

ADHA and the Needs for the Earth Observation Ecosystem

ADHA session to EDHPC Conference

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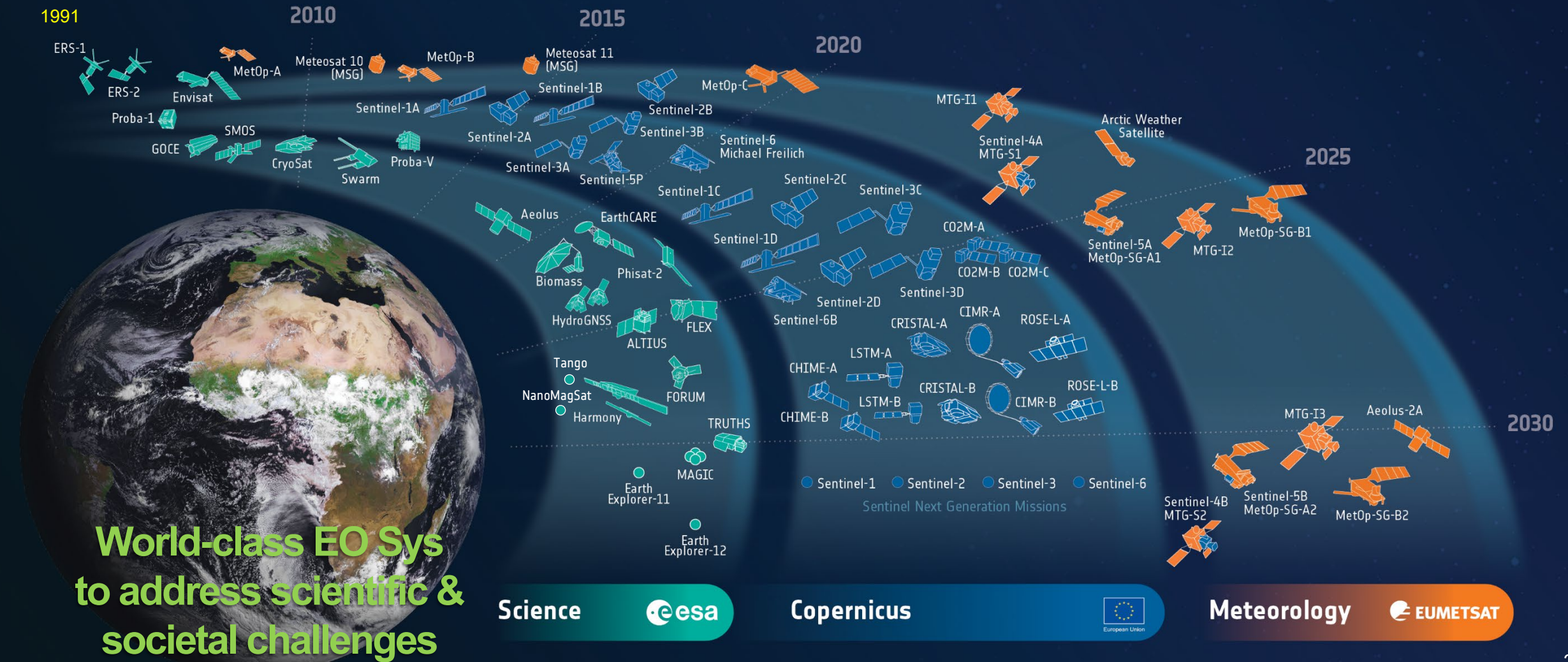
EO Technology Coordination, EOP-FMT
EO Future Missions and Architecture Department, EOP-F
Elx, ES, 13 October 2025

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Satellites: Heritage **08** / Operational **16** / Developing **40** / Preparing **22** / Total **86**

Ph. B2/C/D Ph. 0/A/B1



Higher performance / cost ratio

Largest part

- New Measurements/ **EO instruments** (enabler)
 - Higher spatial, temporal, radiometric, spectral resolution
 - Full spectrum 
 - Disruptive: e.g. "Quantum Sensing" 

Generic
e.g. via BA, GSTP

- Lower recurring **development cost / faster adoption**
 - **Platform Standardisation & multi source suppliers**
 - **Spin-in** techno: e.g. COTS
 - Lifetime & flexibility (FPGAs)
 - Digitalisation (e.g. MBSE, others)
-  **CleanSpace** (e.g. demisable, EoL disposal)

