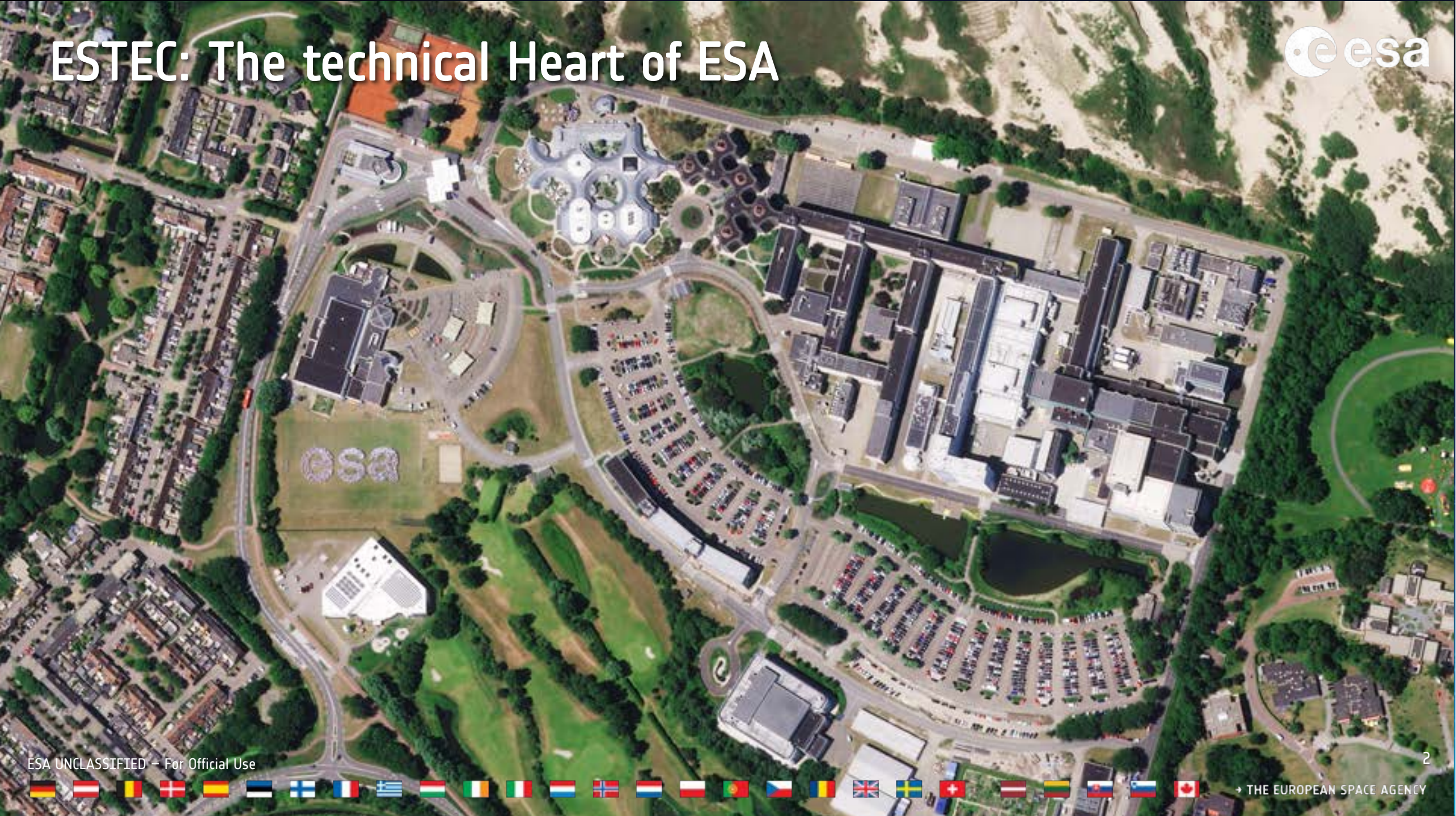


ESA Technology Development Discovery, Preparation, TDE & GSTP

Technology Programmes Office | TEC-RT

09/06/2026

ESTEC: The technical Heart of ESA

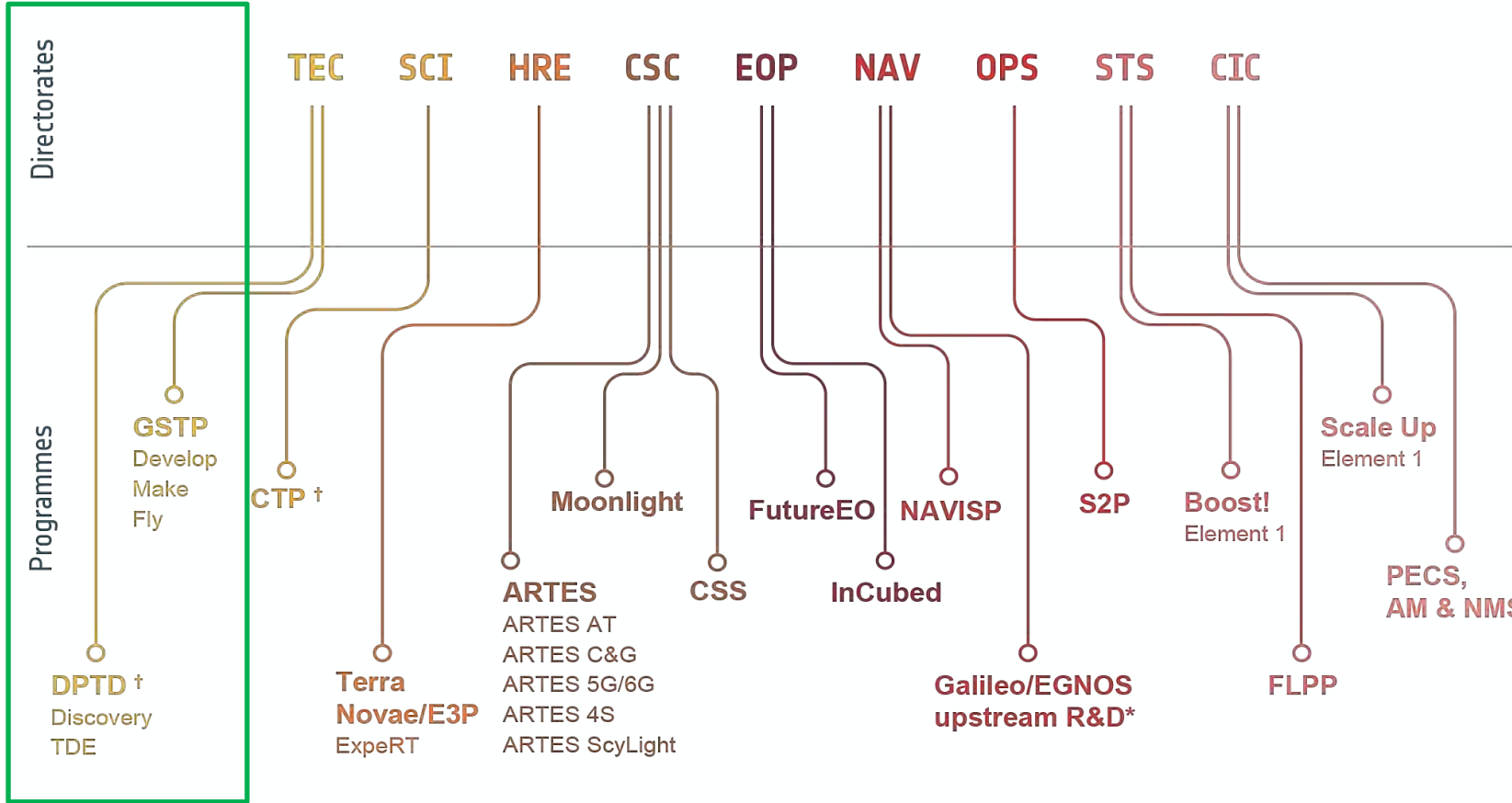


ESA UNCLASSIFIED – For Official Use



→ THE EUROPEAN SPACE AGENCY

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

Discovery
Game changing

Preparation
Future missions

Technology
Enabling techn.

