

Upcoming scientific missions and key opportunities for the Polish sector towards CM25 and CM28

Space Sector Forum, Warsaw
4 June 2024

Frédéric Sifa
Future Missions Department
ESA Directorate of Science

Highly competitive programme

- Competitive selection through open Calls, aiming at scientific excellence
- Competitive industrial implementation

Direct Member States involvement

- Generally for science payload provision and science ground segment
- Also involve international partners: NASA, JAXA, CAS

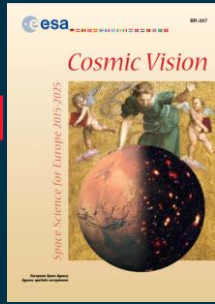
Diverse programme, addressing all space science fields

- 11 missions in preparation or development phase, 19 missions in orbit operations
- Structured Long term Plans: Cosmic Vision Plan 2015-2035 followed by Voyage 2050 Plan

Regular flow of L (flagship), M (medium-size), and F (Fast, small-size) missions

- Robust technology preparation, for the payload and the platform, enabling timely implementation

SOLAR SYSTEM



Solar System



solar orbiter (2020-)
proba-2 (2009-)
soho (1995-)
hinode (2006-)
iris (2013-)

proba-3 (2024)
solar-c (2028)
envision (2031)
smile (2025)
comet interceptor (2029)
martian moons exploration (2026)

IN DEVELOPMENT

bepicolombo (2018-)

cluster (2000-)

mars express (2003-)

exomars trace gas orbiter (2016-)

juice (2023-)

ACTIVE



ulysses (1990-2009)

venus express (2005-2014)

giotto (1985-1992)

double star (2003-2008)

smart-1 (2003-2006)

chandrayaan-1 (2008-2009)

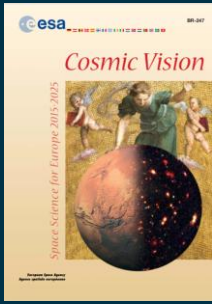
chang'e 1 (2007-2009)

rosetta (2004-2016)

cassini-huygens (1997-2017)

LEGACY

COSMIC OBSERVERS



Cosmic Observers



IN DEVELOPMENT



ACTIVE



microwaves

sub-millimetre

infrared

optical

ultraviolet

x-rays

gamma rays

gravitational waves

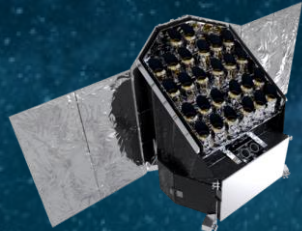
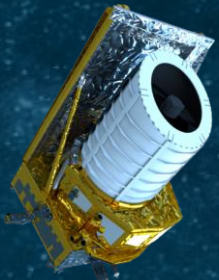
LEGACY



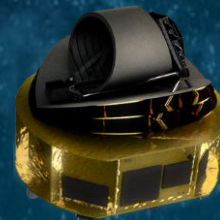
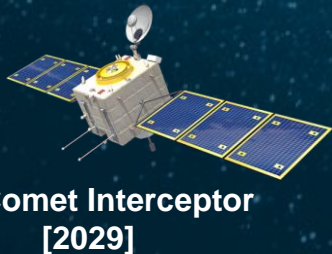
Cosmic Vision Plan 2015-2035