- **Big Data & Analytics** ([AI enabler](#)) & Data continuity



Miniaturisation and constellations

- More **autonomous** platform & operations & synchronisation
- **Distributed** Ground Segment

Not limited to **LEO**: also **HEO** & **GEO** orbits relevant for EO



ADHA System Studies – with FutureEO funding



cPCI-S-S

ADHA-1

- Formulation of initial concepts
- Industry agrees to use the cPCI-S-S Interconnect Standard

2019-2020

ADHA
Req.
Specs

ADHA-2 (ongoing)

- ADHA Req. Specs Issue#1 Published (2023) – mainly 6U
- 3x Core 6U-ADHA platform modules
- 2x 6U-ADHA Unit developments
- 6U-ADHA platform modules to be integrated in ADHA 6U Units
- ADHA 6U modules: Interoperability testing in 2 separate LSI test setups

2021-2026

ADHA-3

start in Q4 2025

- ADHA **Payload** Req. Spec. to be defined (**power + thermal challenges**)
- ADHA **3U** Req. Spec. defined & completed
- ADHA **SW** + **EGSE** Sys. Architecture Def.
- Extended 6U/3U **AIT campaigns** (Unit Integration and testing)
- Extension of concepts **beyond EO**: to SCI, Telecom, Exploration

2025-2027

M-IND: Industry-driven recommendations

- **35+** integrators involved in the M-IND initiative

Survey on platform &
Workshop @ **ESTEC 20th March 2025**



5 major M-IND recommendations

(M-IND Report in June-2025)

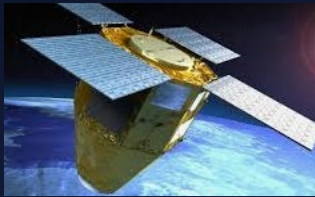
1. Industrialisation (MRL; support transition highly customised low volume to serial production)
2. Industrial Policy
3. Reduction and communalisation of interfaces
4. Priority platform subsystems (for competitive, modular and sovereign supply to integrators)
5. Constellation deployment and operations

Partially in GSTP Compendium + Roadmaps under preparation together with Programme Directorates

M-IND Implementation: multi-program



Funded by TDE & GSTP,
led by TEC



Not all
cross points
apply to all

IRIS²
LEO Platform Products

ERS
LEO Platform Products

LEO PNT
Platform Products



Funded & led by
Application
Directorates

ADHA – APA (in mid-size sat context)

- **Highly vertical integration** (industrial + technical miniaturisation)
- More digital & High Power consumption → thermal dissipation
- **M-IND Reduced & Common Interfaces:**
 - KO end-Oct.2025 with SpinIn + 3 LSIs
 - **Survey Dec Q4-2025** → for all (Integrators + Suppliers) in Europe
 - **mini-Workshop (End-Jan. 2026, TBC)**

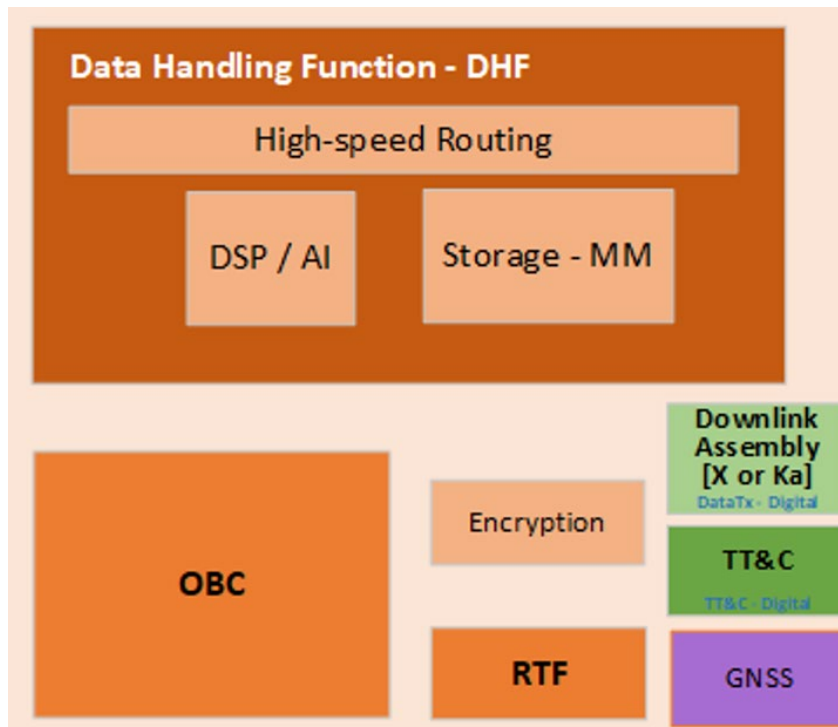
Ethernet, SpFi, SpW, CAN
28V, 70V, ...
other

