



# *Be Ready with your Space Electronics – the future is near*

*Gaisler 25 Years In Space*

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ESA UNCLASSIFIED - For ESA Official Use Only



→ THE EUROPEAN SPACE AGENCY

**1: How ESA envisions the future**

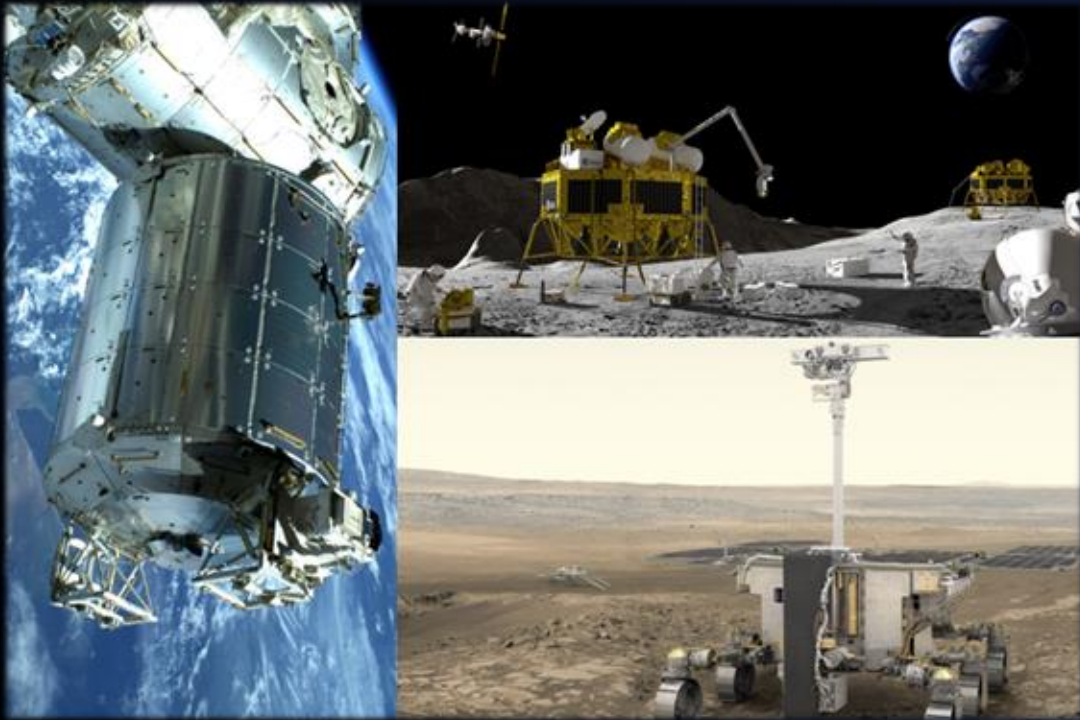
**2: Missions' requirements: examples of applications**

**3: What it means for electronics**

# 1: How ESA envisions the future



# CM25: some highlights



**Cosmic Vision**

**L4**  
Moons of the Giant Planets

**L5**  
From temperate exoplanets to the Milky Way

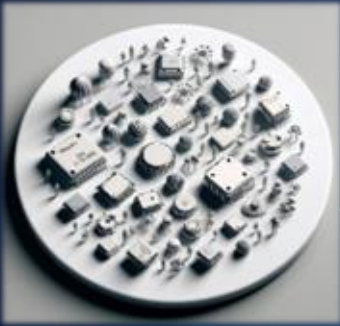
**L6**  
New physical probes of the early Universe

Large ..... → Leadership

Medium, Fast, mini-Fast ..... → New calls to widen bottom-up community engagement

International cooperation ..... → Grant access to 'Flagship' missions for European scientists and Member States

**CM25** → **CM28 - CM31**



ESA-CM2025-press conference



# ESA Technology 2040



## Artificial Intelligence

- Space missions design, development & engineering
- Space missions manufacturing: assembly integration test and validation
- Mission operations to improve efficiency, effectiveness & autonomy