GSTP
General Support
Technology Programme



AI Quantum Sustainability Propulsion



Specific



Disruptive Ideas

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

Discovery

Future Missions

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

Preparation

Technology Raising

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

TDE

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

GSTP

Disruptive Ideas

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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

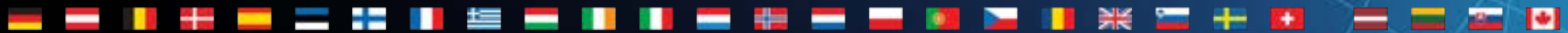
esa.int/discovery

ideas.esa.int

activities.esa.int

Discovery year in numbers:

~160 activities	100% Industry/Academia driven Open Competition	~18m€ contracts	~80% SME's, R&D inst. and academia
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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



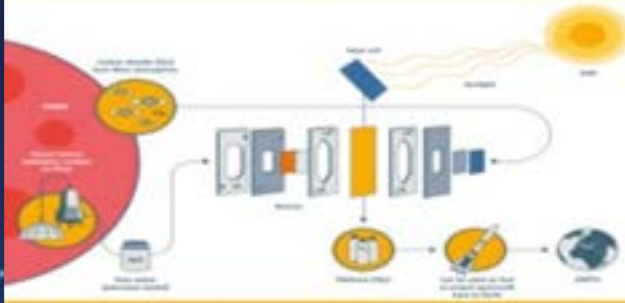
Application area: Telecom

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." – Soeid Karamzadeh, Silicon Austria Labs GmbH

8 July 2024 8 March 2025

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



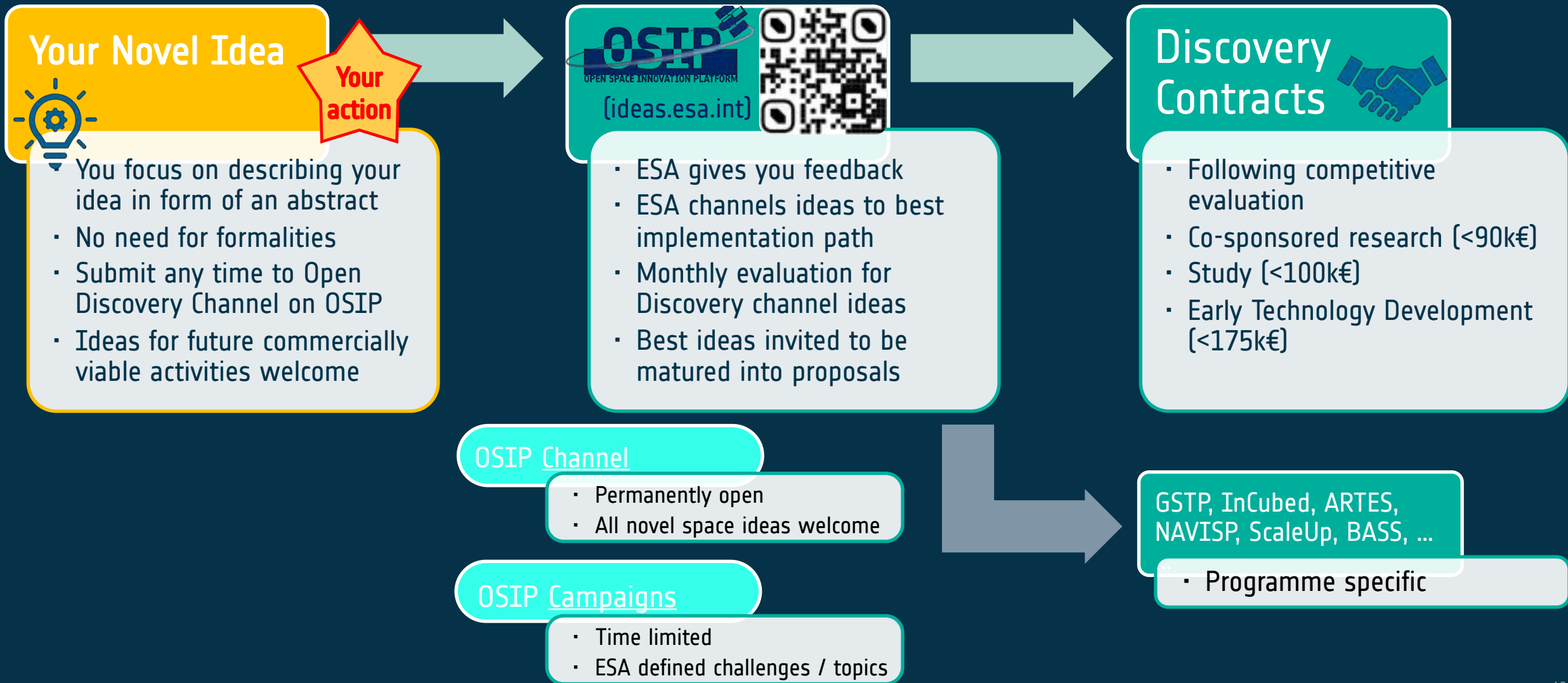
Application area: Generic for multiple applications

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

Discovery Element Process Steps

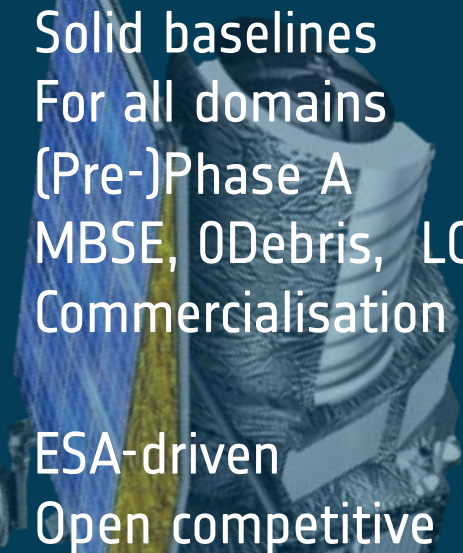


Disruptive Ideas

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Discovery

Future Missions

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 - Commercialisation
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 - Open competitive
- 

Preparation

Technology Raising

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- All ESA applications
- Enabling missions
- 2yr work plans
- ESA driven
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TDE

- Higher TRL
- Support Competitiveness
- Enabling missions
- Work plans and industry-driven proposals
- SME focus
- Delegation support
- 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**