Medium-class missions



Large-class missions

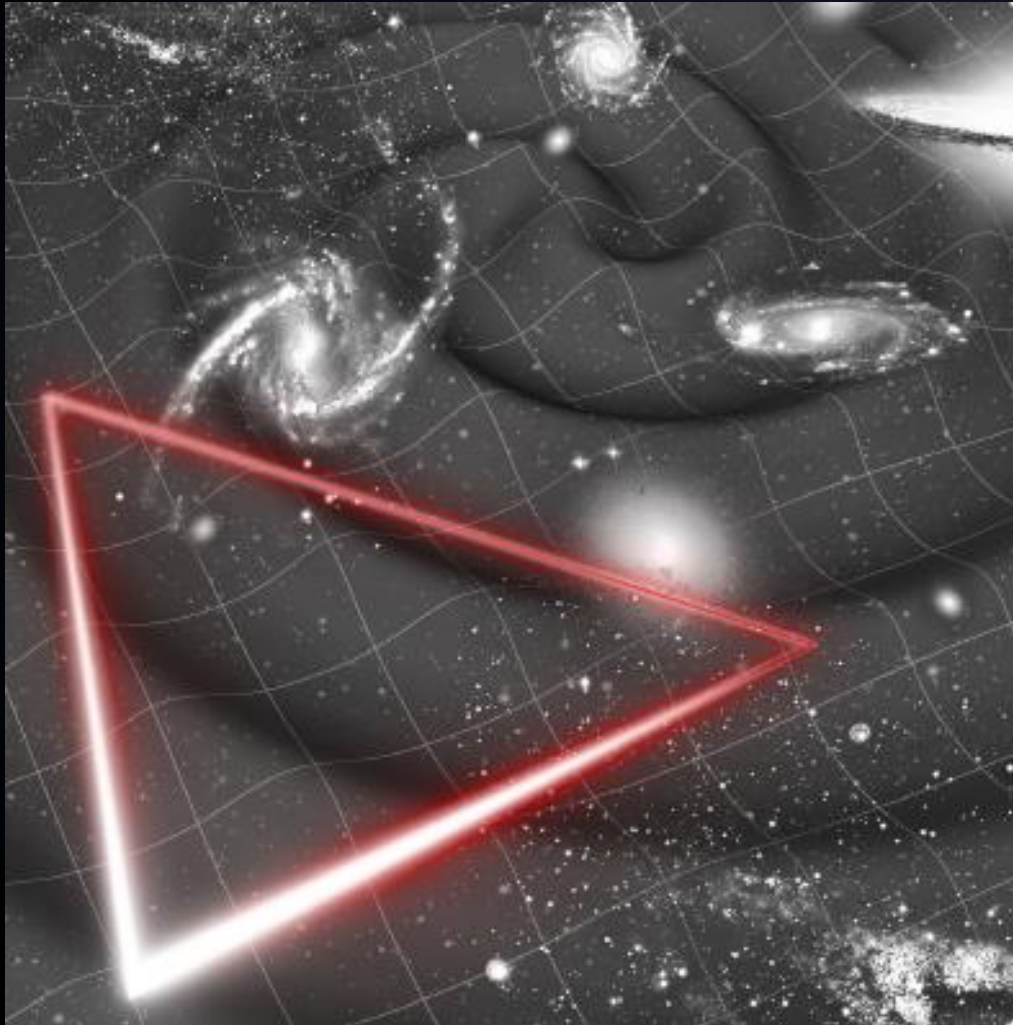


Small/Fast missions



D-SCI Town Hall | 28 May 2024

→ THE EUROPEAN SPACE AGENCY



EnVision Venus Orbiter

*Understanding why Venus is so different from Earth
Launch end 2031*

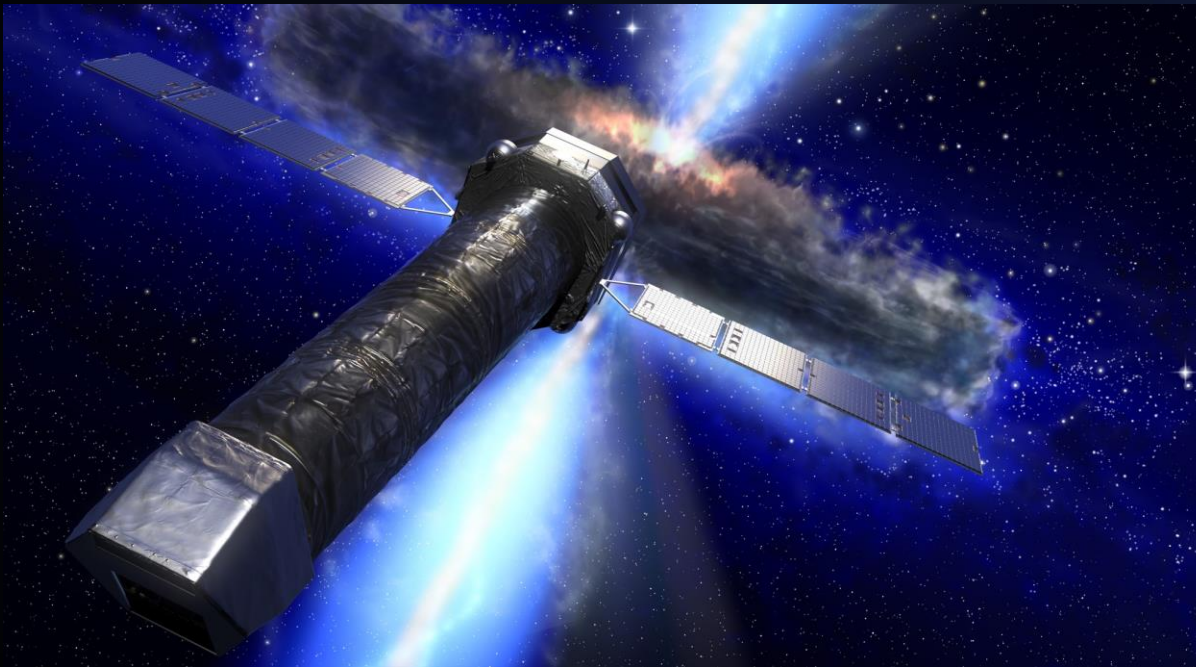
LISA Gravitational Waves Observatory

Constellation of three 2.5-ton SC, launch in 2035

ESA UNCLASSIFIED – For Official Use



Next L/M missions: NewAthena and M7



*NewAthena X-ray Observatory
14.5 m, 7 tons
Mission adoption planned in Q1-2027*



M-MATISSE

Mars - Magnetosphere and Ionosphere and Space-weather

A mission proposal in ans Phase-2 (July 2022)

Lead proposer:

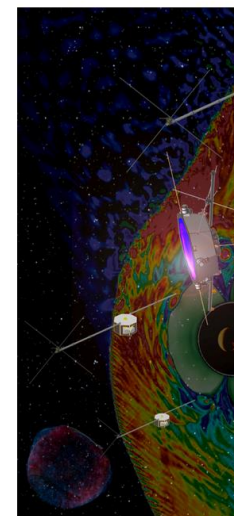
Beatriz Sánchez-Cano, University of Leicester, U

Co-Lead proposer:

François Leblanc, LATMOS, CNRS, Sorbonn

Call for a Medium-size and a Fast mission opportunity in ESA's Science Programme - 2021
M-class mission to be launched around 2037 (M7)
Phase-2 proposal

Plasma Observatory



Unveiling plasma energization and plasma environment through

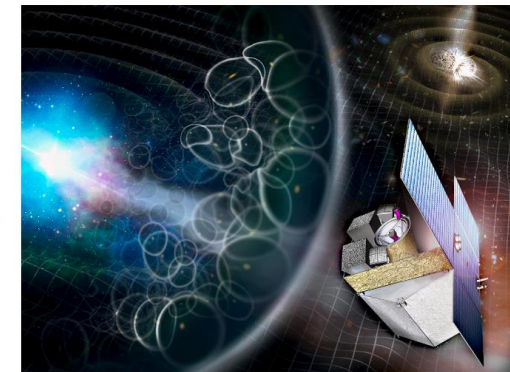
Lead Proposer: Mari

15 July

Phase-II proposal for ESA Medium-class mission opportunity
(ESA Call issued on 13 December 2021)

THESEUS

Transient High-Energy Sky and Early Universe Surveyor



Lead Proposer: Dr. Lorenzo Amati (INAF - OAS Bologna, Italy)
Co-Leads: Prof. Paul O'Brien (Univ. Leicester, UK), Dr. Diego Götz (CEA/Irfu, France), Prof. Andrea Santangelo (Univ. Tübingen, Germany), Dr. Enrico Bozzo (Univ. Geneva, Switzerland)
Lead of USA contribution: Dr. Miles Smith (NASA/JPL, USA)