## Quantum Technologies

- Cold atom technologies for Rubidium and Strontium based devices
- Optical Clock Technologies
- Optical ground station developments for QKD
- Quantum computing algorithms for space



## VLEO

- Enhanced observation capabilities
- Higher data rates / lower latency
- Natural end-of-life disposal / milder radiation environment.
- Compact and high efficiency/long lifetime electrical propulsion technologies,
- atomic oxygen (ATOX) resistant solutions



## Innovative Propulsion

- Higher performance technologies (e.g., Advance Airbreathing Propulsion)
- Technologies expanding the space logistic capabilities Innovative Aerodynamic Surfaces, ISRU propellants)
- Greener and lower cost technologies (e.g. Long-Term Storability & Operation of H2 Peroxide, Water Propulsion)

Technology\_2040.pdf



# ESA Strategy 2040

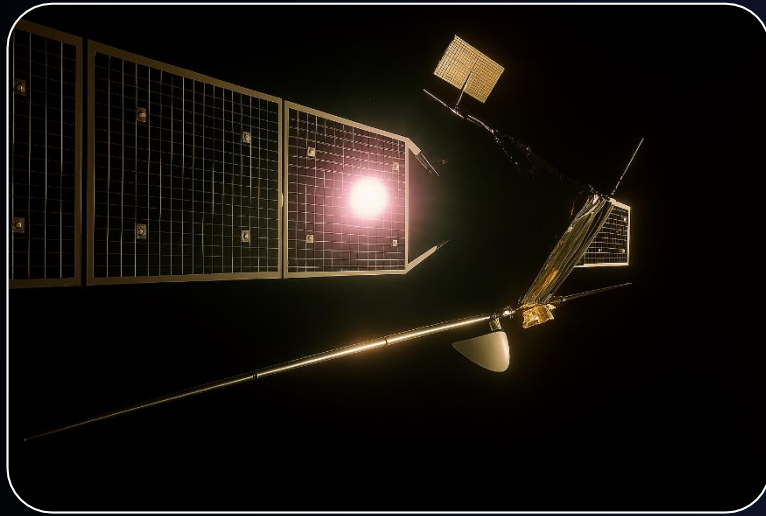


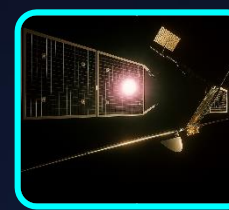
## 5 Goals with tangible objectives and strategic actions to achieve them

1. Protect our Planet and Climate
2. Explore and Discover
3. Strengthen European Autonomy & Resilience
4. Boost European Growth and Competitiveness
5. Inspire Europe