<https://esa.int/preparation>

Disruptive Ideas

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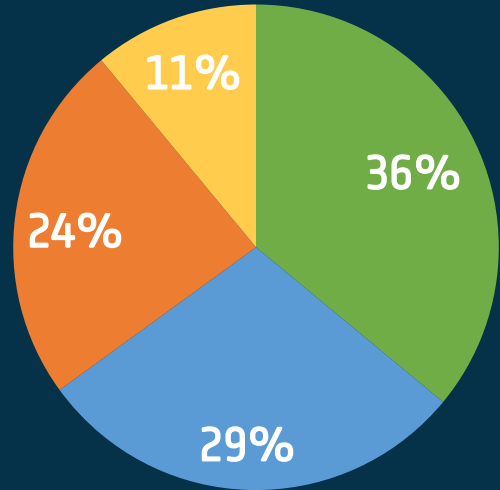
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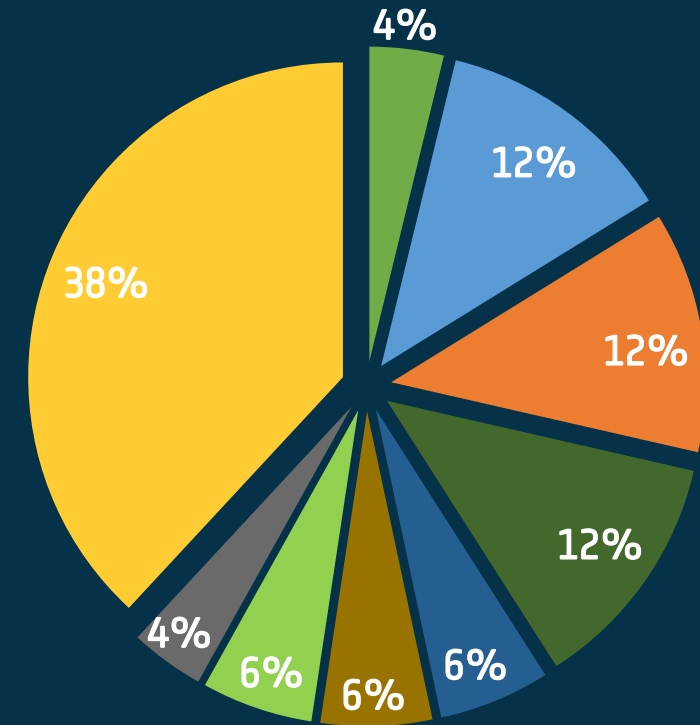
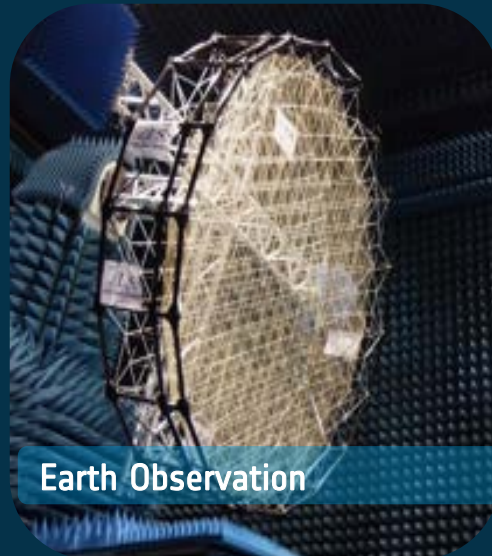
GSTP

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

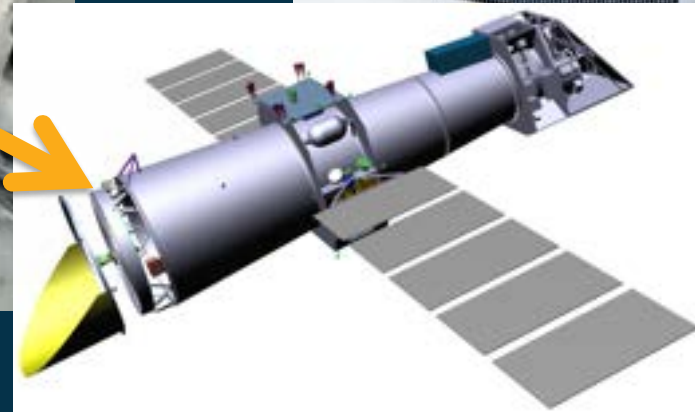


■ MidCaps ■ Univ. & Res. Inst.
■ SME ■ LSI



■ 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 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

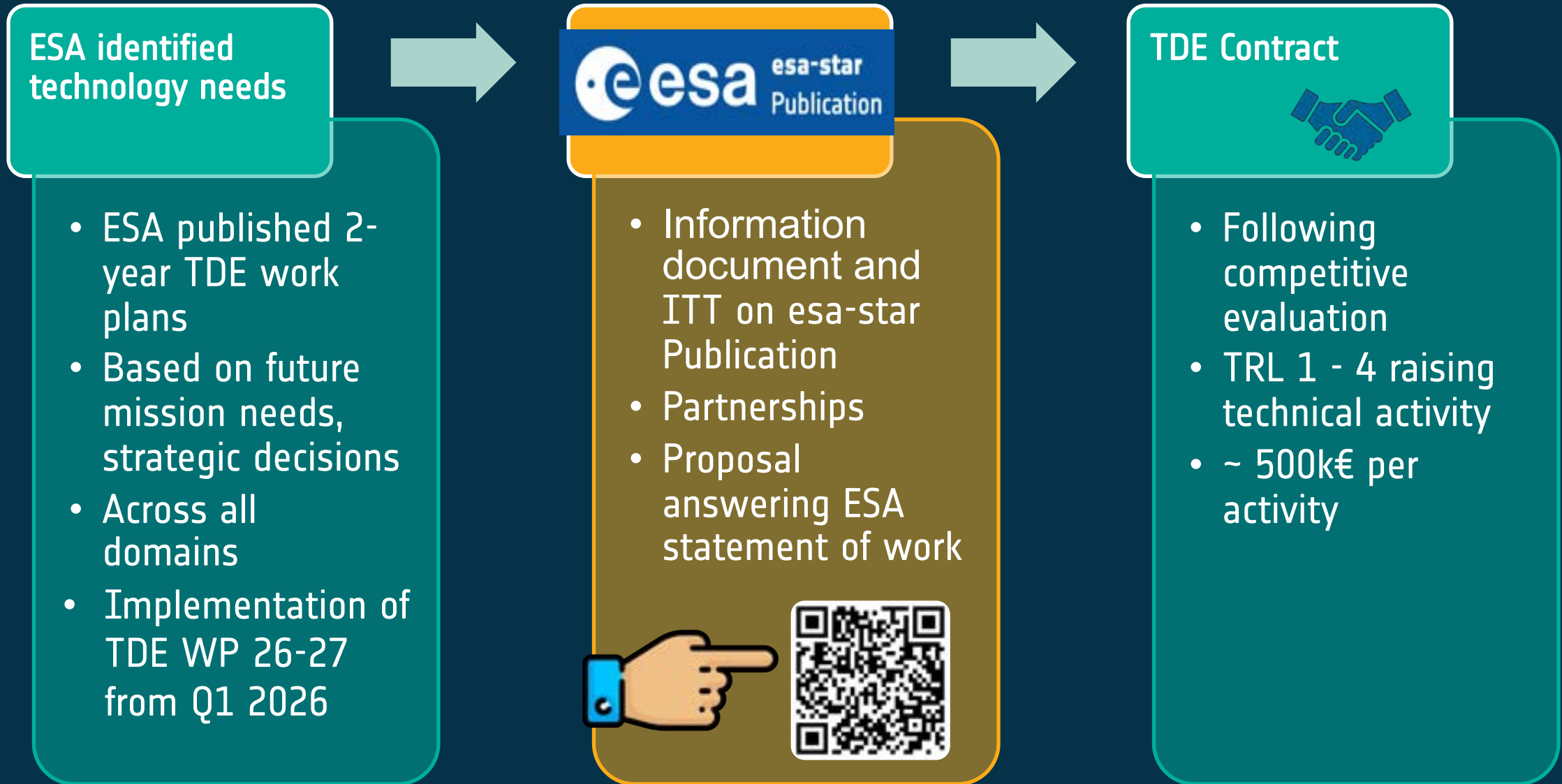
→ Generic Technologies:

- 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



Disruptive Ideas

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Preparation

Technology Raising

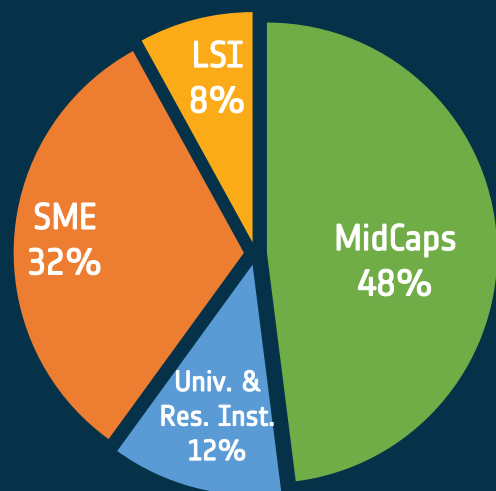
- Low TRL
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- Higher TRL
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- 3 Elements

