ESA CyberCUBE mission

Cyber CUBesat Experiment

ESA Security Office

CyberCUBE – ESA Cyber Resilience

The Cyber Security Resilience Programme is an ESA cross-directorate initiative, led by the ESA Security Office (ESO), to support the development of solutions aiming at increasing the security posture of the Agency at corporate and space mission level.

As part of the Cyber Security Resilience Programme, it has been developed the Cyber Security Operational Centre (CSOC) with the aim, among others, to monitor the ESA space mission.

The CyberCUBE mission, part of the CSOC Cyber Evolutions activities of the Agency, has the main objective to validate the CSOC data monitoring and analysis capabilities of space assets.

Additionally, to cope with the future needs of the ESA space programme, the CyberCUBE includes onboard cyber capabilities for demonstration purposes.

The objective of the CyberCUBE mission is to provide a cost effective and reconfigurable cyber capabilities allowing ESA for in-orbit demonstration of new technologies to minimise risks and to foster and accelerate cyber solutions for other ESA missions.

CyberCUBE - Overview

The CyberCUBE is a flying testbed to improve cyber security capabilities of ESA space mission:

➢ Detection and protection against unauthorized access in terms of safeguarding command, control, and links

➢ Detection, protection, and response against communications jamming and spoofing

➢ Monitoring and protection of onboard systems

➢ Experimentation to validate new cyber algorithms/technologies/software

➢ Support to real 'capture the flag' and cyber experiments.

CyberCUBE - Specs

SIZE: 3U CubeSat

ORBIT: SSO at an altitude of about 500Km.

COMMUNICATIONS: S-Band Transponder

PAYLOAD: S-Band Transponder + X-Band HDR Transmitter + SDR

CAPABILITY: On board Processors + FPGA (fully reprogrammable) + Real Time core

GROUND INFRASTRUCTURE: ESEC + ESOC (SMILE) + ESTRACK

OPERATIONS: ESEC

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CyberCUBE - Operational Scenario

CyberCUBE will be operated from ESEC by ESA OPS Team

SMILE infrastructure in ESOC will provide X-Band and S-Band capability to download data and RF I/Q samples at high data rate link

The User Segment will prepare the experiment based on dedicated tools to develop cyber applications and ESA OPS upload the cyber applications

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CyberCUBE - Experiment Scenario

Different tools will be available to prepare experiments:

✓ FlatSat

✓ FPGA programming and validation tool

✓ SCCoE environment

✓ MCS and PGS

Goal is to develop Cyber SW applications to be run on-board

The CyberCUBE processing platform allows for a full configurability

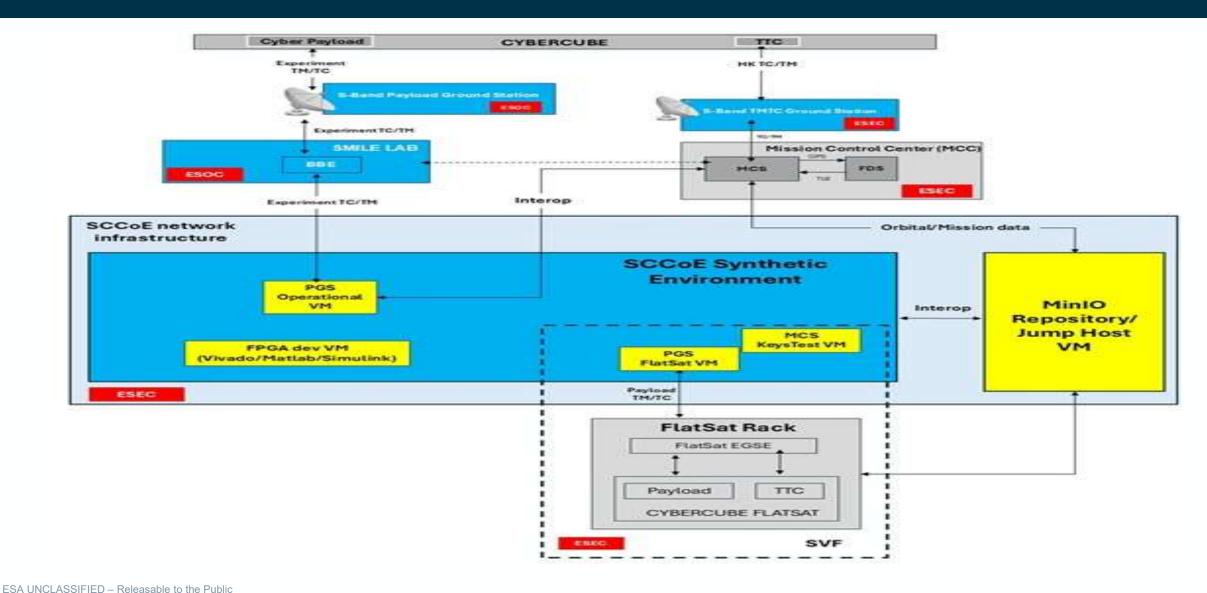The Cyber SW applications can exploit on-board data

✓ OBDH data

✓ Radio Frequency I/Q samples

✓ Sensor Data
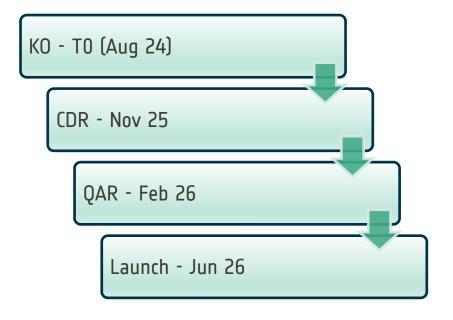
CyberCUBE - Financials and Timeline

Budget 1.9 M€

KO - T0 (Aug 24)

CDR - Nov 25

QAR - Feb 26

Launch - Jun 26

- Start of Operation July 2026
- End of Operation: at least 1 year later

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End of Presentation

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