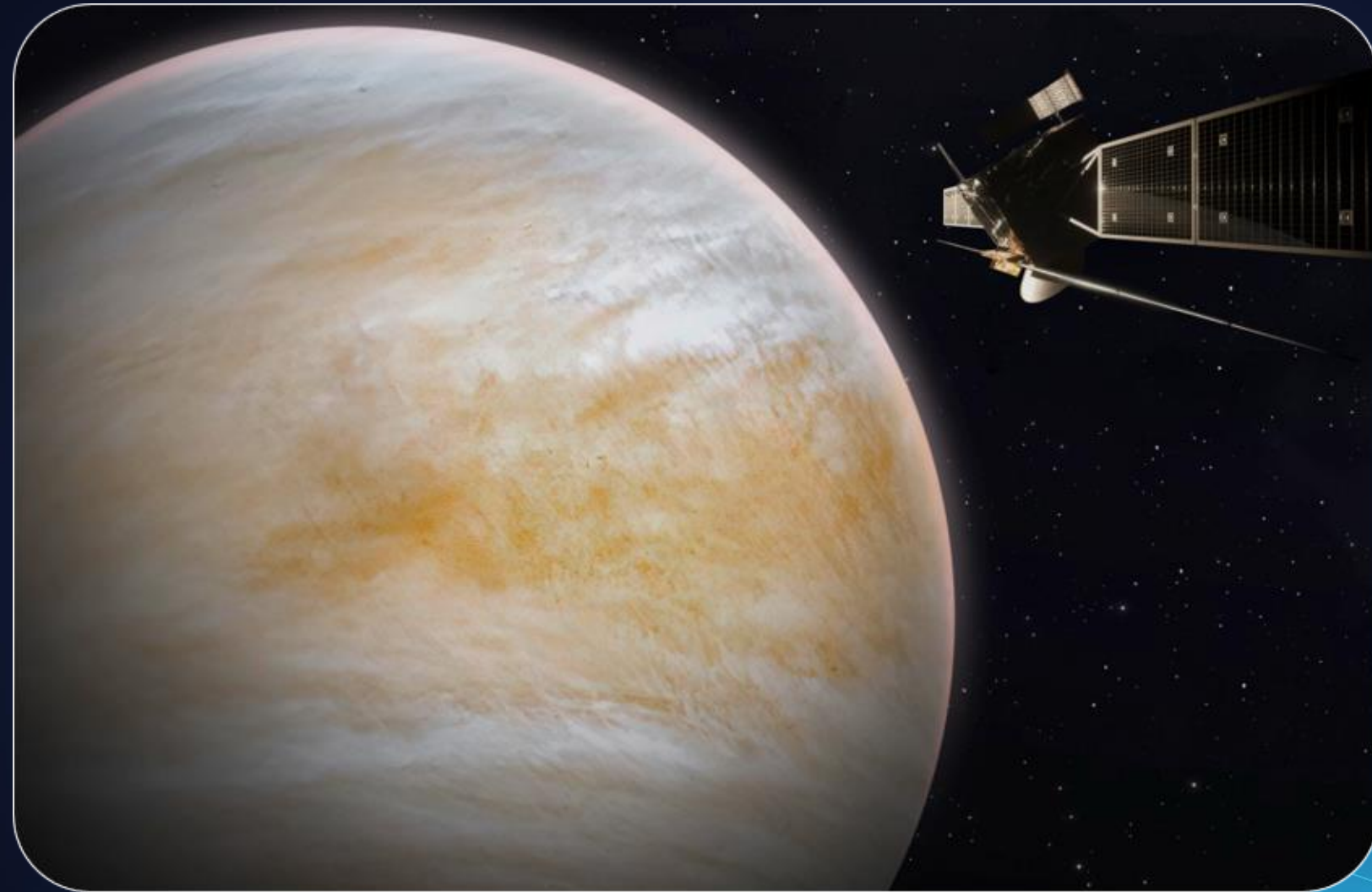
# 2: Missions' requirements examples

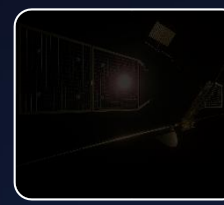




## Planetary Exploration Use-Case

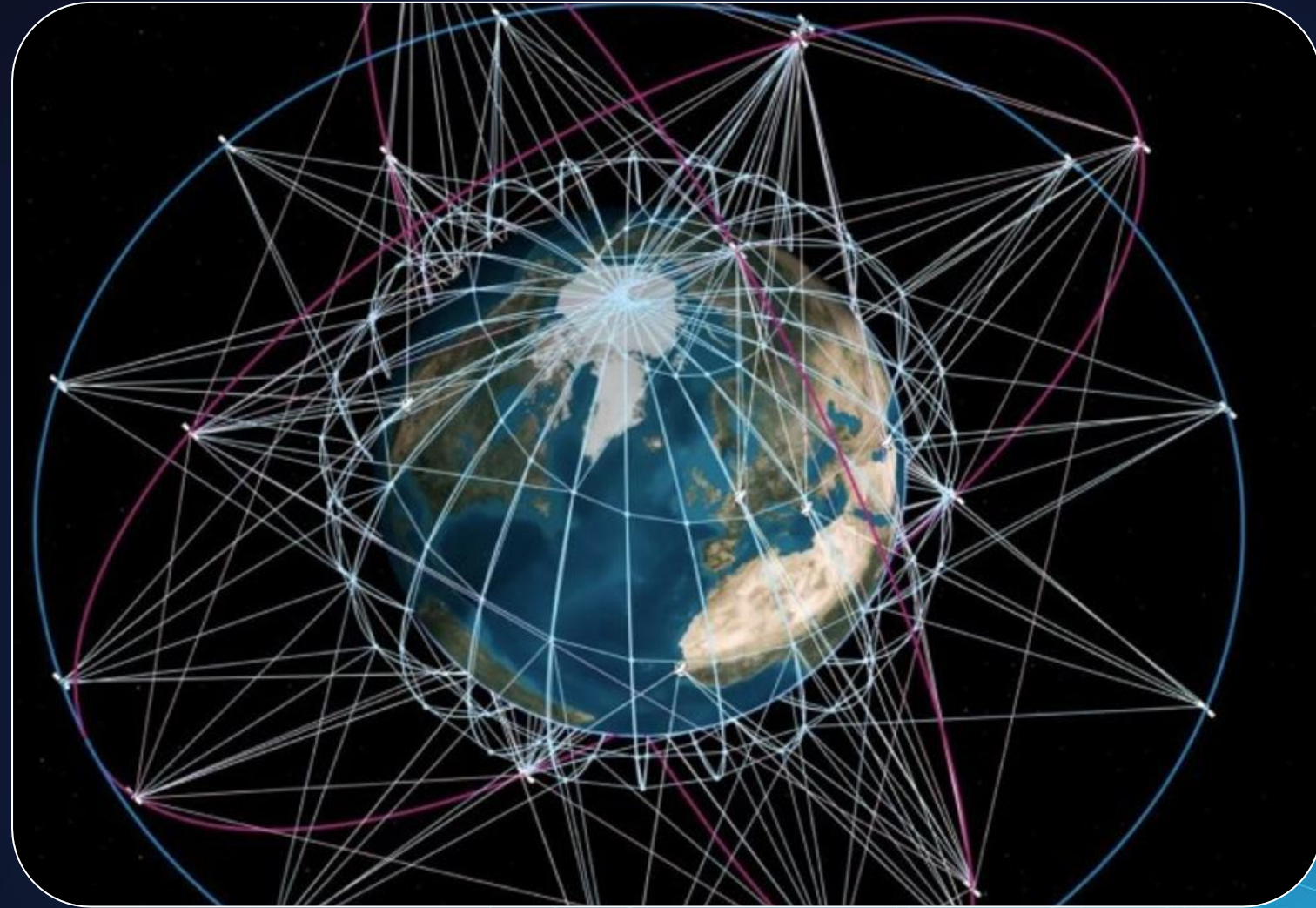
1. OWLT = 20'
2. VIO: T=146h; SCI-O : T = 94'
3. 15m Aerobraking; 2000 passes  
High Temp. & ATOX
4. FDIR, bail-out manoeuvre
5. One orbit determination per day
6. 6 Venus cycles  
~200 Tb of science data return