GSTP

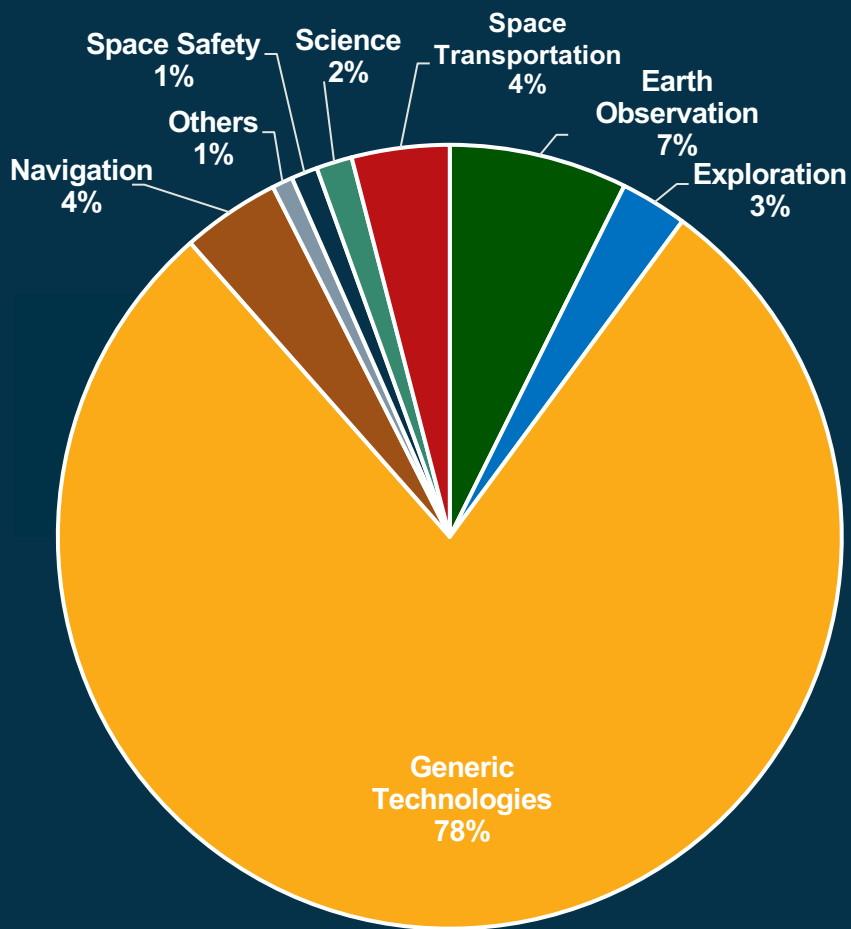
Overall GSTP actors



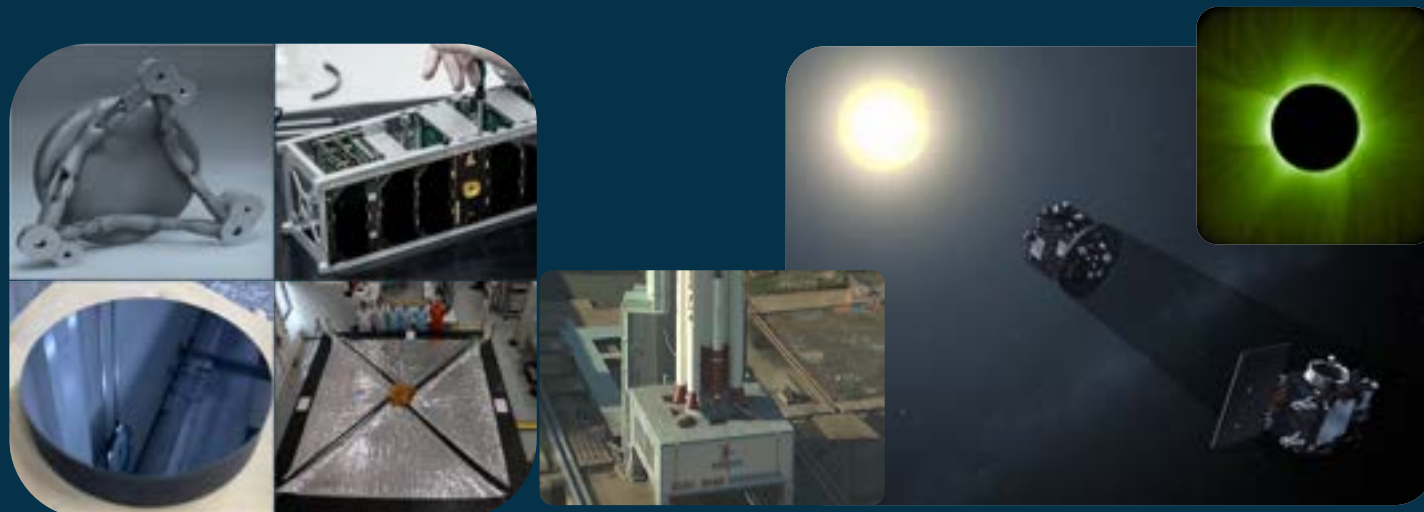
GSTP's mission

- For more **than 30 years**, the GSTP has been developing leading-edge space technologies to
 - enable future missions
 - support the competitiveness of European industry
 - Reinforcing European technology non-Dependance
- 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 200 M€ in contracts
- Launch of Genasat-OT and Iperlite





ESA GSTP IMPACT: DENMARK



AI Augmented Star Tracker Performance Enhancement

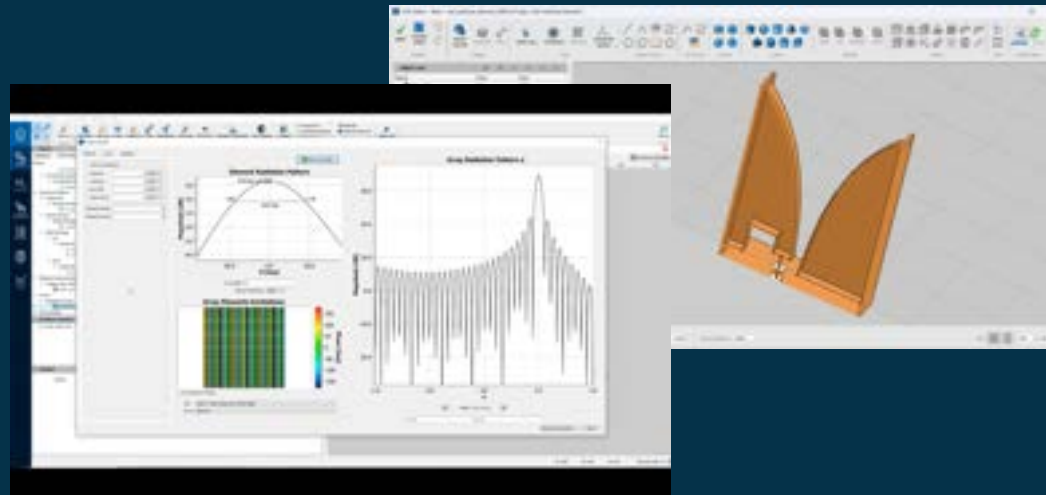
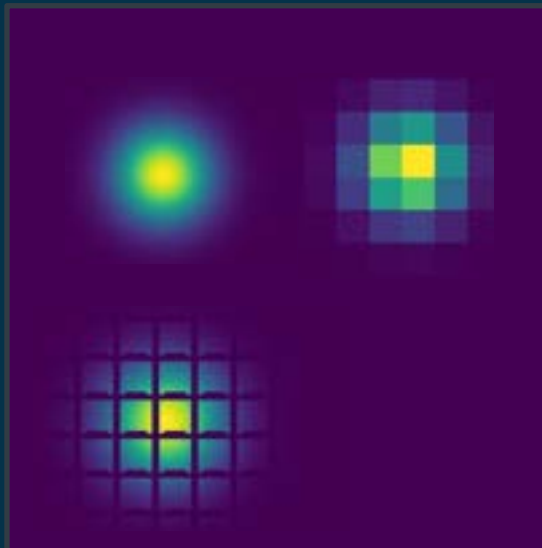
Enhances attitude determination accuracy enabling improved pointing stability and data quality.