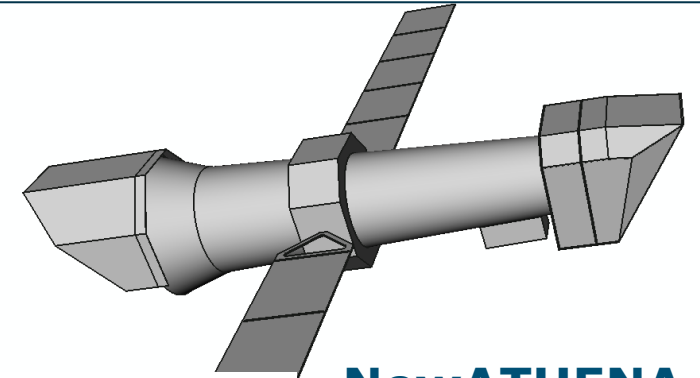
*Voyage 2050
M7 candidates*





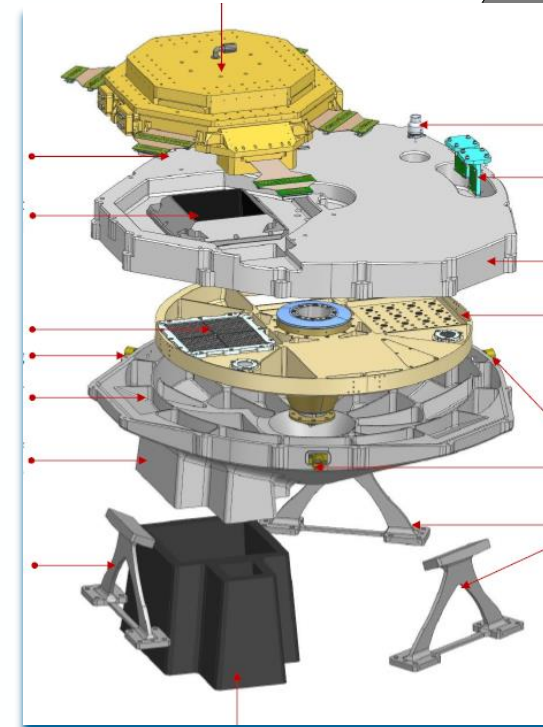
Plasma-Obs

- Daughtercraft payload suite and parts of the EMI instrument on Mothercraft
- ESA contract on daughtercraft pre-development



NewATHENA

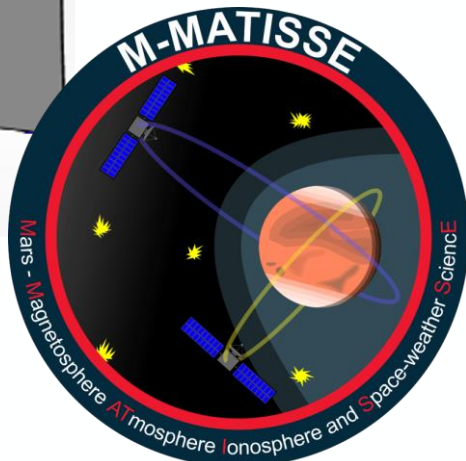
- WFI filter wheel assembly and power supply
- ESA contracts on large mirror mechanism