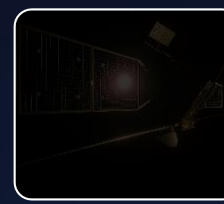




## Telecom multi-orbit constellation Use-Case

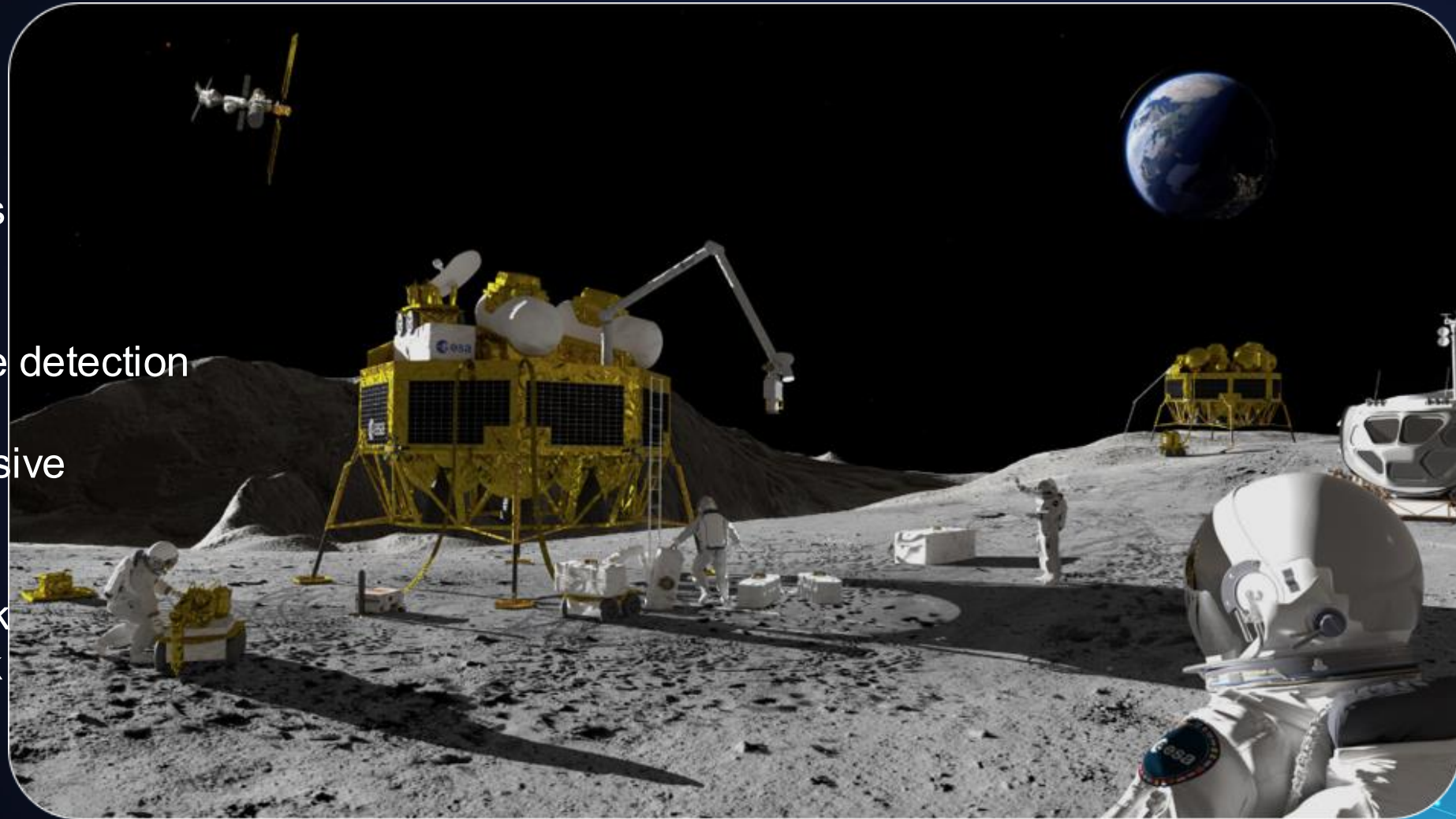
1. 290 Sats in MEO & LEO
2. DBFN
3. 5G Stack
4. SDR
5. GOV: Crypto & Cyber