Antenna Design Tool for Future Flexible Payloads

ARRAY tool for Phased Array Antenna Design and Simulation has been launched and is available on the market since early 2026.

Smart skin system for robotic arms

Integrated and tested the smart skin breadboard in a robotic arm prototype.



GSTP Structure



GSTP

From proof of concept to orbit

TRL 3

TRL 8

Elements

GSTP Element 1 – Develop Technology for missions

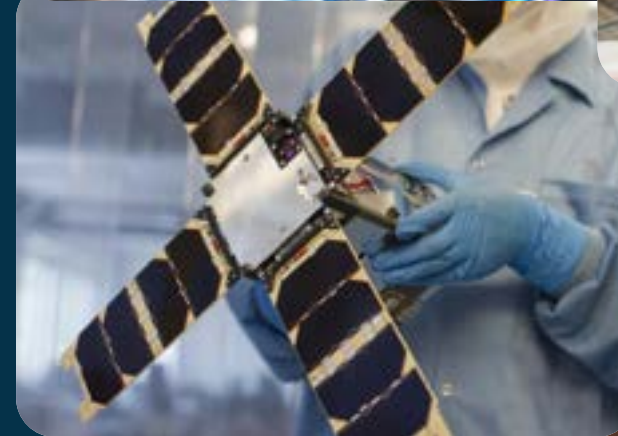
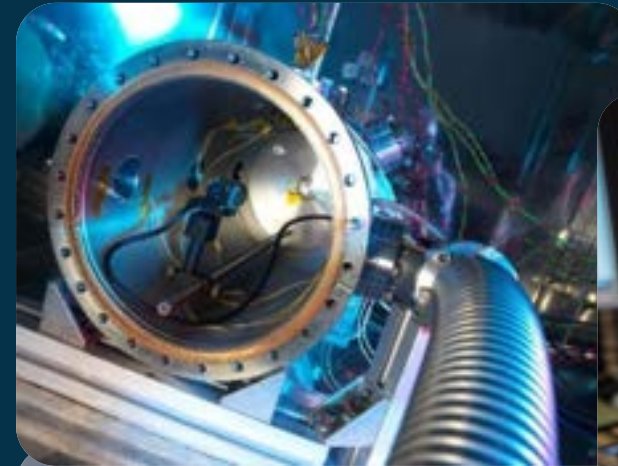
GSTP Element 2 – Make Technology for competitiveness

GSTP Element 3 – Fly In-orbit demonstration

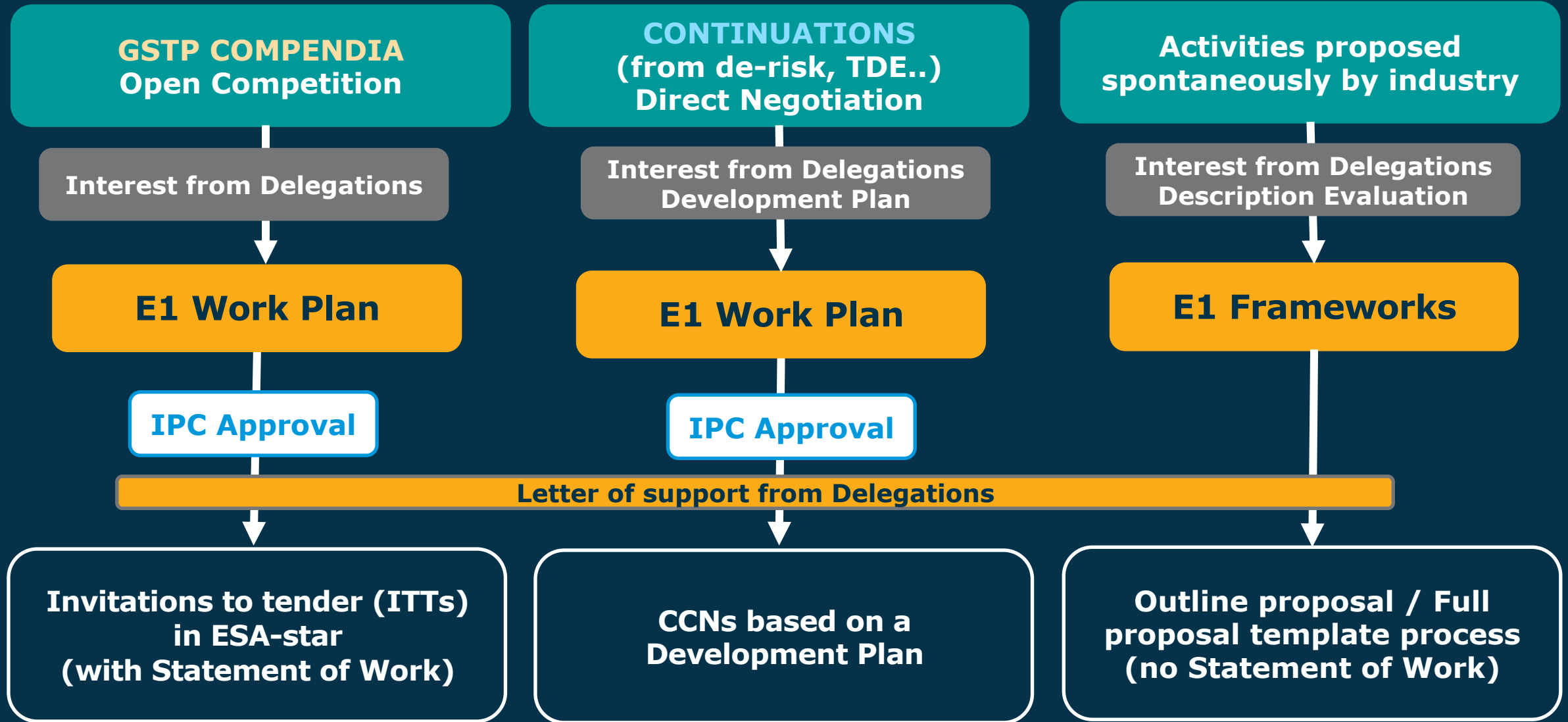
Components - Technology for resilience & European non-dependence

GSTP EEE

GSTP Resilience & Security



GSTP Element 1: Work Plan & Frameworks



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 Compendia – Denmark Current Status



GSTP Compendia 2023-2025: 8 activities from the 2024 and 2025 Calls

GT17-612MS	Space thermoplastic composite assemblies
GT1Y-607ES	IP over CCSDS including internet protocol security module
GT17-677SY	Immersive space design environment
GT17-634EP	Technologies to accurately estimate the state of charge
GT17-642MM	Adaptive optical lenses for compact optical corrections in small satellite payloads
GT17-622ES	Data relay RF simulator system
GT17-682SD	Manoeuvre pattern inference for safe operations
GT17-640EF	Digital processing unit for RF payloads and microwave instruments

ITT to be re-published

ITT to be published

GSTP Compendia 2026-2028: 5 activities from the 2026 Call

GT1C-810SD	Data fusion for collision avoidance and space traffic coordination
GT17-807EC	Digital twin of attitude and orbit sensors
GT17-808EC	Modular facility for hardware-in-the-loop testing of nanosat AOCS
GT17-817EF	Deployable reflector for cube- and smallsats
GT1Q-807MM	Miniaturization of nitrogen-vacancy center-based magnetometers
GT1M-810EP	Active battery management system maturation

Planned ITT: Q2/Q3 2026

Planned ITT: Q3 2026

Planned ITT: Q4 2026

Planned ITT: Q3 2026

Planned ITT: Q3/Q4 2026

Planned ITT: Q4 2026

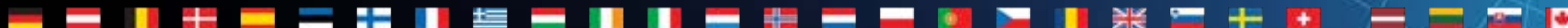


GSTP Element 1 WP - Special Activity List: GSTP (Cyber)Security Products for Space Systems Protection