Theseus

Theseus

Power supply units (boards) for the Data Handling Units



M-Matisse

Contribution to COMPASS e-box

Voyage 2050 L4 mission to the Saturn system

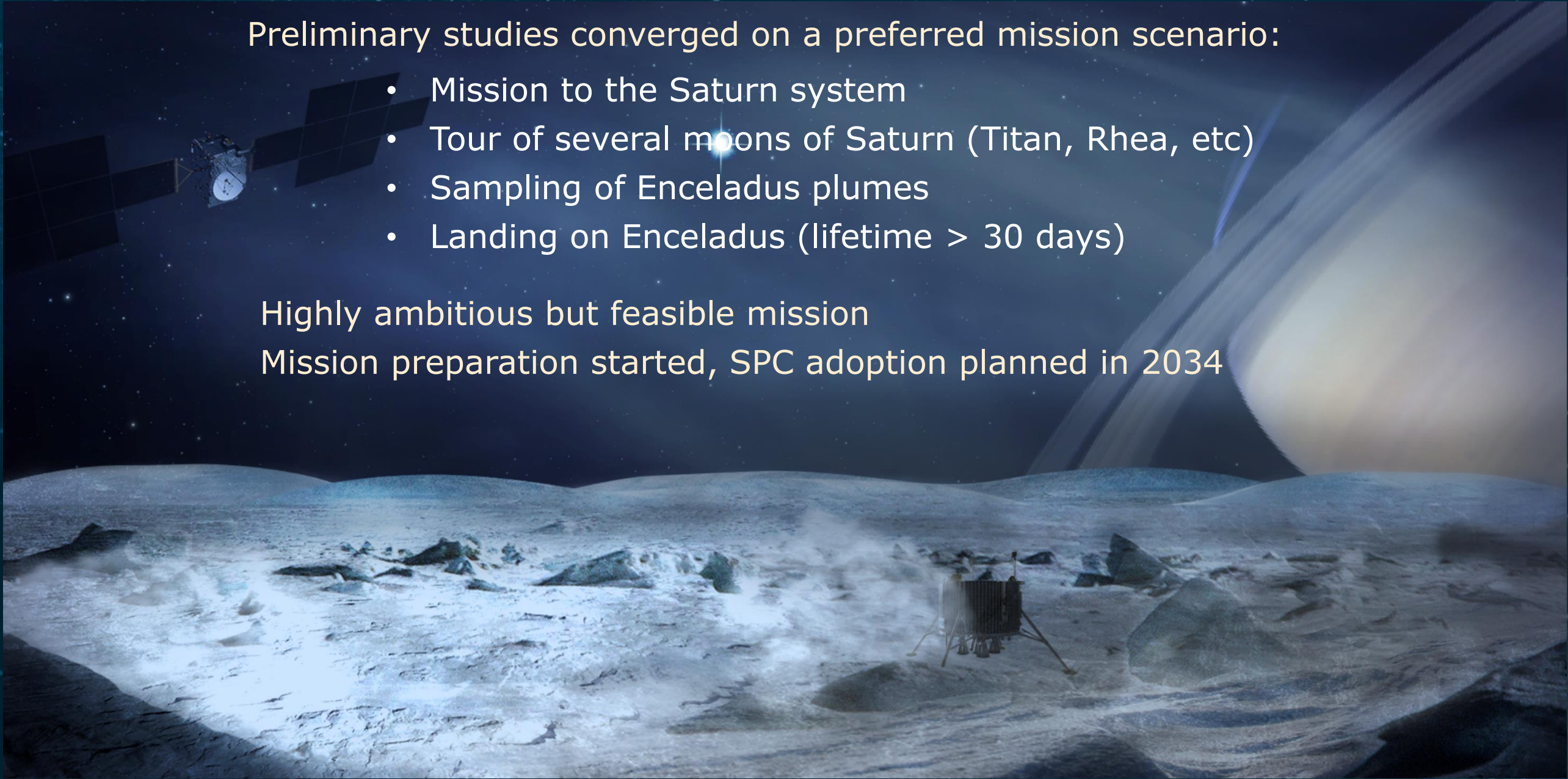


Preliminary studies converged on a preferred mission scenario:

- Mission to the Saturn system
- Tour of several moons of Saturn (Titan, Rhea, etc)
- Sampling of Enceladus plumes
- Landing on Enceladus (lifetime > 30 days)

Highly ambitious but feasible mission

Mission preparation started, SPC adoption planned in 2034



L4 mission will boost our technologies in several domains

Launch mass capability

In-orbit assembly with A64 double launch, potentially fueling in-orbit

High reliability in extreme environment

Long operations, cold temperatures (70 K), far distance (10 AU), radiation tolerance

