EDA - Future perspectives for time horizon 2040+
ESA European Earth Observation Ecosystem 2040+, ESTEC, 10.02.2025

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RESEARCH, TECHNOLOGY &
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WHEN IT COMES TO SPACE, WHAT IS THE PLAN FOR THE FUTURE?

- **As Andrius Kubilius highlighted at the European Space Conference in Brussels last month, "We want Europe to be stronger as a space power."**
- **Space is no longer just a frontier for scientific exploration or technological advancement; it has become a strategic domain for security, sovereignty, and economic dominance.**

EDA ROLE IN THE EU SPACE ECOSYSTEM

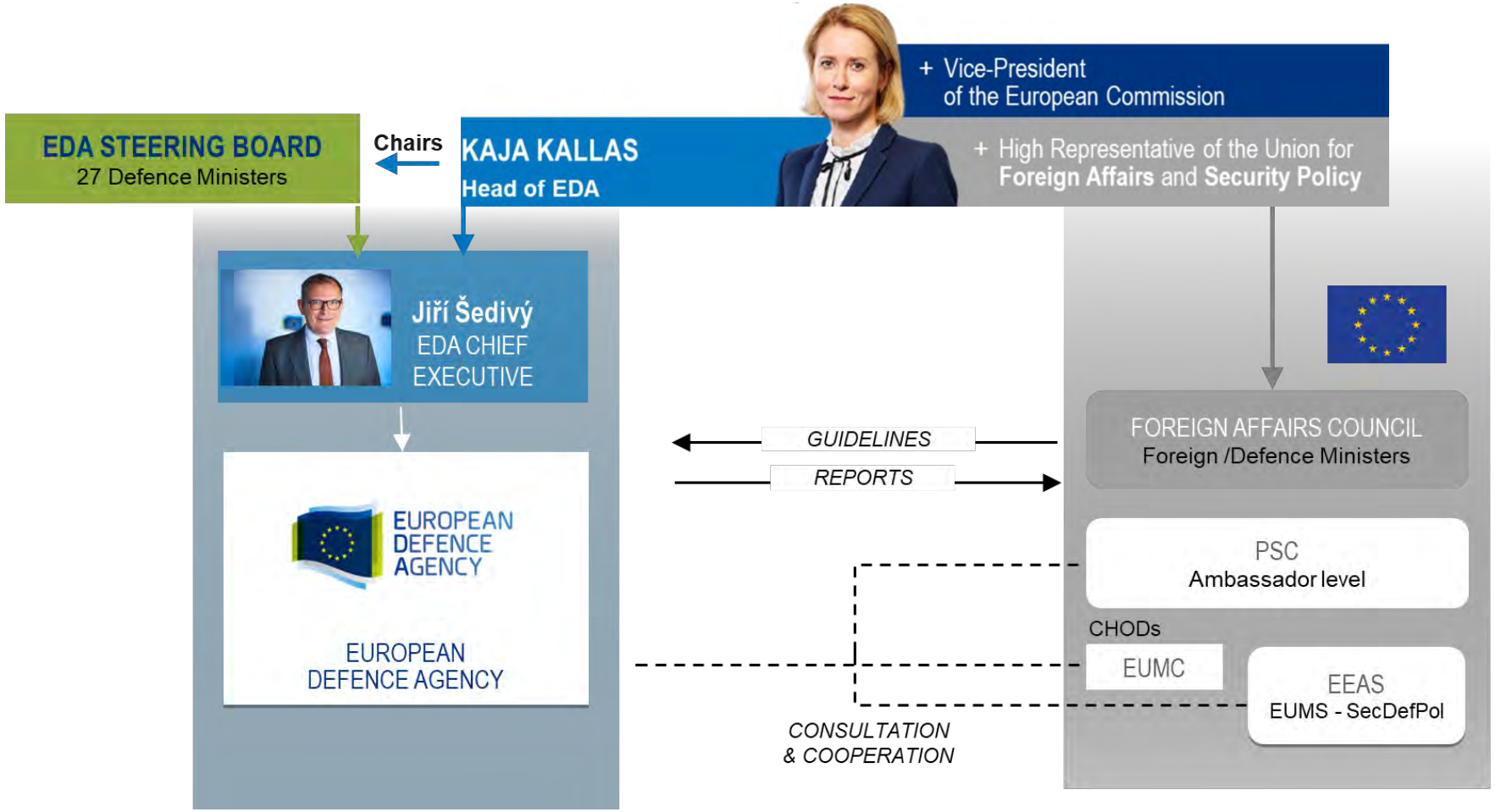
- **EDA is the home of the Member States to solve the key defence challenges of space, namely:**
  - **EU autonomy so that no actor can deny our space capabilities incl Earth Observation.**
  - **Invest more strategically and coordinated within the defense sector by pooling resources together to avoid fragmentation and duplication of efforts and boost scaling economies.**