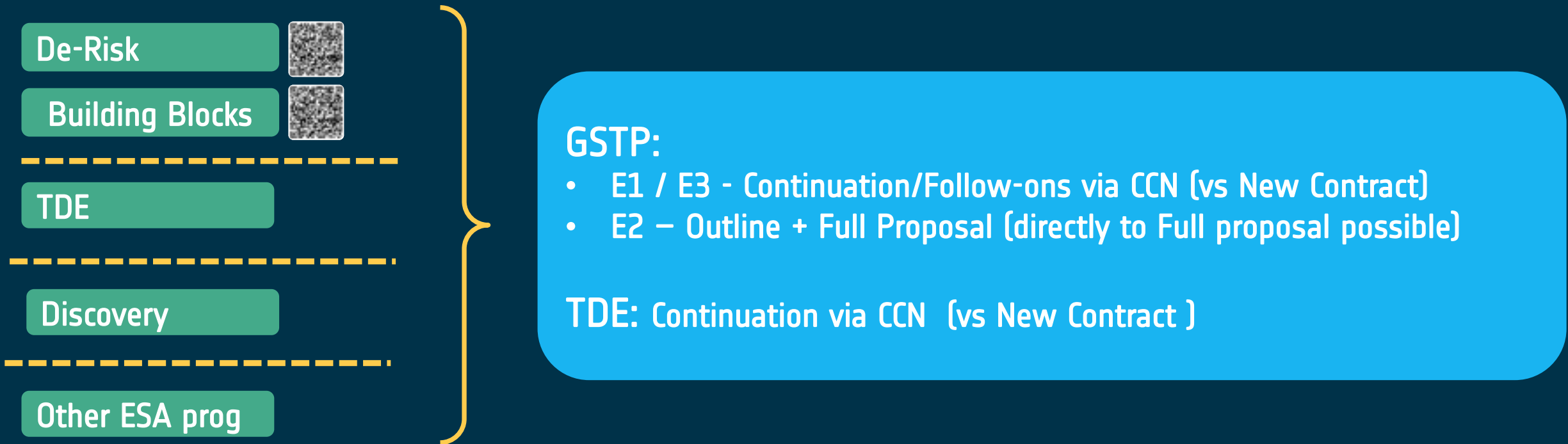


(Cyber)security Products for Space Systems Protection 2026-2028 – 8 activities

- Development of products – TRL 6-7
- Complementing the **GSTP 2026-2028 Cybersecurity Compendium (TRL 3-5)**
- **Request for Information and Workshop have taken place, Danish company interest expressed**

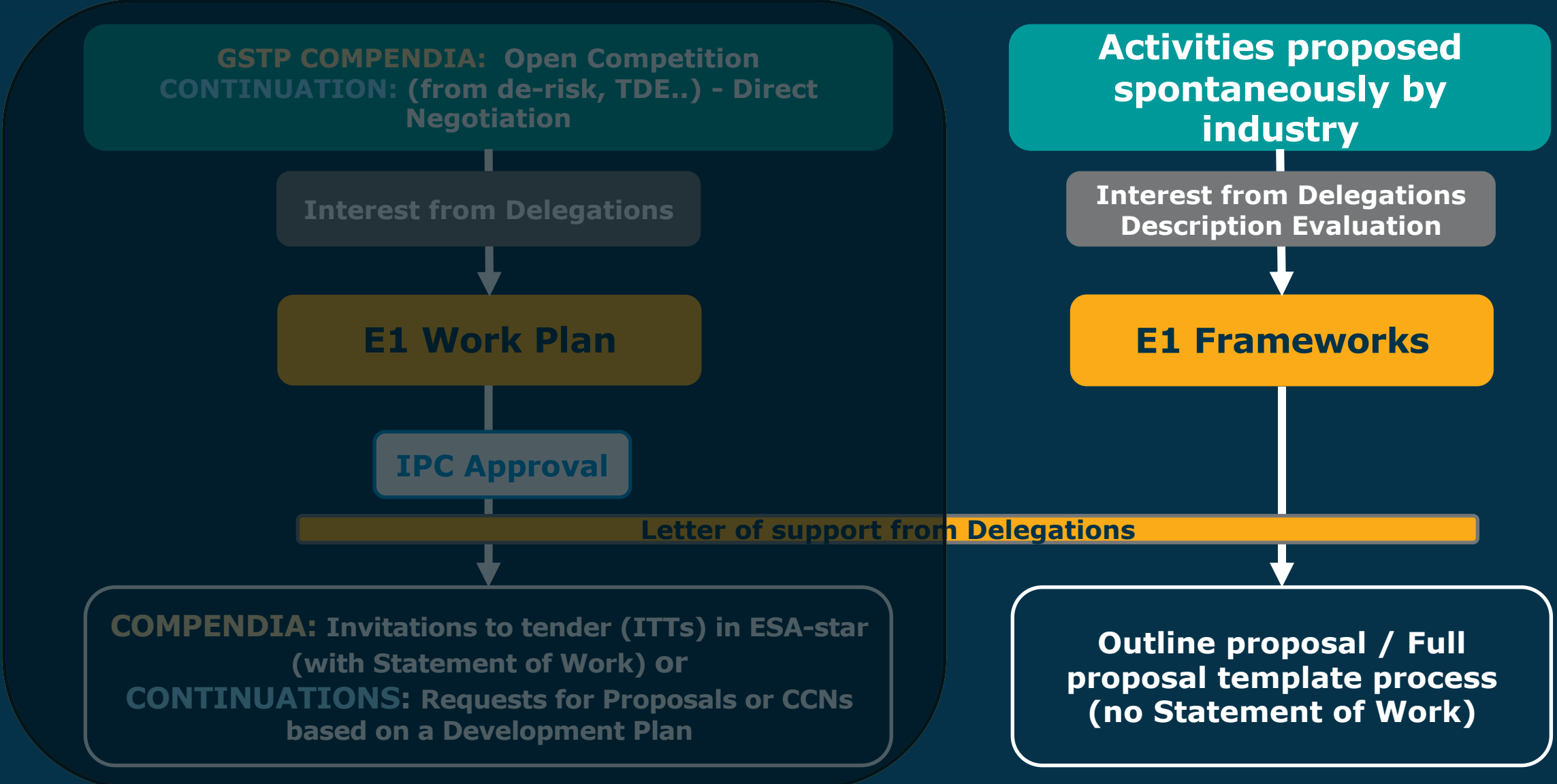


GSTP Element 1 WP- Continuations



Providing continuity to Technology Developments
Reducing time gap between contracts

GSTP Element 1: Frameworks



GSTP Element 1 - Frameworks

De-Risk



Procurement using a template

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

Follow-on using a template

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

~40 de-risk initiated / year

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

Building Blocks



Procurement using a template

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

~20 activities initiated / year

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



GSTP Element 1 – De-risk (What is not new...)

