awarded to SME or R&D Institutes

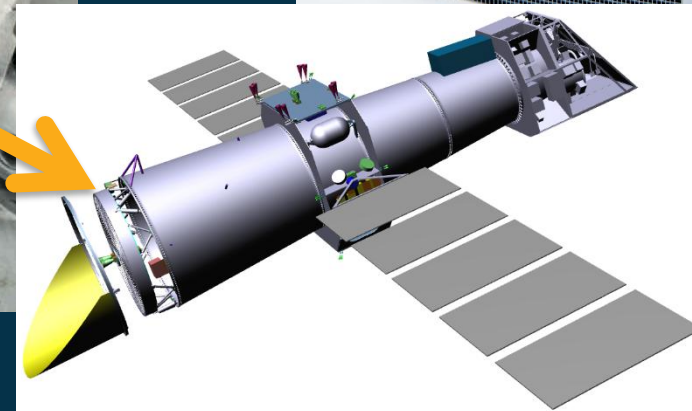
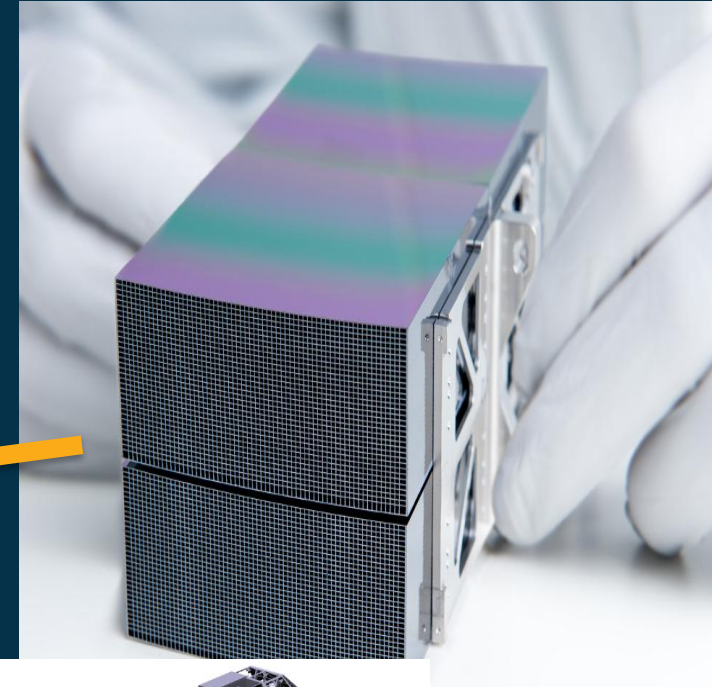
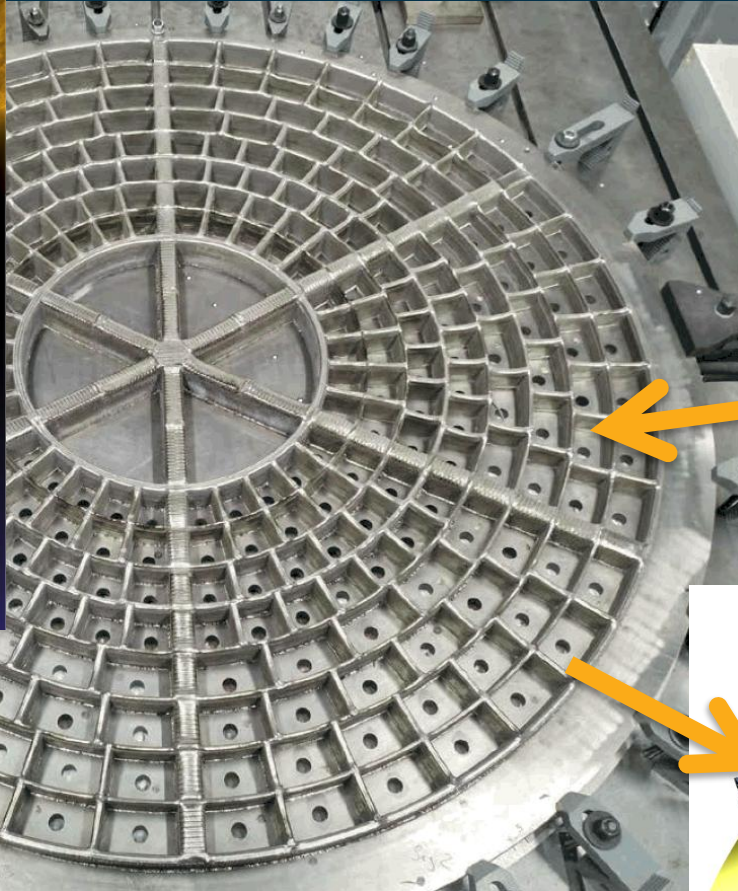
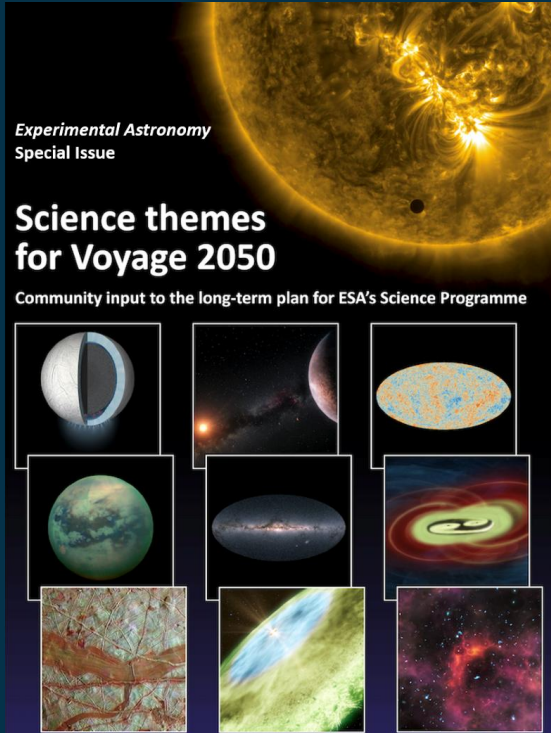


■ MidCaps
■ Univ. & Res. Inst.
■ SME
■ LSI



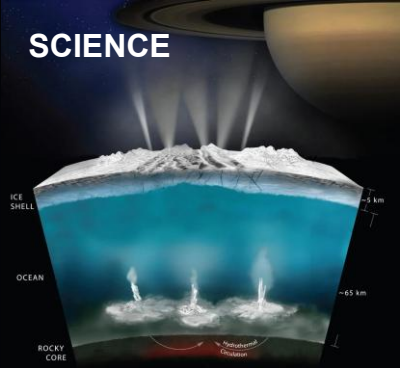
■ Excellence Centres, 4%
■ Earth Observation, 12%
■ Science, 12%
■ Exploration, 12%
■ Space Transportation, 6%
■ Telecommunication, 6%
■ Navigation, 6%
■ Space Safety and Security, 4%
■ Generic Technologies & Techniques, 38%

TDE: From NEEDS to MISSIONS



TDE WP 26-27 - Needs

SCIENCE



- Primary Battery Systems
- Autonomous Landing
- Very Large Solar Arrays
- Electrical Propulsion (S/C Main engine)
- General Energy Reduction
- ...