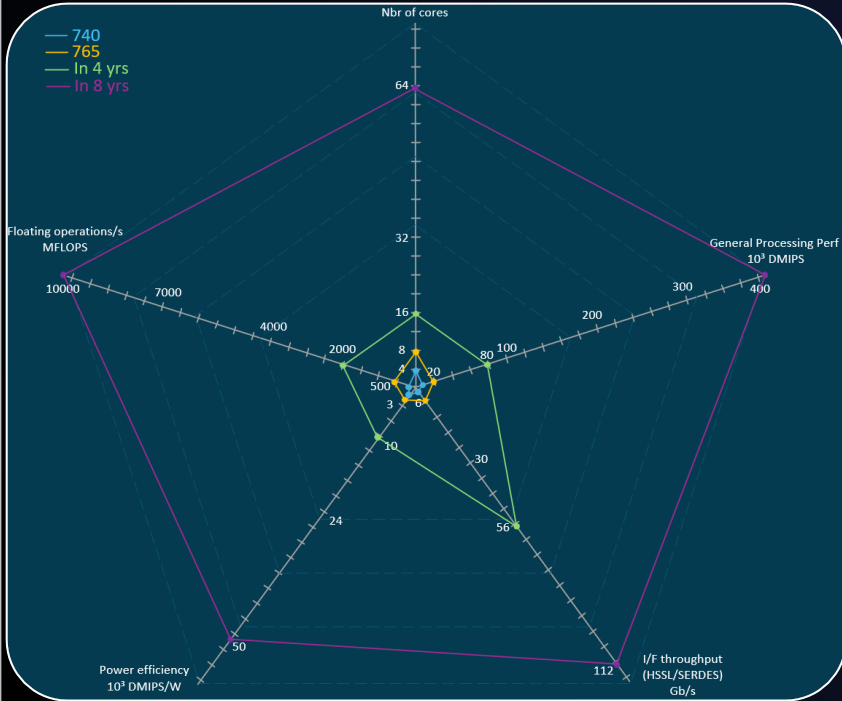
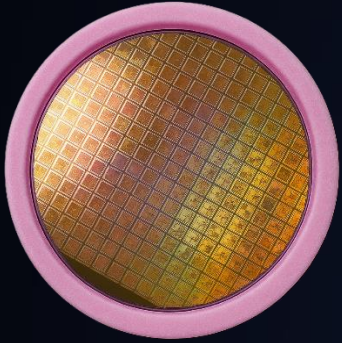
## Lunar Lander Use-Case

1. Autonomous operations
2. Dense optical flow relative navigation & slope detection
3. Computationally expensive 3D reconstruction
4. Artificial Neural Network to Spiking Neural Network