Outline Proposal

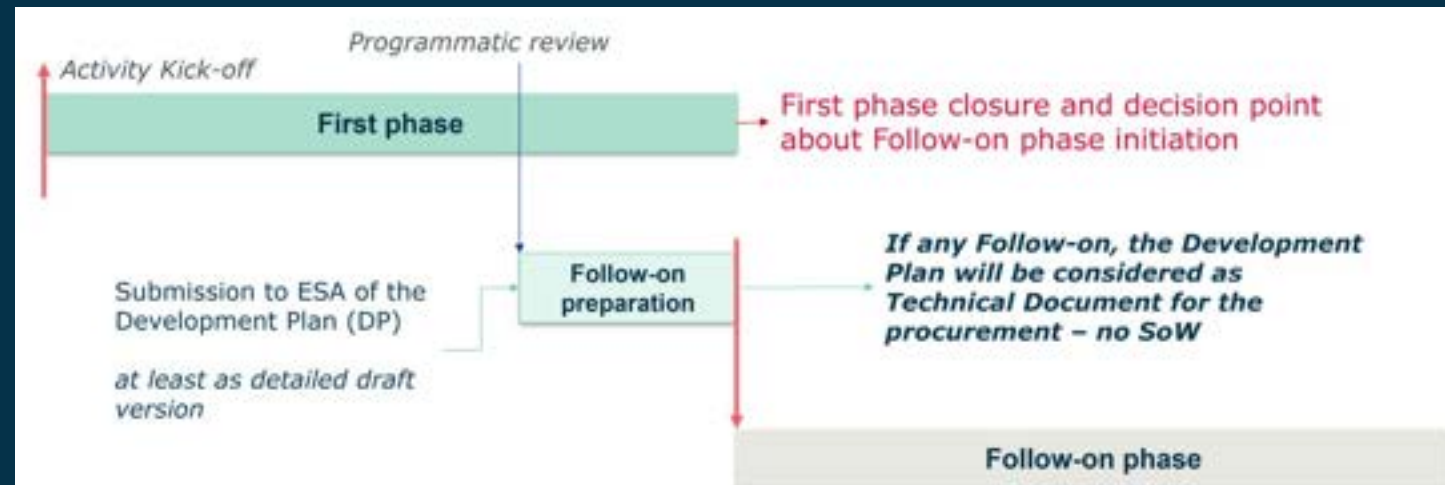


Full Proposal

Submitted Outline Proposals will be evaluated against the following criteria:

- Clear and credible definition of the technical objectives, key requirements, technical steps, and risks to be addressed in this activity.
- Clear indication of the application and potential users of the technology.
- Clarity of the management approach and the adequacy of the proposed costs with the work to be performed in the De-risk, Advanced Manufacturing or Quantum Technologies Framework Activity.
- Clear information about Cost to Completion including the Follow-on activities.

Continuation Approach



GSTP Element 1 – De-risk (What is new...)

Use of the Co-operative Agreement (instead of contracts)
[“New” Call for Proposals without procurement, Art 10 Contracting Regulations]

New mindset at ESA → ESA acts as a Partner

Features of the the Cooperative Agreement, allowed under a call for proposal without procurement:

- **Reduced administration** for industry and ESA
- Simplified agreement that limits ESA access to industry IP (only patented IP with limited use right)
- No (hardware/software) deliverables
- Esa may use Final Report only and limited to further publication, surveys. No right on copyright IP
- Reduced negotiation time

however

- **No changes on ESA control** over activity implementation with verification of the work progress

Introduction of a new OSIP “Common” Platform and a new outline template
“Common”= Multiple programmes (GSTP, ARTES, INCUBED)

In Preparation

GSTP Element 2

Announcement of Opportunity

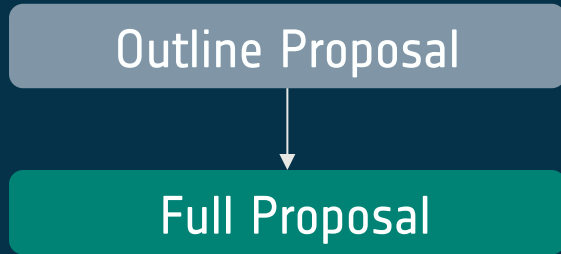
- GSTP Element 2 is dedicated towards **industry driven co-funded activities** enabling the development of technologies and products for market competitiveness and sustainability
- Industry is invited to submit proposals addressing one of the 3 technology and product development segments:
 - Market Oriented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



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



GSTP Element 2



EVALUATION CRITERIA

Outline Proposals will be evaluated on the basis of the following criteria

- Clarity and credibility of the business opportunity and market context (for segment 1)
- Clarity and credibility of the strategic opportunity and market context (for segment 2)
- Credibility and quality of the technical requirements, technical solutions versus activity objectives.
- Credibility and quality of the proposed development plan, deliverables and schedule.
- Credibility and quality of the bidder's background, experience and facilities.
- Credibility and quality of the cost breakdown by major cost elements and cost by funding source.

TRL of development		Univ. and Institutions*	SME (up to)	Non-SME (up to)
Min	Max			
3	6	100%	80%	75%
6	8	100%	80%	50%

*up to 30%, only as a subcontractor

Use of the Co-operative Agreement (instead of contracts): being presented at the June IPC ("New" Call for Proposals without procurement, Art 10 Contracting Regulations)

Introduction of a new OSIP "Common" Platform and a new outline template

In Preparation

GSTP Element 3

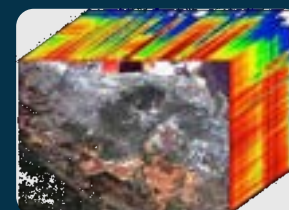
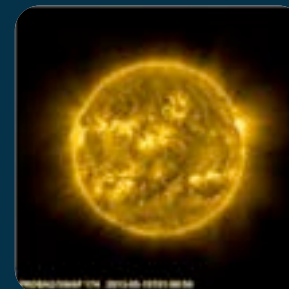
Facilitate Technology Demonstrations

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:

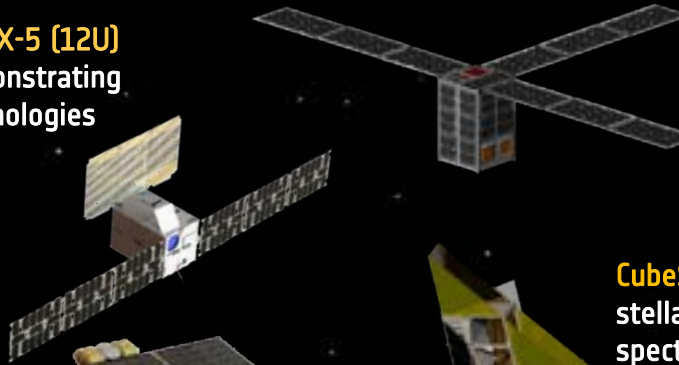
- Demonstration of technology (e.g. platform units, Li-ion batteries).
- Demonstration of techniques (e.g. ADS-B, hyper-spectral, ...).
- First demonstrations of potential capabilities.



Workplan and Cubesat framework

Definition
Implementation
Launched

GOMX-5 (12U)
demonstrating
technologies



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

CubeSpec (6U)
stellar
spectroscopy
from space



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

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



uHETSat
electric
propulsion



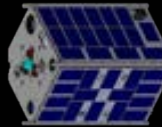
e.Inspector (12U)
demonstrating
debris inspection



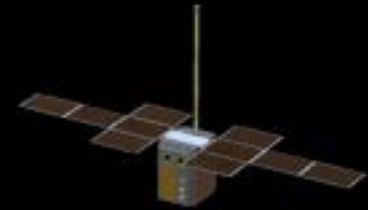
PRETTY (3U)
demonstrating GNSS
reflectometry



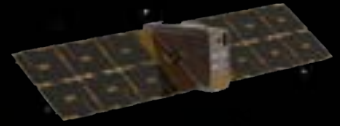
SROC (12U)
demonstrating
close inspection
(Space Rider)



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



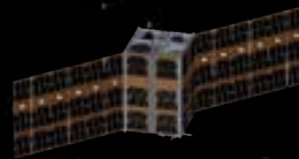
Juventas & Milani (2x6U)
observing asteroid
deflection assessment
funded by S2P (Hera)