EXPLORATION



- Propulsive transfer
- Power communications and navigation
- Precise heavy landing
- Night survival on Moon
- Initiation of Nuclear capabilities' value chain
- ...

TELECOMMUNICATION



- Wavelength Agnostic RF Technology
- Digital and Secure Processing, Cloud & AI
- Optical and Quantum Technology
- Smart Antennas
- Disruptive Satellite Platforms
- Industrialisation Technology
- ...

SPACE TRANSPORTATION



- Fully reusable heavy-lift launchers
- Fuel depot
- In-space transport tugs
- In-space servicing
- Thermal protection for re-entry
- ...

GENERIC



- Critical Technology for autonomy
- Sustainable Space
- Mid-size LEO Satellites Indus. & Compet.
- Vision 2040

EARTH OBSERVATION



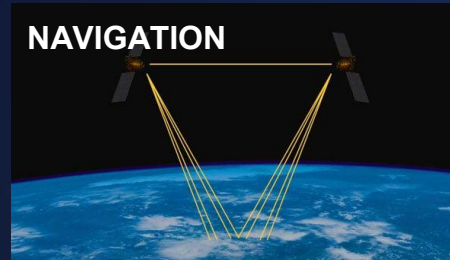
- Lidar Technologies
- Microwave instruments (W and G-band)
- Quantum sensing (e.g Quantum magnetometers)
- IR detectors, large scale antenna reflectors, digital beamforming
- ...

SPACE SAFETY



- Reentry Impact
- CIS Lunar monitoring system
- Compact medium energy particle sensor
- Satellite resilience to collision
- ...

NAVIGATION



- Absolute and relative positioning in deep space
- Robotics navigation, Proximity operation and Rendez-vous,
- Formation Flying
- Propagation models for new bands (UHF, C, Ku/Ka)
- Optical Sensor / detectors for PNT
- Chip-scale and quantum-based sensor
- ...

TDE Workplan 2026 - 2027

→ Objectives:

- In line with [ESA Strategy 2040](#)
- 5 goals:
 - Protect our Planet and Climate
 - Explore and Discover
 - Strengthen European Autonomy and Resilience
 - Boost Growth and Competitiveness
 - Inspire Europe

→ ~200 activities for ~ 120M€

→ All ESA's Application Domains

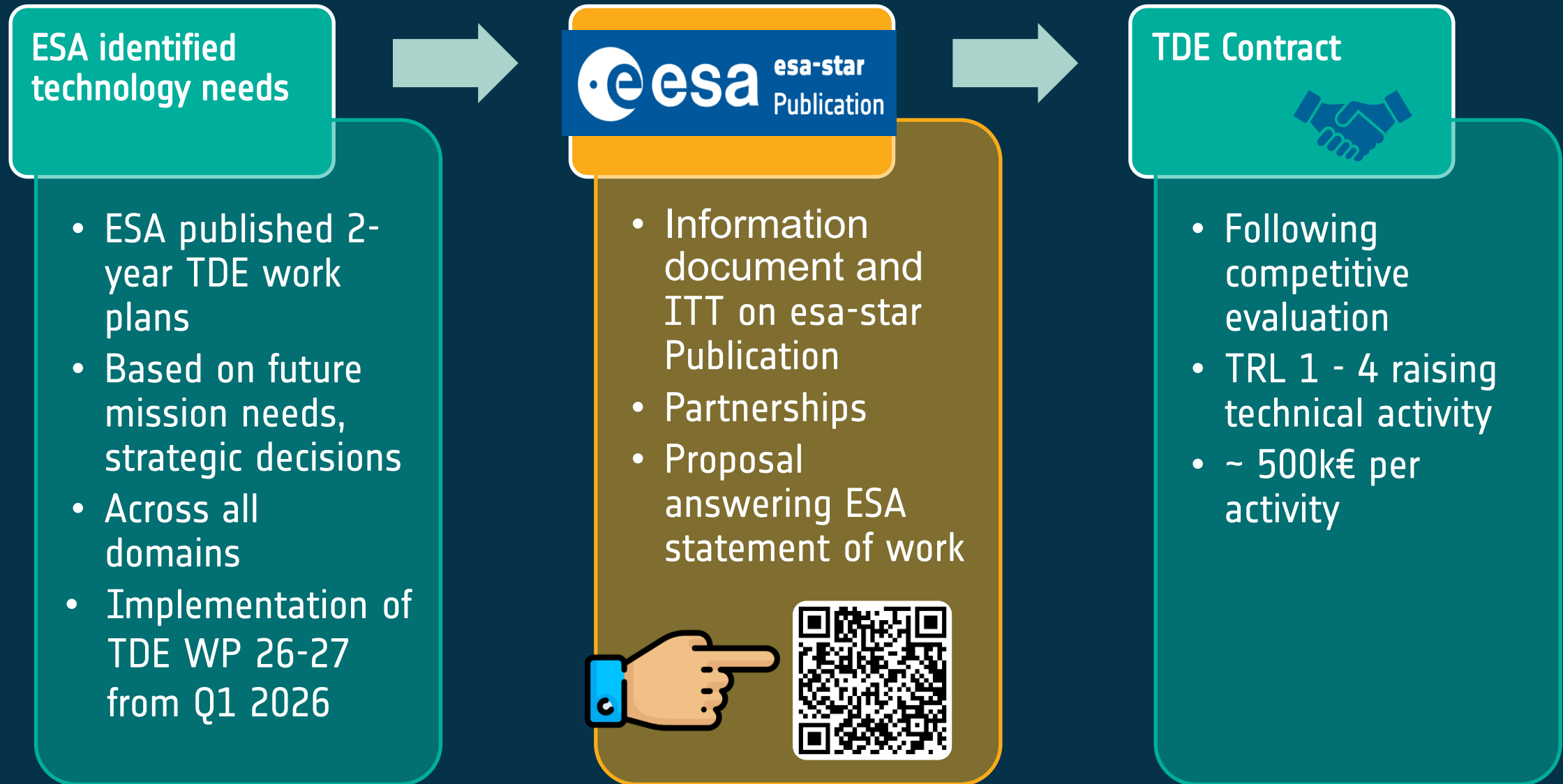
→ Generic Technologies:

- ESA Technology Vision 2040
- Critical Technologies for European autonomy
- Sustainable Space
- Mid-size LEO Satellites Industrialisation & Competitiveness

**esastar-
publication
Nr:1184**



TDE - Raising Low Technology Maturity



Research And Development

Disruptive Ideas

- Taking risks
- Low budget
- Fast and Open
- Novelty driven
- Commercialisation
- Research, studies and tech.dev.
- Outside driven (OSIP)
- Open competitive

Discovery

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Preparation

Technology Raising

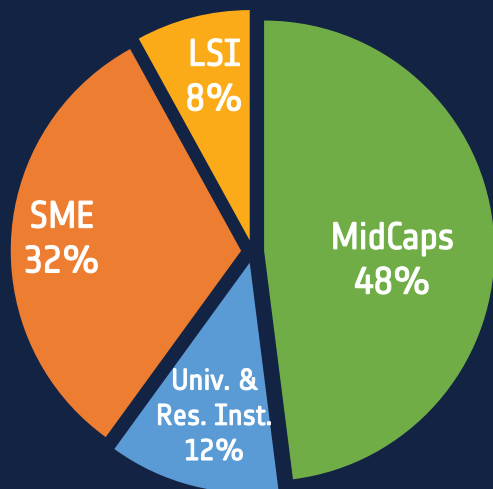
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TDE

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- SME focus
- Delegation support
- 3 Elements

GSTP

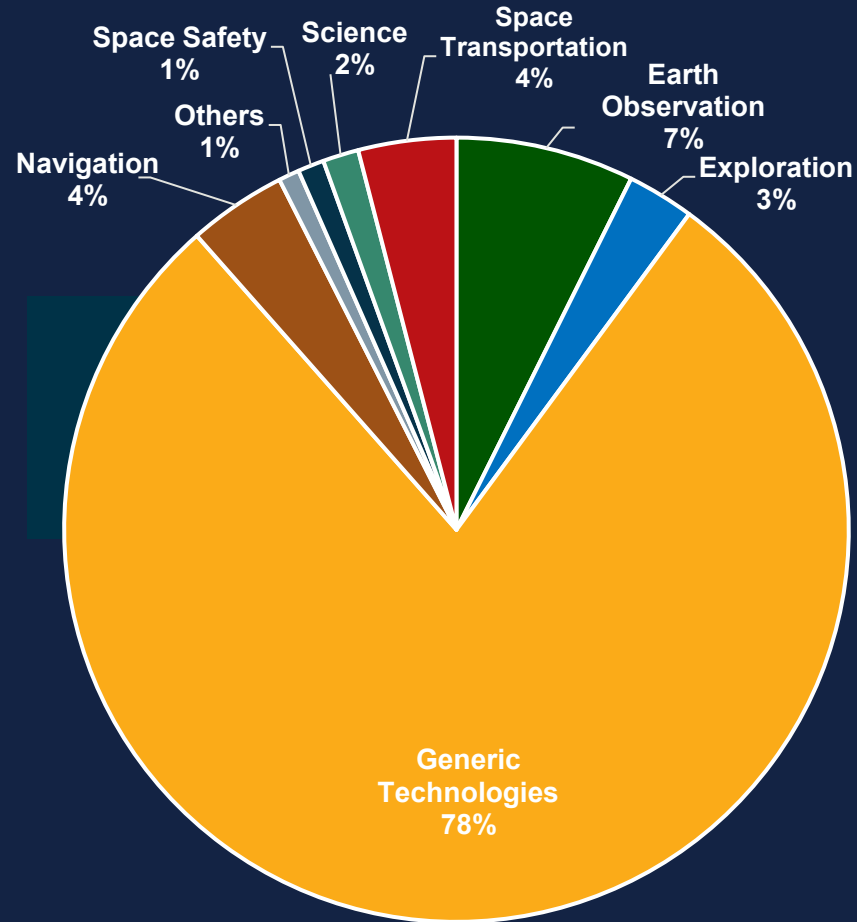
Overall GSTP actors



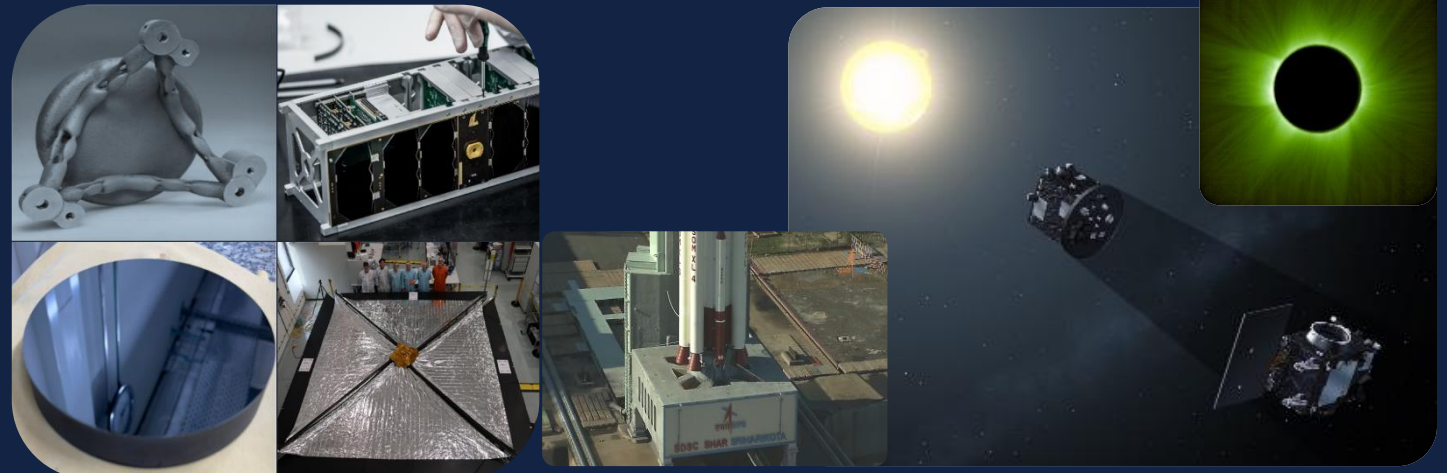
GSTP's mission

- For more **than 30 years**, the GSTP has been developing leading-edge space technologies to
 - **enable future missions**
 - **support the competitiveness of European industry**
- GSTP allows companies of all sizes as well as research and academic organisations to perform technology developments and demonstrations
 - **building capacities,**
 - **fostering innovation and**
 - **creating and improving products and services**
- GSTP is an optional ESA programme with the participation of all ESA Member, Associate and Co-operating States: **28 Participating States**