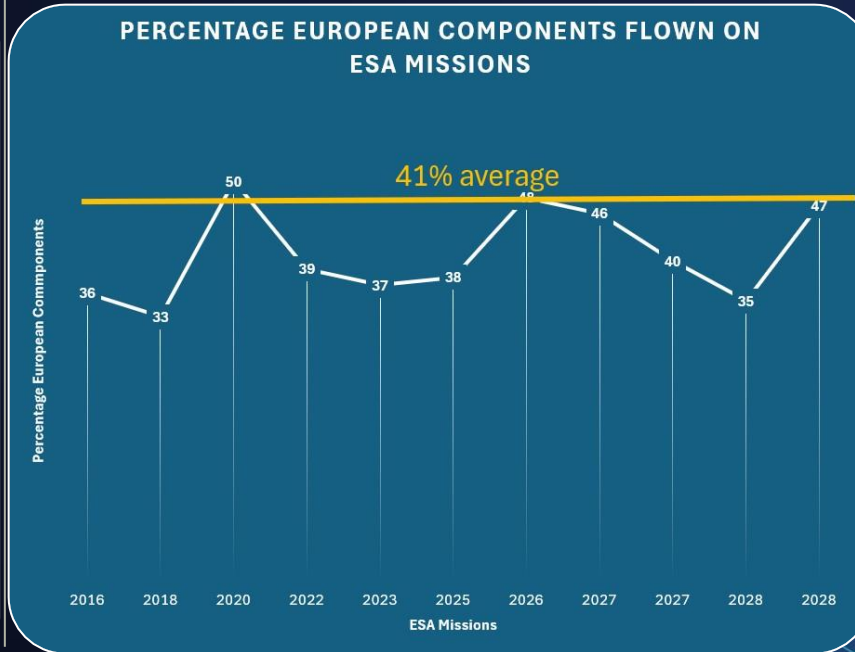


# 3: What it means for your electronics

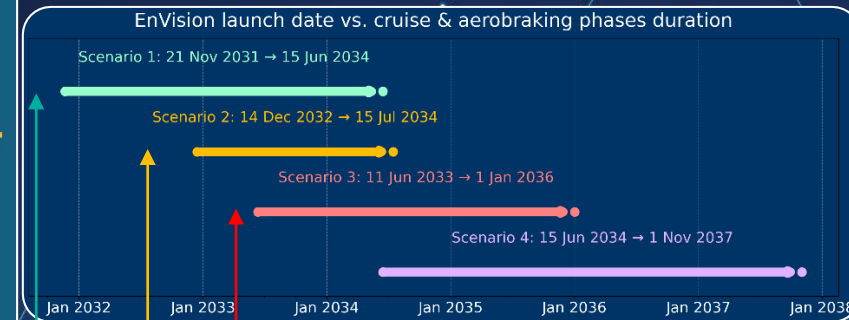
## Capabilities & Spec



## Sovereignty



## Time to market



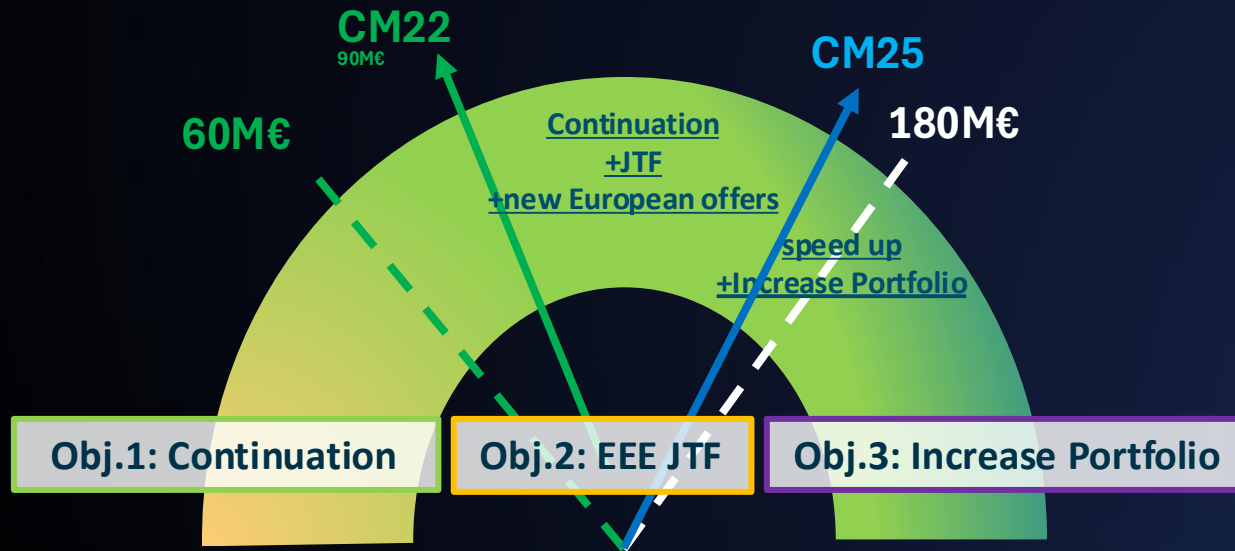
# What are we already doing to get there



## GSTP Element: EEE Space Component Sovereignty for Europe



GTE3-101ED	Ultra Deep Sub-Micron Foundation and Platform Technology
GTE3-102ED	Ultra Deep Sub-Micron Interface and System-in-Package Technology
GTE3-201ED	Super Scaled Nitride Technology (S2CANT)
GTE3-203ED	European Power SiC supply chain (EPOSIC)
GTE3-601QE	High Energy Ions Beam Testing Capability (>22MeV/n)
GTE3-204ED	Thermal Heat Reduction techniques for Semiconductor Technology (THRUST) – Phase 1
GTE3-205ED	GaN monolithic IC Pre-Industrialisation development – GaNICp
GTE3-001TI	Building Blocks for the European EEE Components Supply Chain (24months- 1ME per contract)
GTE3-103ED	Development of Serializer and Deserializer IP Core for Ultra Deep Sub Micron Technologies
GTE3-303ED	Development and space qualification of European 1550nm distributed-feedback laser diode module
GTE3-507ED	Wafer level packaging services
GTE3-504MS	Lead-free Electrical Assembly technology for high reliability electrical connections