Energy management

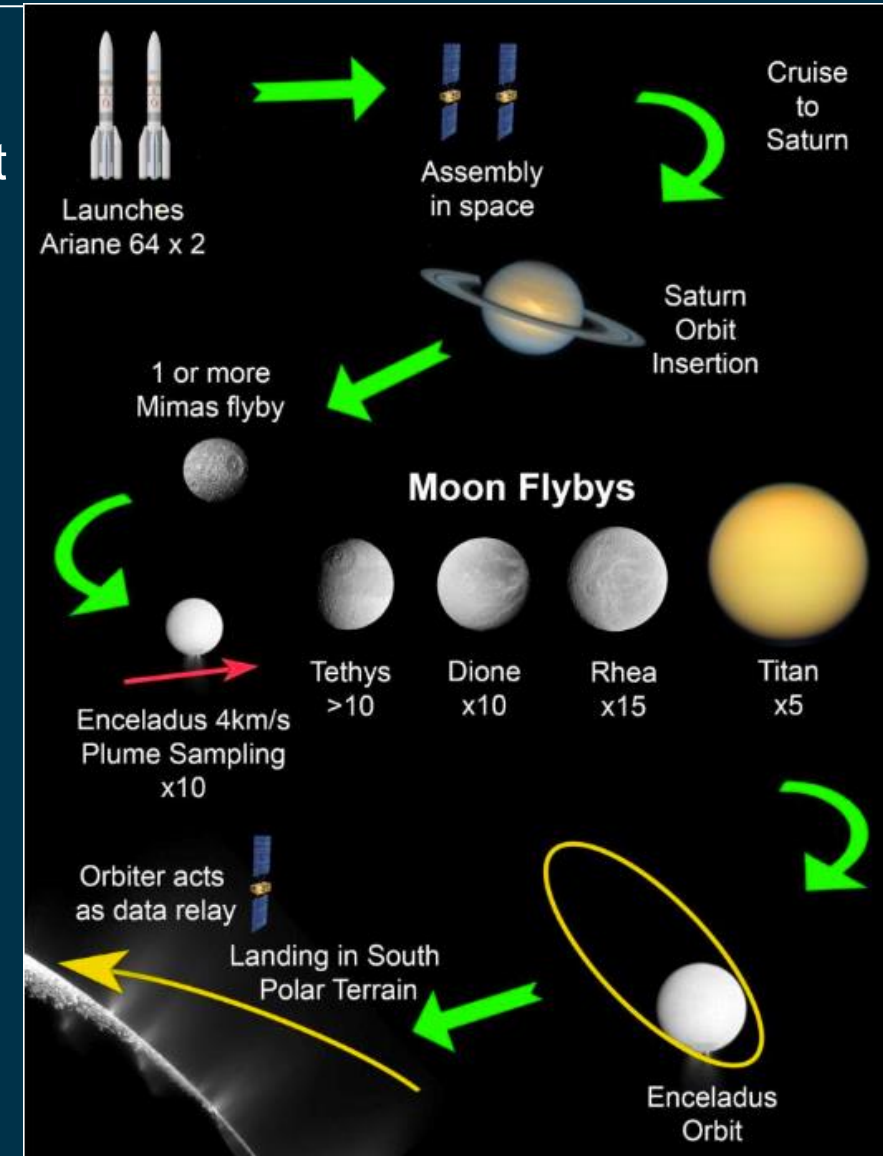
Large deployable solar arrays (Sun flux reduced by 100), Efficient energy storage for lander: batteries, fuel cells, potentially RTGs