INSTITUTIONAL SETTING

>200 staff, 50,9M€ General Budget
Connected with 2,500 experts in Member States

27 Member States
(All EU Member States)

Administrative Arrangements
with Norway, Serbia, Switzerland, Ukraine, and the United States as well as ESA and OCCAR



Main mission

… to support the Council and the Member States in their effort to improve the Union's defence capabilities in the field of crisis management and to sustain the CSDP

CAPABILITY DEVELOPMENT

ZOOMING ON: THE CAPABILITY DEVELOPMENT PLAN (CDP)

OBJECTIVE

- Provide a picture of European military capabilities over time
- Help Member States' defence planners identify priorities and opportunities for cooperation
- Look at the long term trends affecting European Defence
- Identify list of priority actions detailed enough to direct work on capability development

CDP REVISION

- New set of CDP priorities approved in 2023
- Capability driven, R&T and industry dimension included

EDA ROLE

EDA is the architect of the CDP and as such:

Works with experts from Member States, EU bodies and industry on consolidating information on short-, mid- and long-term capability needs

ZOOMING ON THE CDP – EARTH OBSERVATION

2 Priorities and
6 Key Areas

THE 2023 EU CAPABILITY DEVELOPMENT **PRIORITIES** / **SPACE**

Legacy activities

Space Services

The priority **SPACE SERVICES** utilises space-based technologies to deliver defence capabilities in Earth Observation, Satellite Communication and Positioning, Navigation and Timing and are essential enablers in support of all operational domains. Capabilities developed at EU level in the context of the EU Space Programme, considering military requirements and commercially available services, will contribute to the overall defence landscape. Space services are critical calling for an increase on collaborative initiatives, to address possible challenges related to the provision of key services considered essential to ensure and improve resilient C2 and information superiority. Lessons observed in Russia's war of aggression against Ukraine stressed the need to foster and enhance a robust EU MS satellite constellation, including for a tactical use in the frame of battle damage assessment confirmation.

KEY AREAS

Space-based Earth Observation Capabilities
Focused on reinforcing existing
l intelligence and
capabilities through
rveillance, improving
ty, data sharing
and data processing, integrating novel analysis and data fusion techniques whilst leveraging the use of Artificial Intelligence (AI) supported systems.

EO

Positioning, Navigation and Timing
Focused on improving the accuracy and resilience of services, enhancing the
security to
vulnerabilities
oofing,
s) and
developing receivers and algorithms for multiple Global Navigation Satellite System (GNSS) systems usage.

PNT

Satellite Communication (SatCom)
Focused on secure and
Earth Orbit/Medium Earth Orbit)
constellations and terrestrial (5G) systems into SatCom systems.

SATCOM

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SPACE / THE 2023 EU CAPABILITY DEVELOPMENT **PRIORITIES**

New security challenges

Space Operations

The priority **SPACE OPERATIONS** encompass the launch, early-orbit, monitoring, management, execution, and protection of activities related to space missions and assets, ensuring their successful implementation and long-term sustainability in space. Space capabilities are fundamental to enabling all space operations, to protect satellites and to establish a framework of Space Situational Awareness (SSA) for detection, tracking, identification, and characterisation of space objects as SSA is key to the use of space for military operations. Space assets will have to be robust, reliable, resilient, and redundant to keep a high operational availability, since Space is expected to become an increasingly congested, contested, and competitive domain, and each asset will be vulnerable to a wider range of emerging threats.

KEY AREAS

Space Situational Awareness
Focused on fostering
tion,
identification,
risation and
n of all relevant
space objects, risks, and threats from, in and to the space domain.

SSA

Access to Space
Based on regulated and
coordinated regimes,
g an
e,
ility
ther
locations in support of defence objectives, including through responsive launchers.

Access (new)

Protection of Space Systems
Aims to identify risks
space systems.

Protection (new)

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EUROPEAN DEFENCE AGENCY

EARTH OBSERVATION – MILITARY REQUIREMENTS IN THE TIMEFRAME UP TO 2030+.