GSTP: 2025 at a glance



- Around 600 running activities
- 130 activities completed
- 180 technology development and demonstration activities initiated, representing over 230 M€ in contracts
- Launch of Genasat-OT and Iperlite



GSTP Structure



GSTP

From proof of
concept to orbit

TRL 3

TRL 8

Elements

GSTP Element 1 – Develop
Technology for missions

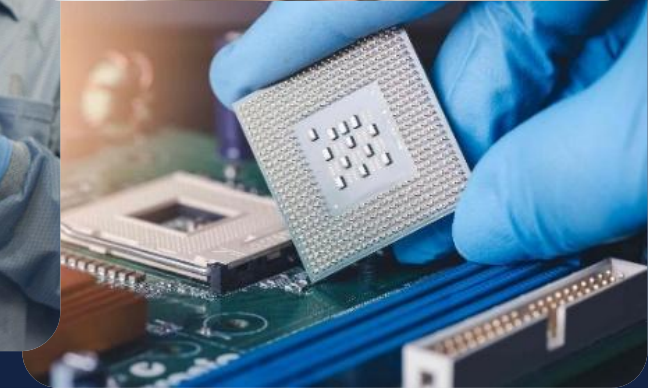
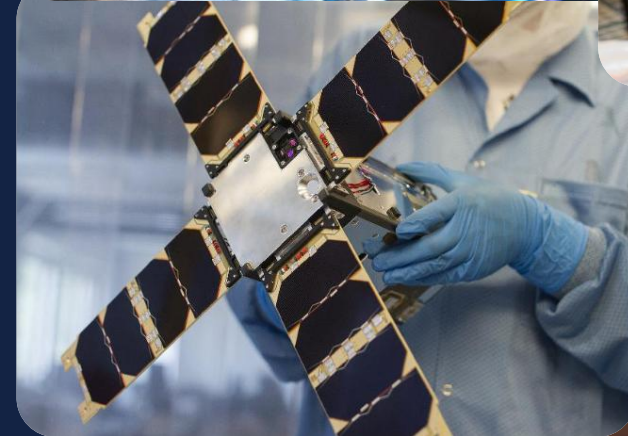
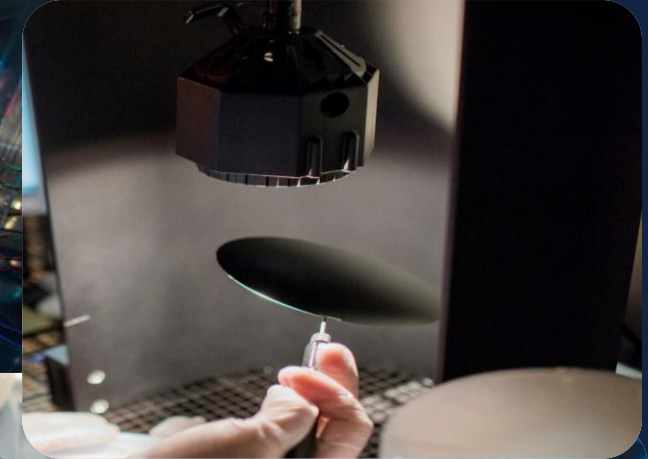
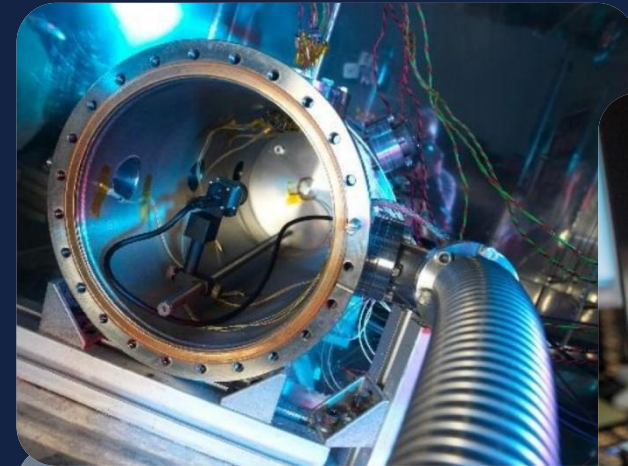
GSTP Element 2 – Make
Technology for competitiveness

GSTP Element 3 – Fly
In-orbit demonstration

Components - Technology for resilience & European non-dependence

GSTP EEE

GSTP Resilience & Security



GSTP Element 1



GSTP

From proof of
concept to orbit

TRL 3

TRL 8

Elements

GSTP Element 1 – Develop
Technology for missions

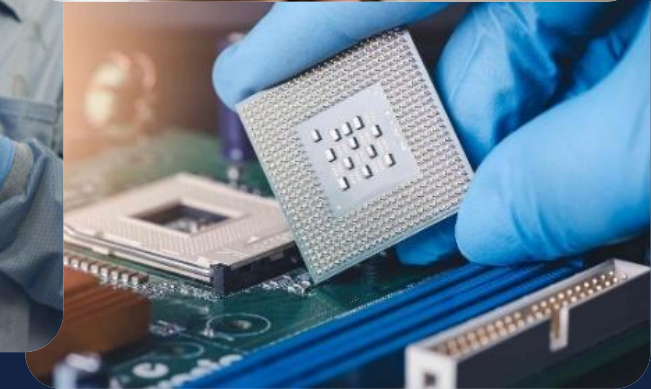
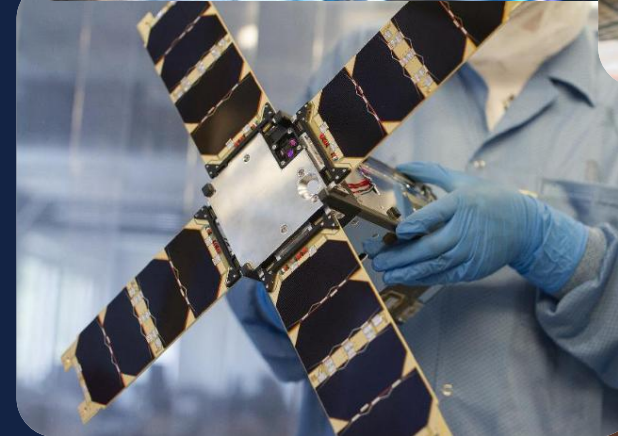
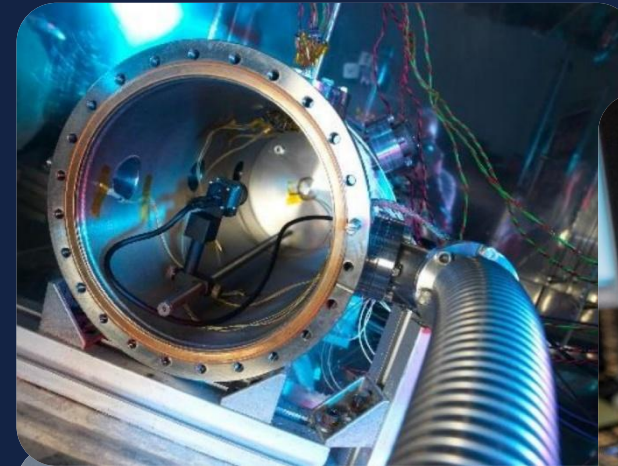
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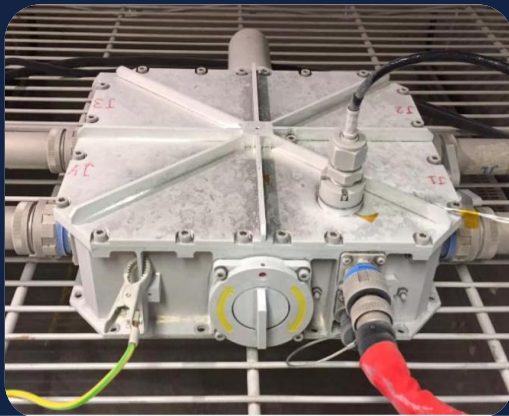
GSTP EEE