Landing technologies

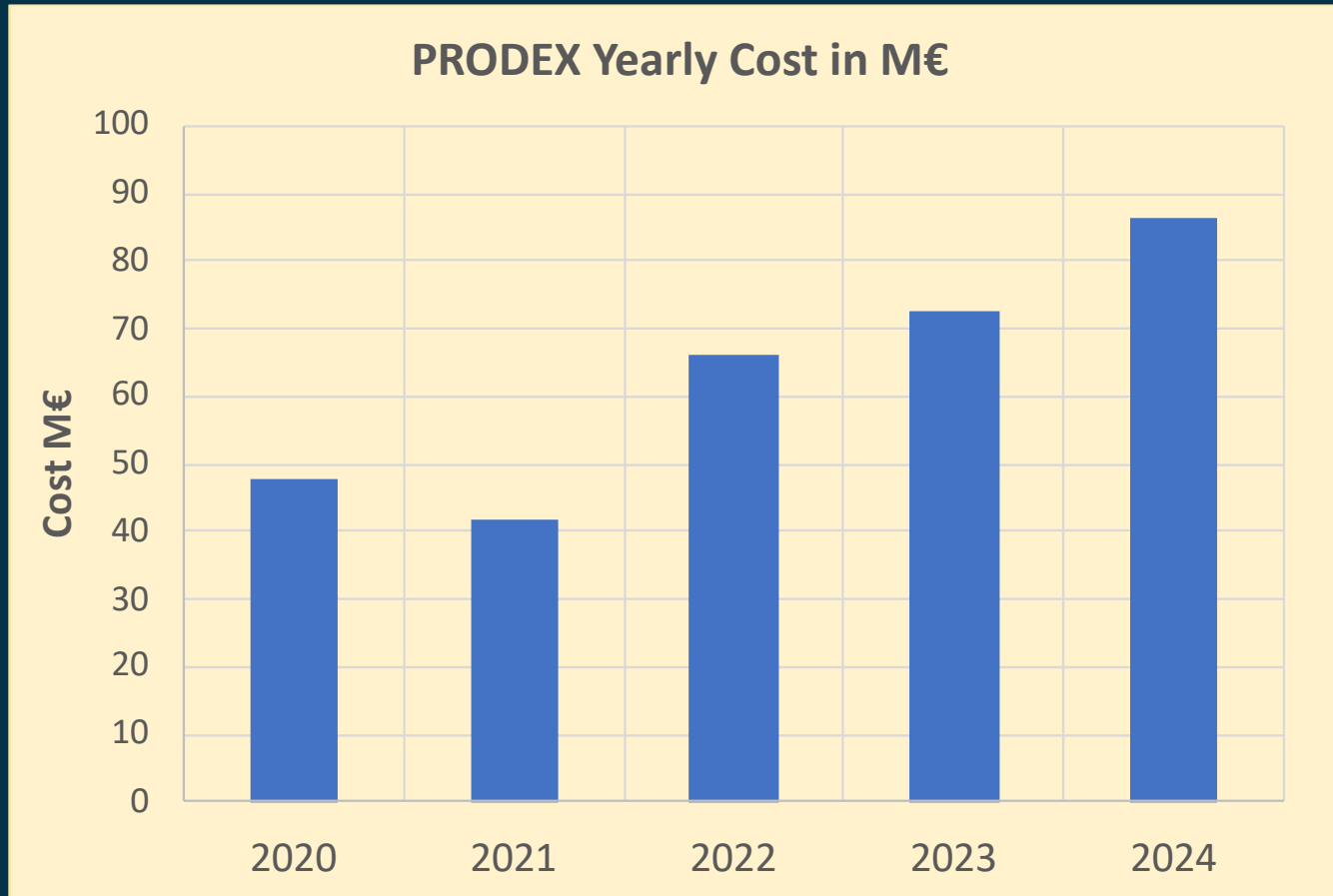
Propulsion, Artificial Intelligence for autonomous operations

Instrumentation technologies

Plume sampling, in situ measurement miniaturisation



Prodex programme : A powerful tool for Member State engagement and development of capabilities



*Growing programme supporting 17 Member States
Budget approaching 90 M€/yr*

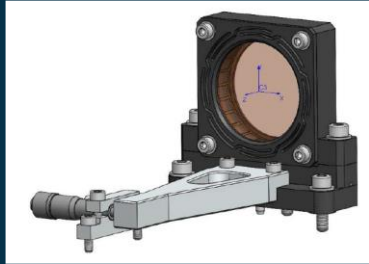
- | | |
|-----------------------|------------------------|
| Switzerland (1986) | The Netherlands (2012) |
| Ireland (1987) | Poland (2012) |
| Belgium (1988) | Romania (2012) |
| Norway (1989) | Portugal (2016) |
| Austria (1991) | Slovenia (2016) |
| Denmark (1994) | Spain (2016) |
| Czech Republic (2008) | Hungary (2017) |
| Greece (2008) | Finland (2019) |
| Estonia (2021) | |



Prodex recent achievements



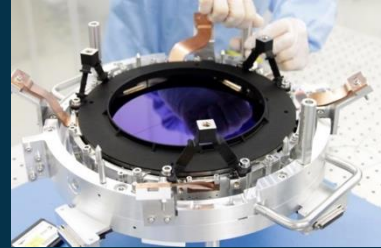
AT: Comet Interceptor
DFP Fluxgate
magnetometer (EM)



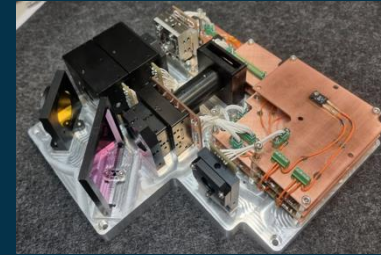
CZ: ARIEL common optics



EE: OPIC instrument
EFM, Comet Interceptor



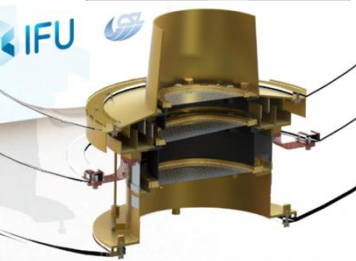
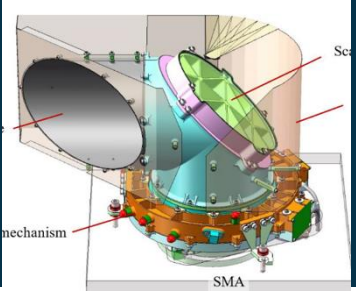
ES: PLATO cameras –
Focal Plane Assembly
Structure