- **In EDA we have in house mechanisms to identify military requirements in the long term**
- **SBEO is vital for political, strategic, operational and tactical levels.**
- **Three capability development lines**
  - **High-revisit small satellite constellations** to complement very high-resolution systems, improving coverage and responsiveness,
  - **Multi-mission, multi-sensor ground segment** to enhance interoperability between different systems and missions and
  - **Improved use and sharing of satellite imagery**

KEY OPERATIONAL NEEDS AND REQUIREMENTS FOR THE MILITARY RELATED TO SBEO?

- Everything revolves around **on-demand, timely, secure, and reliable access to EO data—anytime, anywhere, and in any weather condition**.

- Secondly, **the quality of the information should be sufficient to enable meaningful extraction and facilitate prediction, supporting military decision-making.**

RESEARCH, TECHNOLOGY& INNOVATION

CAPTECH COMPOSITION

The CapTech Space is the biggest defence R&T community for space in Europe & the biggest EDA CapTech!

R&T for space defence for Europe to autonomously deploy, operate, and benefit from space capabilities.

23 Member States (inc. NO + CH)

~550 Participants (MS, industry & academia)

4 Industry Rapporteurs: SENER (ES), AIRBUS (DE), IABG (DE), FLYSIGHT (IT)

EUROPEAN DEFENCE AGENCY

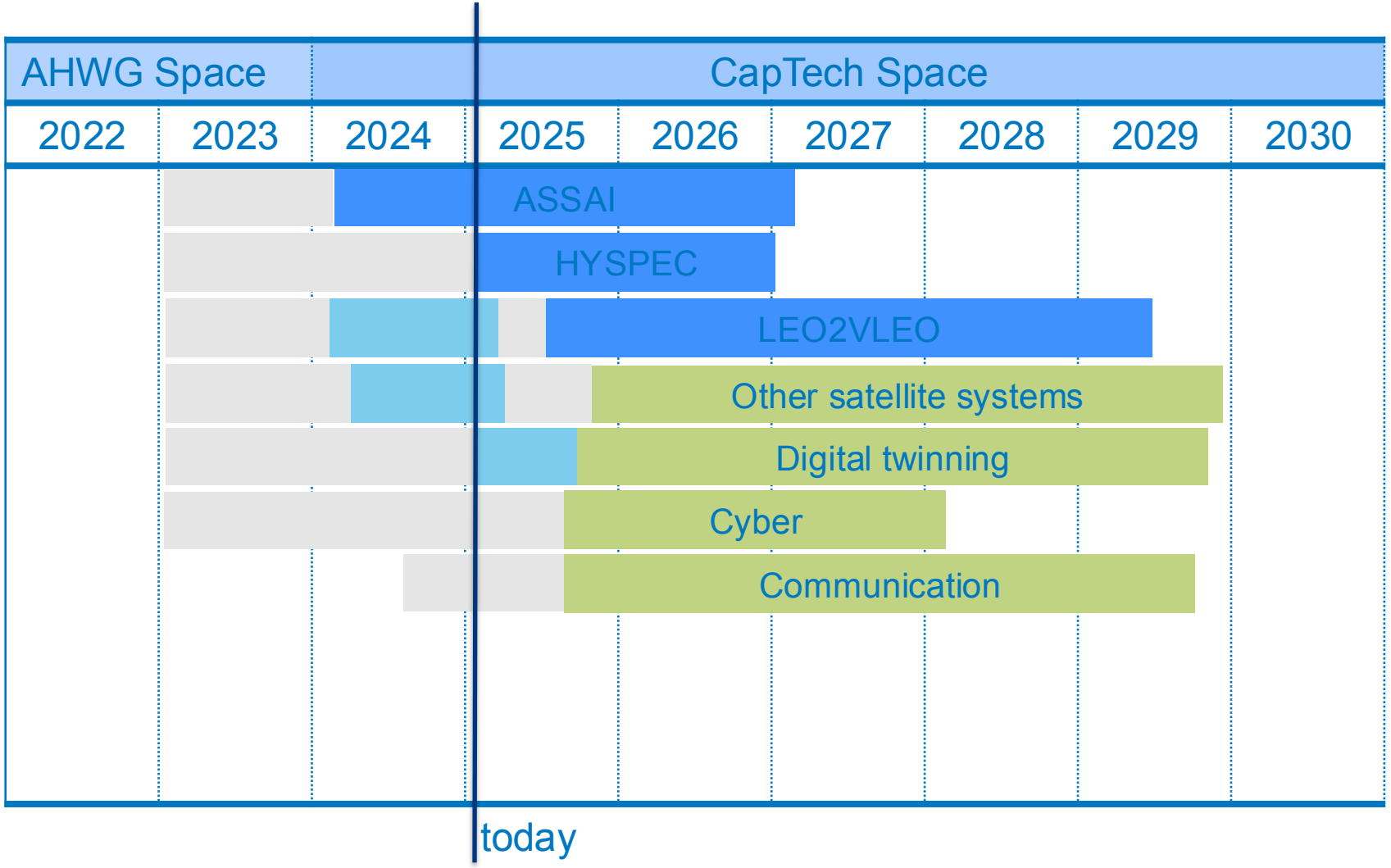
mapchart.net

CAPTECH SPACE PORTFOLIO FOR 2025

- CAT-Bs: Collaborative projects funded by Member States & (co)funded by industry
- 5 out of 8 CAT-Bs include R&T to support Earth Observation!

3 SIGNED CAT-Bs	19 M€
8 CATBs in preparation	38 M€
3 EDA OB STUDIES	1,3 M€
TOTAL	58,3 M€

* FOR THE CATBS IN PREPARATION THE BUDGET CORRESPONDS TO THE MINIMUM ESTIMATION AS OF TODAY WITHOUT CATB.11



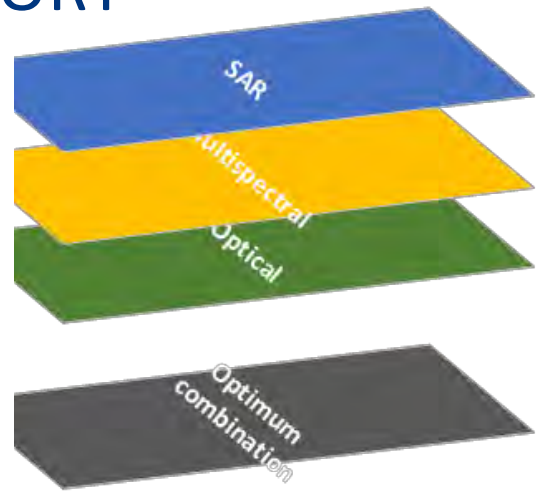
Ideation & Incubation

Signed CATBs In progress

CATBs in preparation

OB studies

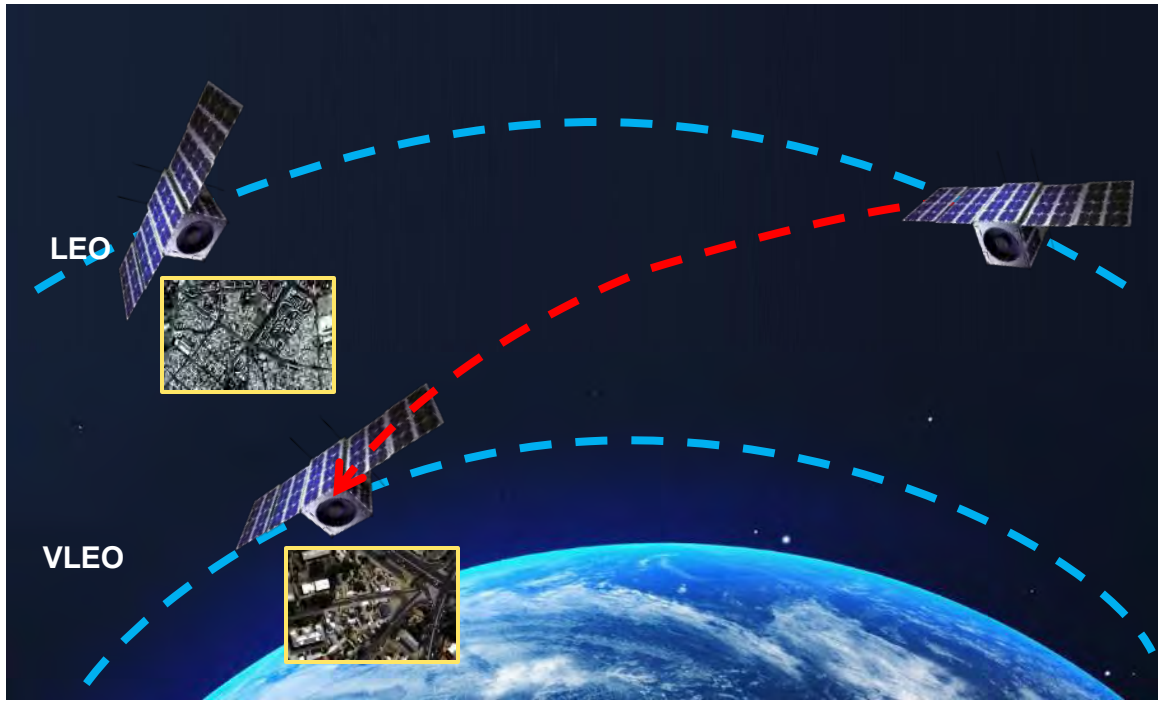
HYSPEC: HYPERSPECTRAL AND OTHER SPACE ASSETS (OPTICAL, SAR) EXPLOITATION WITH INTELLIGENT DATA PROCESSING TO SUPPORT MILITARY COMMANDER'S DECISION-MAKING PROCESS