UDSM	Direct Sampling Ka-Band ADC and DAC
UDSM	Triple low-voltage Power Management IC for FPGAs and Processors
UDSM	Generic Payload Processor SoC with eFPGA, Router, SDR, SEC, TPU
UDSM	ADC & DAC for Digital Beamforming IC & for RF-FPGA
UDSM	PLL and Clock Distribution IC
UDSM	RF-FPGA (with ADC/DAC and Processor)
Packaging	European Supply Chain for System in Package services
Packaging	Development and Standardization of uHDI and IC substrate for Space Applications
Packaging	Flip-Chip assembly capabilities for micro bumps and copper pillar devices
Packaging	Development of glass interposers for microwave and photonics applications
Packaging	Microfluidic cooling
Packaging	Advanced Photonics Packaging
Power	Portfolio of DC/DC Hybrid Modules
Power	Development of Rad-hard low power VCSEL driver
Passive	High Data Rate, high Density backplane board to board Interconnection based on VITA
Passive	Cryogenic Temperature Sensors
photonics	ESCC Evaluation and Qualification of OptoCoupler
photonics	High power fiber optic connectors
photonics	IQ modulators
photonics	Digital Isolator Development
photonics	Integrated Tunable lasers Assembly
photonics	High power fiber coupler

<b>European EEE Component mapping</b>
<b>Space Environment evaluation</b>
Passive fiber optical harness
High power C-band wavelength division multiplexer
High power isolator
High power fiber optic connectors
High current small size inductors and transformers
High Current, Low Voltage Planar Transformers for Auxiliary DC-DC Converters
Optical Switches

ESA's EEE Component ensures long-term, uninterrupted access to strategic, state-of-the-art EEE technologies for European space programmes.

ESA - CM25:space technology

GSTP at CM25

# CONCLUSION



## *The future is near - ESA's approach:*

- 22+ B€ for cutting edge programmes & techno for the **next 3 years**
  - A Technology Vision for the **next 15 years**
- All at the service of a coherent strategy for the role of Europe in Space at horizon 2040*



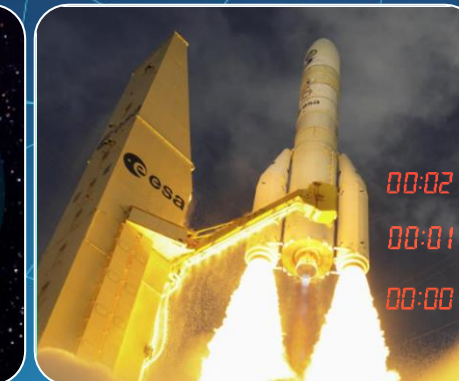
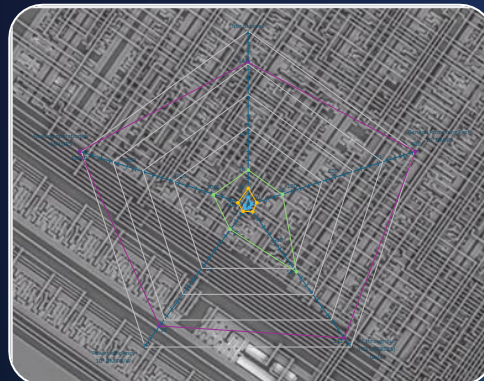
## *Redefining Space Electronics' role:*

- **Planetary exploration:** interplanetary cruise & aerobraking; harsh envt; SCI data Tx
- **Constellations:** Comms & Nav; volume, robustness, more computing power per mW
- **Human & Robotic Explo:** autonomous navigation & landing; edge computing & neuromorphic technology



## *What we need from you for next 15 years:*

- Continue to push the boundaries of what is possible
- Prioritise our sovereignty
- Be on time for launch!



# Inspiring the next generation



#SpaceAmbition  
[www.esa.int](http://www.esa.int)