GSTP Resilience & Security



GSTP Element 1 - Workplan

- Maturing technology from proof of concept to qualification
- ESA driven Technologies for space and ground segment payload, platform, ground equipment, engineering tools.
- 100% funded but co-funding possible for DN activities.
- Letter of support from delegation required
- Invitation to tender (ITTs) published in esastar.
- Activities drawn from the **Compendia** [Open Competition (C)] or **continuation** of previous activities [Direct Negotiation (DN)]



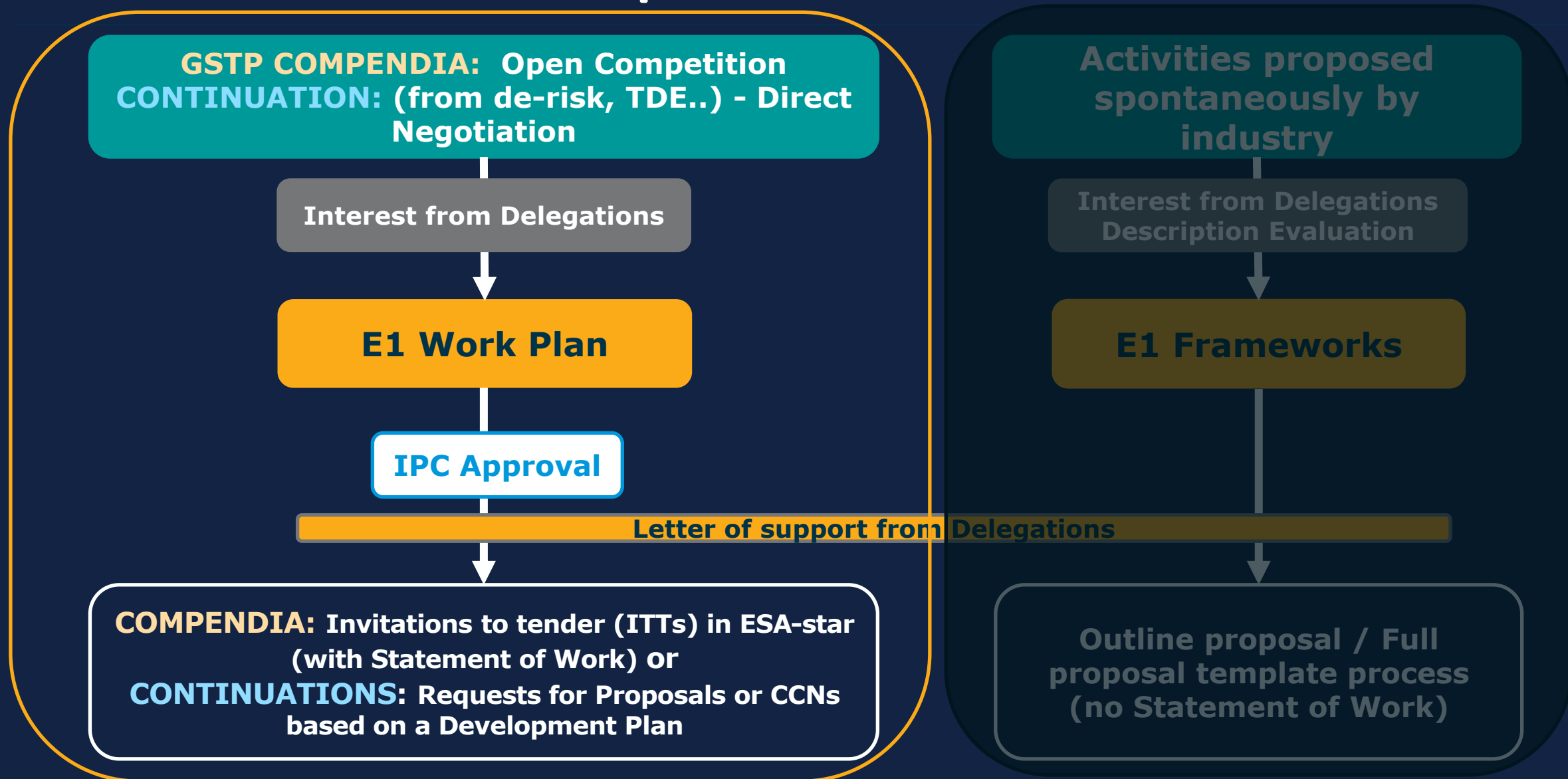
GSTP E1 Compendia 2026-2028 Published on esa-star!



- Generic Technologies
- Artificial Intelligence.
- Quantum Technologies
- Innovative propulsion
- Sustainable Space
- Cybersecurity
- Serialisation
- VLEO

**202 Activities
280M€**

GSTP Element 1: Workplan





- Max budget: 250k€
- Max duration: 9 months

- No budget limit
- No duration limit
- ~ 35% de-risk are continued

- > 200 de-risk so far
- ~ 35m€ overall budget

A banner image for the OSIP Channel GSTP BB. The background is a dark blue gradient. In the center, there is a large, stylized structure made of white and grey blocks, resembling a building or a space station. The structure has a central vertical column and several horizontal arms. The word "CHANNEL" is written in white capital letters at the top of the central column. Below the structure, there is a blue rectangular button with the text "Submit Your Idea" in white. At the bottom of the image, there is a white banner with the text "OSIP Channel GSTP BB" in blue, underlined font.