EO Instruments

- Very High-Res
- also Lower-res

PCDU

- Primary Voltage
- Secondary Volt.



Comms (on-board + direct-to-ground + ISL)

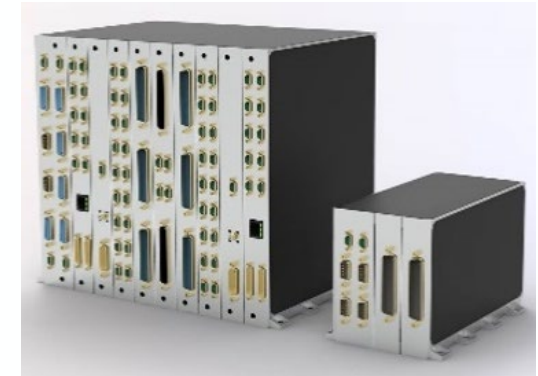
- Low rate (kb/s)
- High rate (Gb/s)
- **New functions: security, routing**

Centralised vs decentralised

- High integration
- Modularity
- SW aspects (AOCS)

Eurocard sizes:

- 6U: 220x233mm,
- 3U: 220x100mm





Mission Definition & Feasibility (Ph.0/A)

- **Earth Explorer-13** : 4 mission concepts in **Ph.0** ; ≤ 2 in Ph.A ; Implem. after CM31
- **Earth Explorer-12** : 2 mission concepts in **Ph.A** ; Implem. after CM28
- **Scout-3rd cycle**: ≤ 4 mission concepts in Consolidation Phase; ≤ 2 for Implem. after CM28
- **Stepping Stones** ≤ 4 mission concepts in Definition Phase
- **Sent-6 NG** : **Phase A/B1** (additional freq. for RA + MWR) ; for Implem. after CM28
- **Meteosat 4th Gen.** **Phase 0**
- **Missions of Opportunity** **Phase 0**
- **Phi-Sat-3** **Up to Ph.E1**

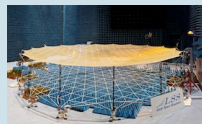
At end of Ph.B1 (ISRR)
→ Target TRL 5 Instruments
TRL 6 Equipment
SRL 5

Pillar 1

(3 interlinked areas)

Technology Maturation

- Instrument maturation
 - as part of Ph.0/A
 - support to Commended EE-13, future Meteo Missions
 - new low TRL concepts, miniaturisation
- Other Preparatory : e.g. architectural / system studies
 - In synergies with DPTD / GSTP for EO
 - **Standard Platform + Communications**
 - Frequency Management



Science & Applications (with EOP-S)

- BoostFutureEO in
 - Step-1: EO Science Strategy = update of Living Planet Challenges
 - Step-2: New EO Mission Ideas (NEOMI)
 - Step-3/4: as part of Phase 0/A
- End-to-End Simulation :
 - as part of Ph. 0/A
 - also enable new EO concepts (low SRL)
- Campaigns (in-situ, airborne)



EOP Technology needs (incl. European independence)

- New + higher performance (EO instruments – also for the digital ADHA part)
- Higher efficiency (incl. platform / instruments)

Driven by **Large Satellites** (institutional),
but **growing needs for mid-size Sats** (Scouts, constellations) → M-IND

FutureEO – Pillar 1

Mission Definition



FutureEO Programme

- Unique synergizer to build the whole range of ESA EO missions
- EO technology needs **grows**



More about EO Technology:
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