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



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



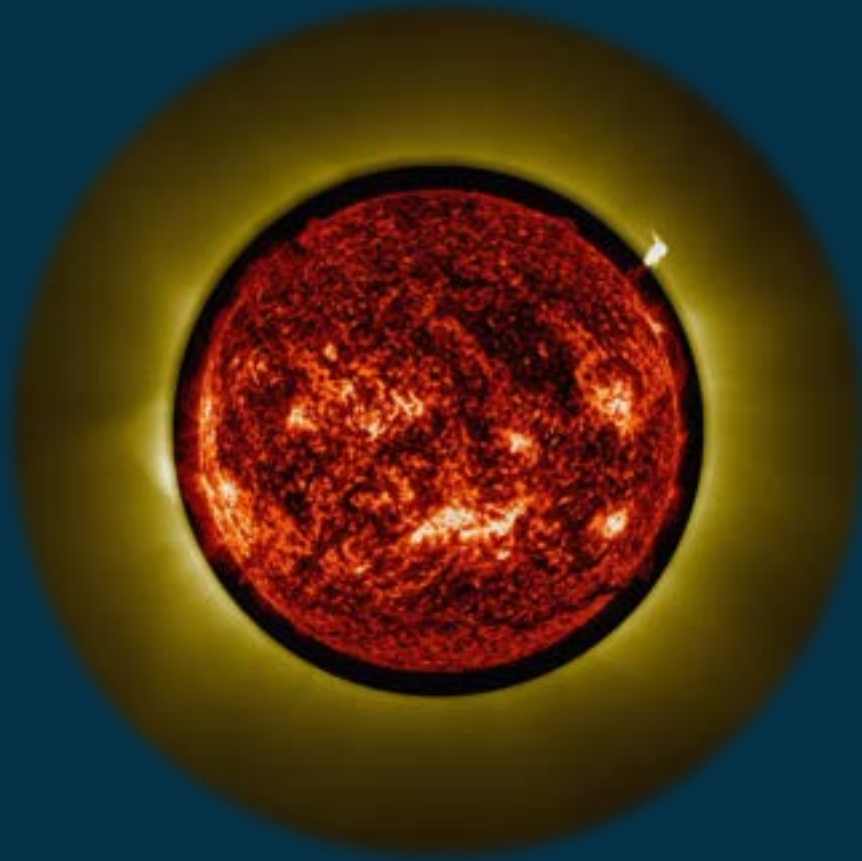
LUMIO
measuring lunar
surface impact
hazards



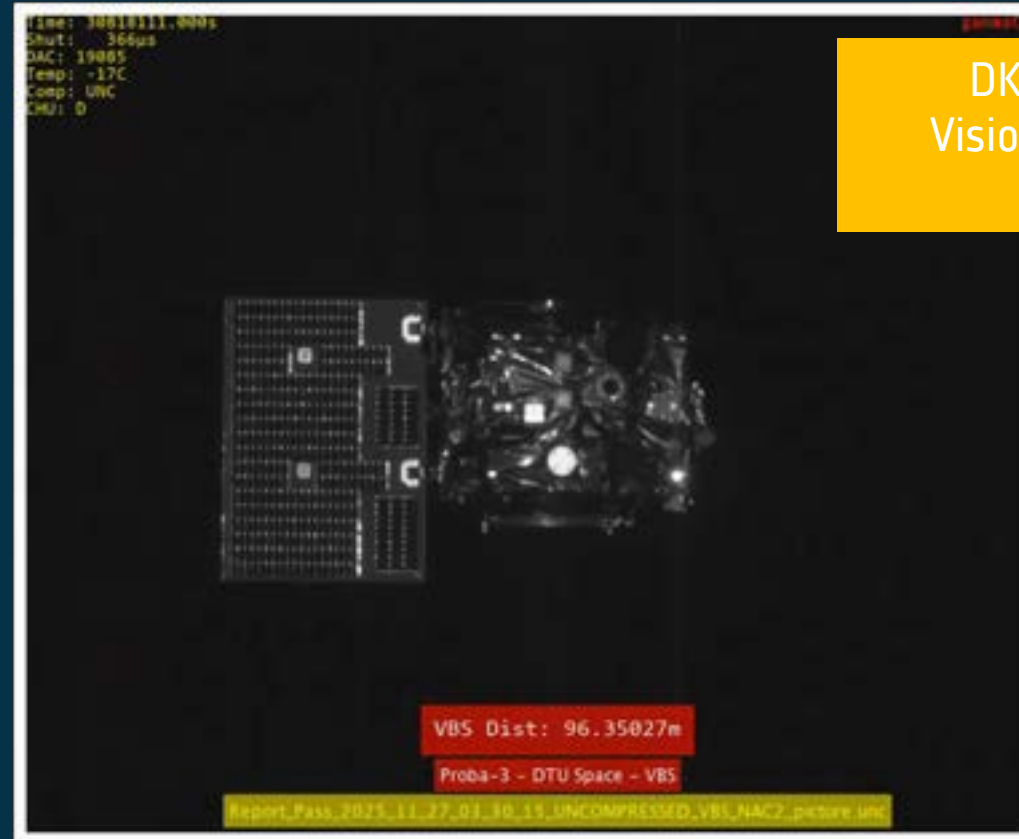
SkimSat (VLEO)
electric
propulsion



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



DK Contribution:
Vision-based Sensor
System

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



Background

EEE Space Component Sovereignty for Europe Initiative approved at CM22 as a Component, with same implementing rules than GSTP E1



Objective

Establish a sustainable European supply chain of space qualified EEE components, without any access restrictions, based on strong partnership



Collaboration

With Delegations, NSA, EC (JTF, SecEEE, Tiger Team) and Industry (workshop, bilateral, ESCC CTB,...)



Achievements

High-value activities to develop state-of-the-art European technologies have been defined, approved by IPC and initiated.



155M€ subscribed,

105M€ /12activitie approved

70M€ supported,

37M€ contracted,

19M€ under negotiation...

New Work Plan under preparation

Resilience & Security component

- Critical non-EEE Technologies
- Advanced (Cyber)Security
- MS / appl. driven dual-use technologies (clusters)

Critical non-EEE Technologies

- Development of critical technologies for non-EEE European strategic non-dependence – JTF List
- Fields of solar generators, propulsion, antenna technologies, optoelectronics)
- **WP activities. Preliminary Selection - 25 act (~95 M€)**



Advanced (Cyber)Security

- *Identify:* SST Sensors, SST Correlation and Analysis Engine, Space Honeypots,...
- *Protect:* High Speed ISL + appl. Layer crypto, Jamming Det. RF Firewall, Optical Blind Det., Bpsec, IPsec in space, QUIC, Space TEE, Onboard secure hypervisors, Secure Avionics Busses
- *Detect:* On Board IDS
- *Respond:* GS Digital Forensics Management, Secure SDR
- *Recover:* Root of Trust/ Secure Boot

MS / appl. driven dual-use technologies (clusters)

- Capability layers driven classified Technologies (up to TRL7, clusters)

Useful links



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

ideas.esa.int



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



Activities Portal

- Running activities
- Visibility on progress

activities.esa.int



Nebula Public Library

The knowledge bank of ESA's R&D programmes

- Discovery, Preparation activities summaries
- TDE and GSTP partially

nebula.esa.int



Discovery and Preparation

- Discovery & Preparation
- Achievements, Highlights



shaping the future

- TDE/GSTP information
- TDE/GSTP achievements
- Reports & highlights



- Discovery Element: available for industry to propose novel early stage technology developments
- Technology Development Element: please check the 2026-27 Work Plan and prepare for upcoming Invitations to Tenders
- GSTP Element 1
 - **Compendia: new Compendia published, first Invitations to Tenders to be released in 2026**
 - **New initiatives: (Cyber)security Products...**
 - **Continuations: streamlined to improve continuity (reducing gaps)**
 - **Frameworks: De-risk and Building Block frameworks available for industry-driven outline proposals**
- GSTP Element 2: available for industry to propose market oriented co-funded activities (based on an outline proposal)
- GSTP Element 3: implementing in-orbit demonstration missions to demonstrate technologies, techniques and capabilities
- GSTP EEE: Improve sovereignty through targeted development (UDSM, WBG, Testing Facilities)
- GSTP Resilience & Security Component: addresses Critical Technologies, Advanced Cybersecurity and Member State driven developments

THANK YOU FOR YOUR ATTENTION!



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