- **Concept & Solution:**
  - Combine optical, hyperspectral and radar images of a given geographic area using AI
  - Improve object detection, anomaly detection, and target identification in satellite imagery.
  - Decision support platform using augmented reality
- MSs involved: IT (L), LU
- Consortium: FLYSIGHT (L) IT, e-GEOS (IT), LEONARDO (IT) , EarthLabL (LU), LIST (LU), TASL (LU), RSSH (LU)
- Duration: 24 months; Total Budget: **5 M€**
- **Status: PA signed, Kick-off Meeting in January 2025**
- **Follow-up topic in EDF 2024 (**DF-2024-LS-RA-CHALLENGE-SPACE-MSIAP: Multi-source satellite imagery analysis)

LEO2VLEO: MILITARY CRISIS-RESPONSE SATELLITE CONSTELLATION PROJECT

- **MSs involved: NL (L), AT**
- **Duration: 48 months; Total Budget: ~10 M€**
- **Status: PA signed ALSO BY EDA, Kick-off Meeting in Q2 2025**



Operational needs:

- **Crisis-response from space**
- **Low-cost solution with a short timeframe of implementation**

Expected outcome:

- **A crisis-response solution from space, with the ability to lower the orbit from LEO to VLEO fast**
- **The demonstration of innovative operations, maneuvering satellites between LEO and VLEO**
- **Combining options for Earth Observation (EO)/ Space Situational Awareness (SSA)/NavWar/Emergency-Communication capabilities within one constellation of satellites**

LESSONS LEARNT & THE WAY TO R&T AND INNOVATION FOR 2040+

1. **We all know that the technology pace for the space domain is very fast.**

2. **Space is not only a critical ecosystem but an umbrella domain which enable interoperability and integration with other domains**

3. **We need technological advancement and innovation to keep the pace with the evolving military needs.**

FUTURE R&T & INNOVATION PERSPECTIVES FOR 2040+?.

1. Activities & strategic investment on the system level

- Large and mega-constellations of multi-orbit and multi-sensor satellites with proliferated network architectures

2. R&T and innovation in specific fields namely to support:

- **the EO capability per se;**
- **Other services linked with EO like SSA & SATCOM**
- **in the domain of space operations**

FUTURE R&T & INNOVATION PERSPECTIVES FOR 2040+?

1. **R&T and innovation in specific fields namely to support:**

   - **the EO capability per se; - > AI for making new connections - drill out new features from combination of datasets, Spatial and temporal coverage**

   - **other services linked with EO like SSA -> novel protection tools addressing the threats of the 2040+ battlefield, quantum technologies**

   - **in the domain of space operations ->**

     - **logistics,**
     - **reconfigurable satellites,**
     - **additive manufacturing in space**
     - **New fuels, new propulsion schemes**
     - **AI-ENHANCED SATELLITE OPERATIONS by improving data processing, enhancing communication, and enabling autonomous satellite control.**

COOPERATION WITH OTHER ORGANISATIONS

ACTIVITIES WITH OTHER INSTITUTIONS – HOW WILL THESE EVOLVE IN 2040?

EUROPEAN UNION SATELLITE CENTRE
SatCen
Analysis for decision making

- Cooperative OB - Digital Twin Earth
- CapTech Space members

esa

- Joint Task Force
- Possible project cooperations

EUROPEAN SECURITY AND DEFENCE COLLEGE
COLLÈGE EUROPÉEN DE SÉCURITÉ ET DE DÉFENSE
ESDC

Doctoral Research Fellowship – coop.

EUROPEAN DEFENCE AGENCY

CapTech Space

EDF harmonization and other activities

European Commission

Exchanges, including staff-to-staff talks, cross-briefings and reciprocal invitations to events.

NATO OTAN

HOW TO BECOME A MEMBER OF CAPTECH SPACE?

Contact us with a brief presentation of your entity!

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THANK YOU FOR YOUR ATTENTION!
QUESTIONS?