- Max budget: €1 M
- Max duration: 24 months

- 100 activities so far
- ~ €43 M overall budget



GSTP Element 1: Frameworks

GSTP COMPENDIA: Open Competition
CONTINUATION: (from de-risk, TDE..) - Direct Negotiation

Interest from Delegations

E1 Work Plan

IPC Approval

Letter of support from Delegations

COMPENDIA: Invitations to tender (ITTs) in ESA-star
(with Statement of Work) or
CONTINUATIONS: Requests for Proposals or CCNs
based on a Development Plan

**Activities proposed
spontaneously by
industry**

Interest from Delegations
Description Evaluation

E1 Frameworks

**Outline proposal / Full
proposal template process
(no Statement of Work)**

GSTP Element 2



GSTP

From proof of
concept to orbit

TRL 3

TRL 8

Elements

GSTP Element 1 – Develop
Technology for missions

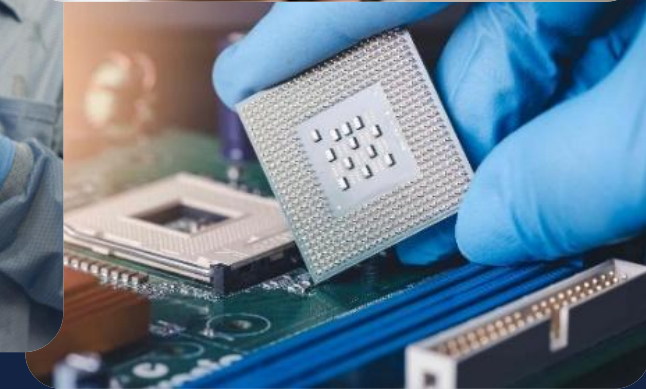
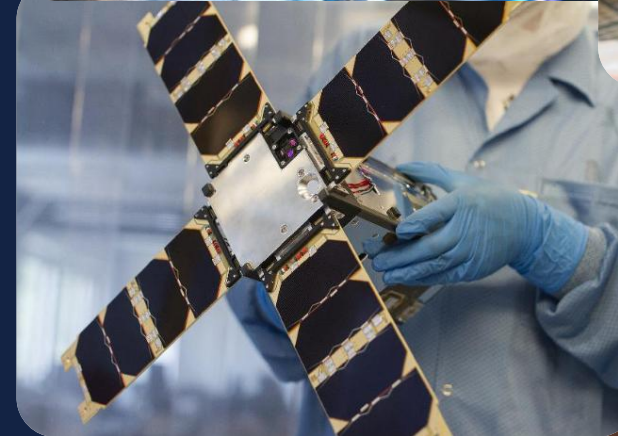
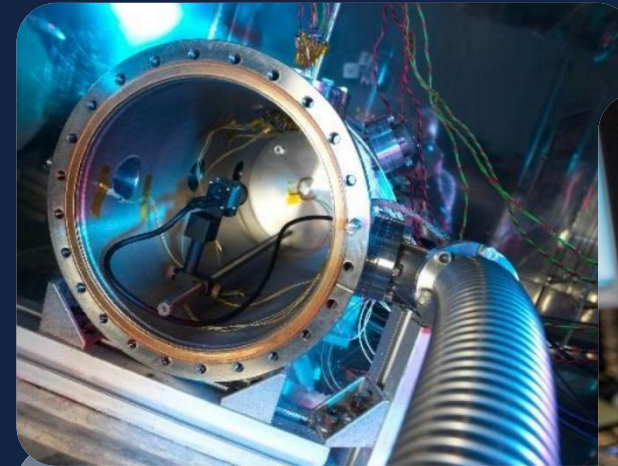
GSTP Element 2 – Make
Technology for competitiveness

GSTP Element 3 – Fly
In-orbit demonstration

Components - Technology for resilience & European non-dependence

GSTP EEE

GSTP Resilience & Security



GSTP Element 2

Announcement Of Opportunity

- GSTP Element 2 is dedicated towards **industry driven co-funded activities** enabling the development of technologies and products for market competitiveness and sustainability.
- Industry is invited to submit proposals addressing one of the 3 technology and product development segments:
 - Market Oriented Opportunities,
 - Strategic Opportunities and
 - Implementation of National Priorities.



35 - 40 activities committed per year
(40m€ - 50m€)



GSTP Element 3



GSTP

From proof of
concept to orbit

TRL 3

TRL 8

Elements

GSTP Element 1 – Develop
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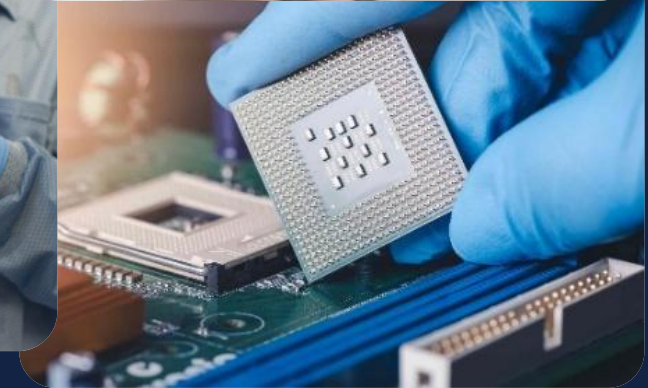
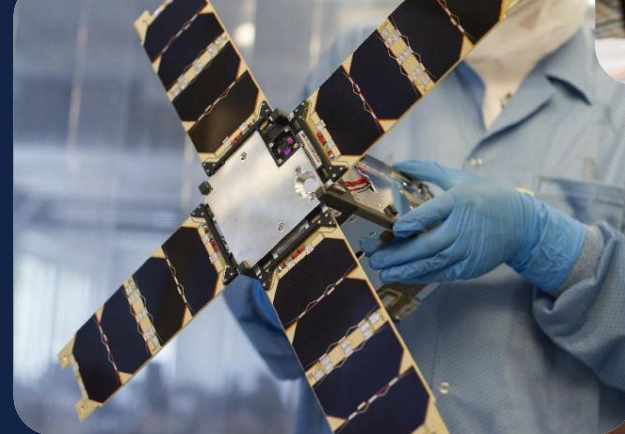
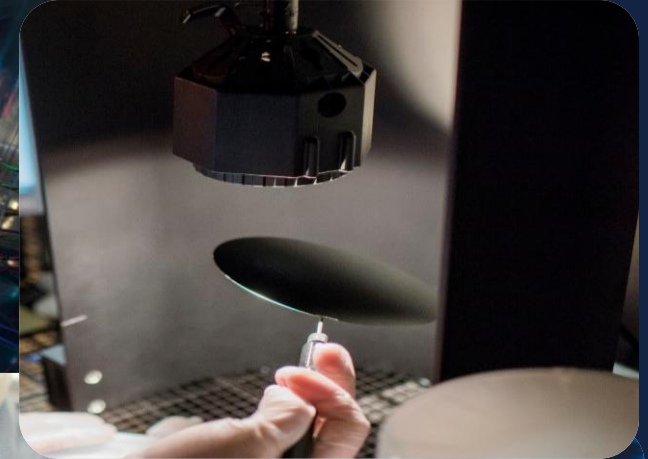
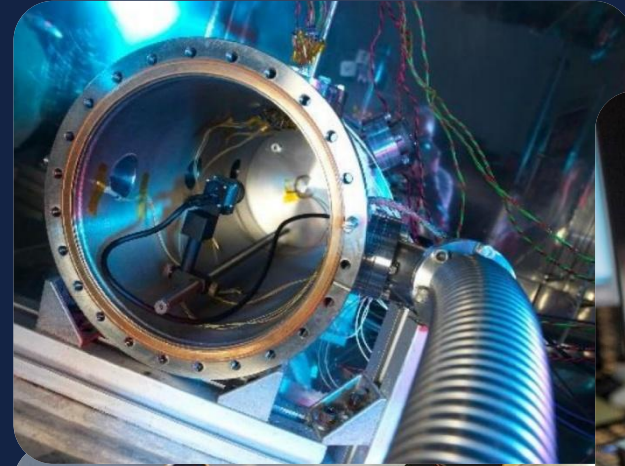
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GSTP Element 3