FI: Comet Interceptor
MIRMIS NIR-MIR
channels (STM)



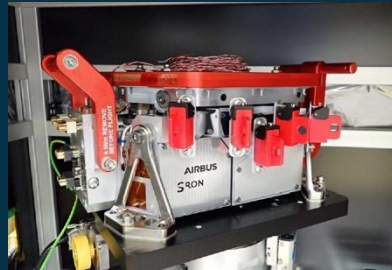
PT: PLATO OGSE
& MLI



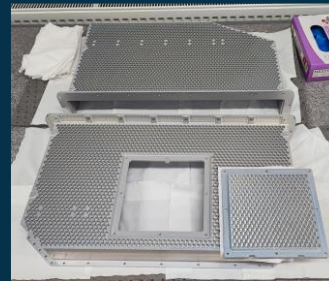
BE: Comet Interceptor
CoCa pointing mirror (top)
ATHENA X-IFU
Aperture Cylinder
(bottom)



DK: ARIEL bipods



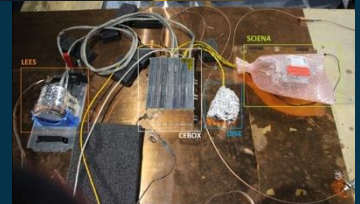
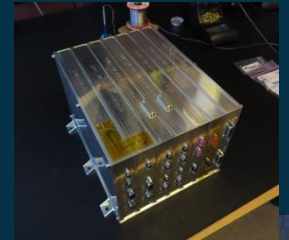
NL: SPEX-one
Earth atmosphere
Polarimeter



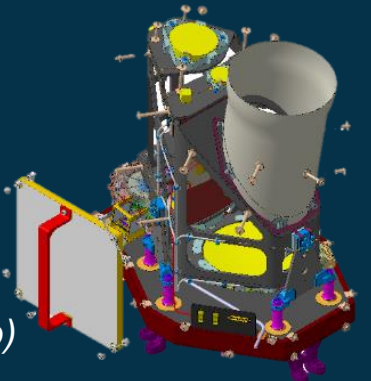
HU: ARIEL MGSE,
instrument radiator



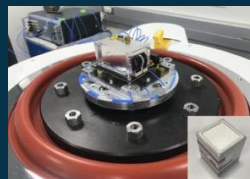
NO: SMILE
radiation shutter



PL: Comet Interceptor
DFP : EM EMC test
and CEBOX



CH: Comet Interceptor
CoCa instrument



IE: EIRSAT-1
3 experiments

RO – LISA
Low-latency pipelines.



Future science missions and opportunities

Mission (Project phase)	SPC adoption	Technology preparation phase	Flight Model industrial opportunities
EnVision (Phase B2)	Done in Jan-24	completed	2024-2027
LISA (Phase B2)	Done in Jan-24	completed	2024-2027
ARRAKIHS (F2, Phase A/B)	June 2026	2024-2026	2024-2026
NewATHENA (Phase B1)	Q1-2027	Ending 2026	2027-2029
M7 mission (competitive Phase A) <i>M-Matisse, Plasma-Obs or Theseus</i>	Q4-2028 <i>M7 selection Jun-26</i>	2024-2028	2029-2031
L4 mission to Saturn/Enceladus	2034	2025-2034	2035-2038
<i>VOYAGE 2050 second Call for new missions in 2025 (tbc)</i>	2030 (F3) 2032 (M8)	2027-2029 (F3) 2028-2032 (M8)	2027-2029 (F3) 2033-2036 (M8)

Useful contact points

Future science missions department: frederic.safa@esa.int

Future science missions definition: peter.falkner@esa.int

Technology plan: marcos.bavdaz@esa.int

Payload definition & pre-developments: martin.linder@esa.int

PRODEX programme: michel.lazerges@esa.int

The end