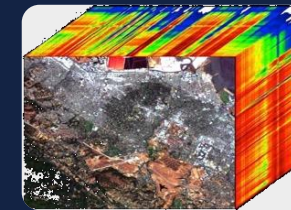
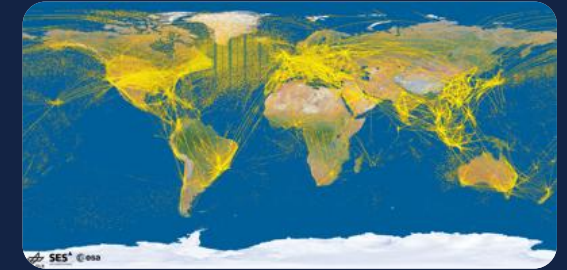
Facilitate Technology Demonstrations

The main objectives related to Element 3 are to:

- Ensure the successful implementation of the **Missions** and **In-Orbit Demonstrations** currently in preparation.
- Identify/prepare new mission/IOD opportunities.
- Expand and enhance the demonstration approach.

Opportunities cover:

- Demonstration of technology (e.g. platform units, Li-ion batteries).
- Demonstration of techniques (e.g. ADS-B, hyper-spectral, ...).
- First demonstrations of potential capabilities.



Workplan and Cubesat framework

Definition
Implementation
Launched

GOMX-5 (12U)
demonstrating
technologies

GENA-OT (12U)
demonstrating
commercial
IOD/IOV services

M-ARGO (12U)
demonstrating
asteroid rendezvous
and identifying in-situ
resources

CubeSpec (6U)
stellar
spectroscopy
from space

AOS-P and AOS-D
Precursor and
Demonstrator for
Arctic Ocean
Surveillance

uHETSat
electric
propulsion

e.Inspector (12U)
demonstrating
debris inspection

PRETTY (3U)
demonstrating GNSS
reflectometry

SROC (12U)
demonstrating
close inspection
(Space Rider)

**PROBA-V
Companion
(12U)**
Imaging
Vegetation

HENON (12U)
space weather
monitoring from
Distant
Retrograde Orbit

**Juventas & Milani
(2x6U)**
observing asteroid
deflection assessment
funded by S2P (Hera)

SkimSat (VLEO)
electric
propulsion

**VULCAIN
(2x12U)**
formation flying
for stereoscopic
IR imaging of
volcanos

LUMIO
measuring lunar
surface impact
hazards

Funded in GSTP Fly unless otherwise stated

GSTP Components



GSTP

From proof of
concept to orbit

TRL 3

TRL 8

Elements

GSTP Element 1 – Develop
Technology for missions

GSTP Element 2 – Make
Technology for competitiveness

GSTP Element 3 – Fly
In-orbit demonstration

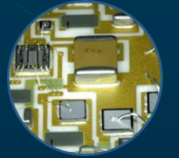
Components - Technology for resilience & European non-dependence

GSTP EEE

GSTP Resilience & Security

GSTP EEE

- establishing a long-term **sustainable and uninterrupted access**"
- "fostering long-term industrial partnerships with strategic EEE-manufacturers allowing continuous access to **relevant EEE space components**"
- 155M€ subscribed, 105M€ /12activities, 70M€ supported, 37M€ contracted, 19M€ under negotiation...



Increase the portfolio of
European space EEE
components for all EEE
Critical Technologies

GSTP Resilience & Security

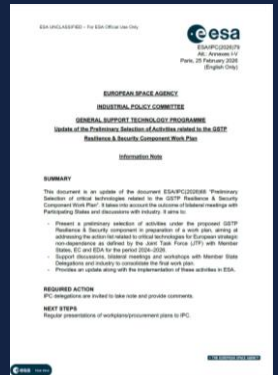
Critical Technologies (non-EEE)

- Development of critical technologies for European strategic non-dependence – JTF List
- **WP activities. Preliminary Selection - 14 act (~70 M€)**
- Propulsion, Solar Generators, Antenna Technologies, Optoelectronics

Advanced (Cyber)Security

Clusters

MS / appl. driven dual-use technologies –
> Classified techn.



GSTP Achievements



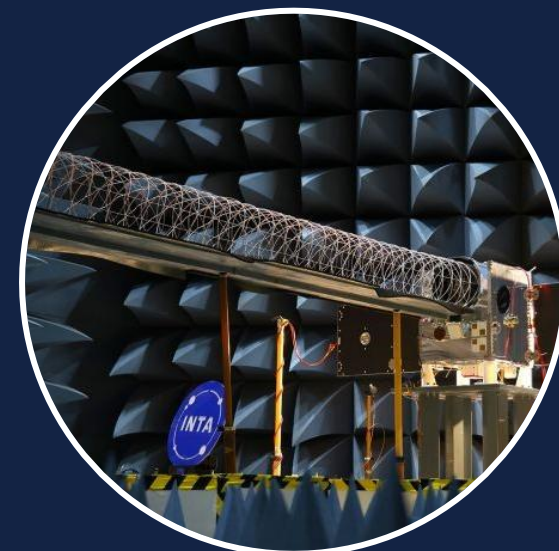
Mini space Thruster that runs on water (URA Thrusters)



Compliant Mechanism Based on Additive Manufacturing (CSEM)



Miniature Active Pixel Sensor based Star Tracker to support PLATO mission (TERMA)



High power deployable Helical S-band Antenna for air traffic monitoring (OSS)

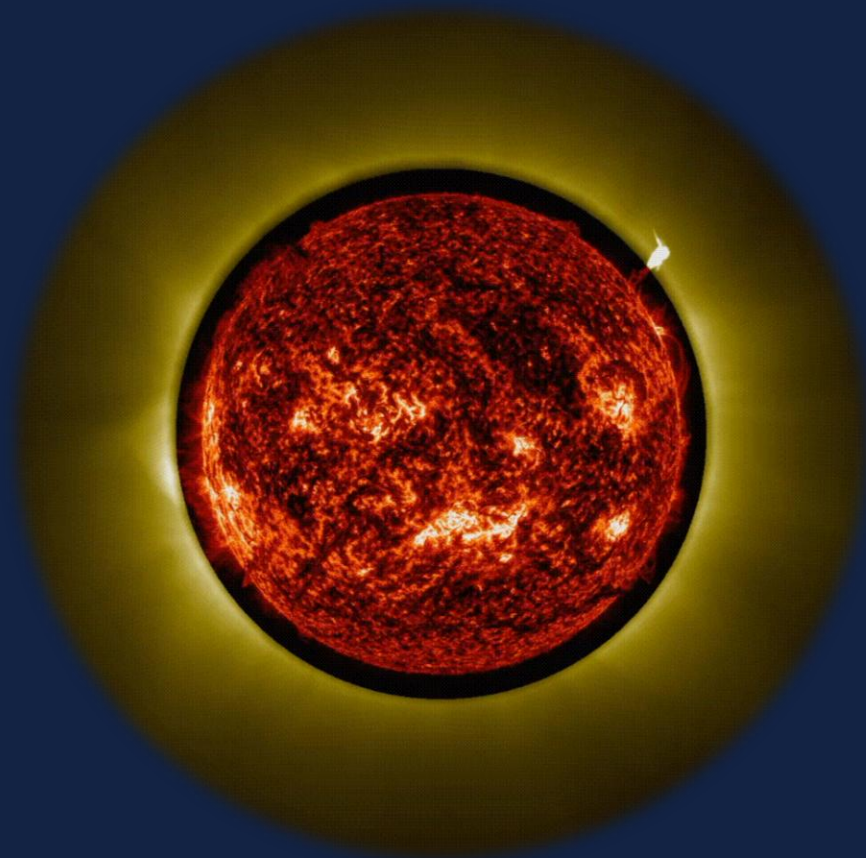


Additive manufacturing for novel structural components (demonstrated in JUICE)

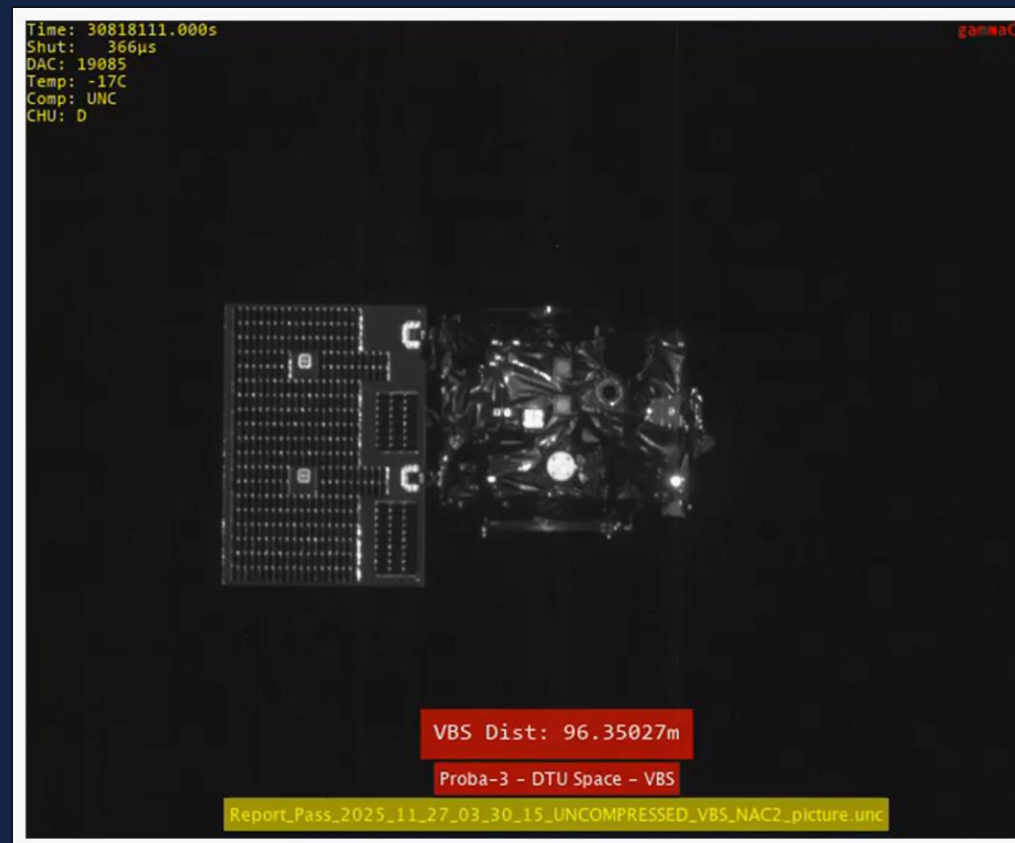


Reconfigurable telemetry transmitter for Earth observation satellites (TESAT)

Proba-3 - Our eyes on the Sun's inner corona



Animation made up of false-colour images taken by ESA's Proba-3 mission and NASA's Solar Dynamics Observatory



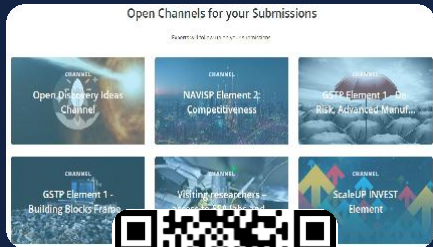
Proba-3's Coronagraph spacecraft captured by a camera onboard the Occulter spacecraft

Useful links



- Channel & Campaigns
- Entry to Discovery
- Submission of pre-proposals / outlines

ideas.esa.int



- Registration of companies
- Invitations to tenders (ITTs)
- News/Procurement related announcements: TDE WP, GSTP Compendia

esastar-publication-ext.sso.esa.int



Activities Portal

- Running activities
- Visibility on progress

activities.esa.int



Nebula Public Library

- Discovery, Preparation activities summaries
- TDE and GSTP partially

nebula.esa.int



Discovery & Preparation

- Discovery & Preparation
- Achievements, Highlights



Shaping the Future

- TDE/GSTP information and achievements
- Reports & highlights





50 YEARS OF
INNOVATION
AT ESA

THANK YOU FOR YOUR ATTENTION!

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