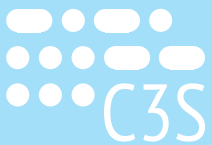




COMPLEX SATELLITE SYSTEMS

EVERY SATELLITE IS
BORN SOMEWHERE

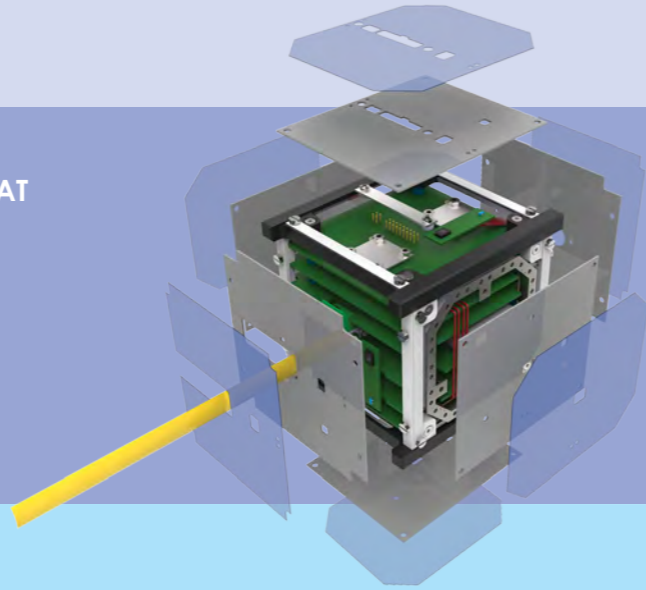


Cadtern
plan with us

CAD-TERV Engineering LTD has been offering professional engineering services since 1997. Our portfolio consists of comprehensive engineering services and distribution and assistance of Dassault Systèmes and Mentor Graphics solutions. The Engineering department acquired the ISO MSZ EN 9001:2008 certificate.

MAIN INDUSTRIES IN WHICH WE POSSESS GREAT MECHANICAL ENGINEERING AND PRODUCT DESIGN SERVICES:

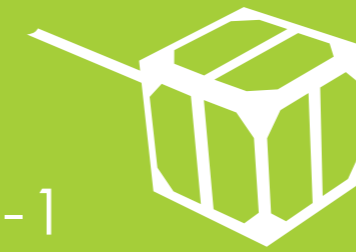
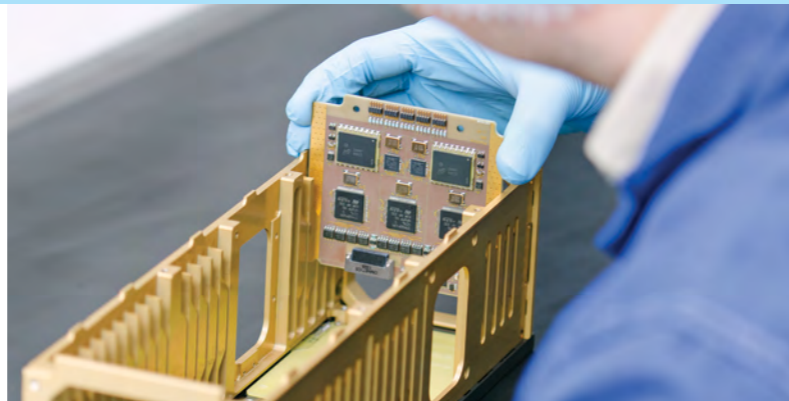
- Automotive industry and transportation
- Industrial equipment
- Aviation, space and defence industry
- Consumer goods, household products



OUR SPECTRUM OF ACTIVITIES INCLUDE:

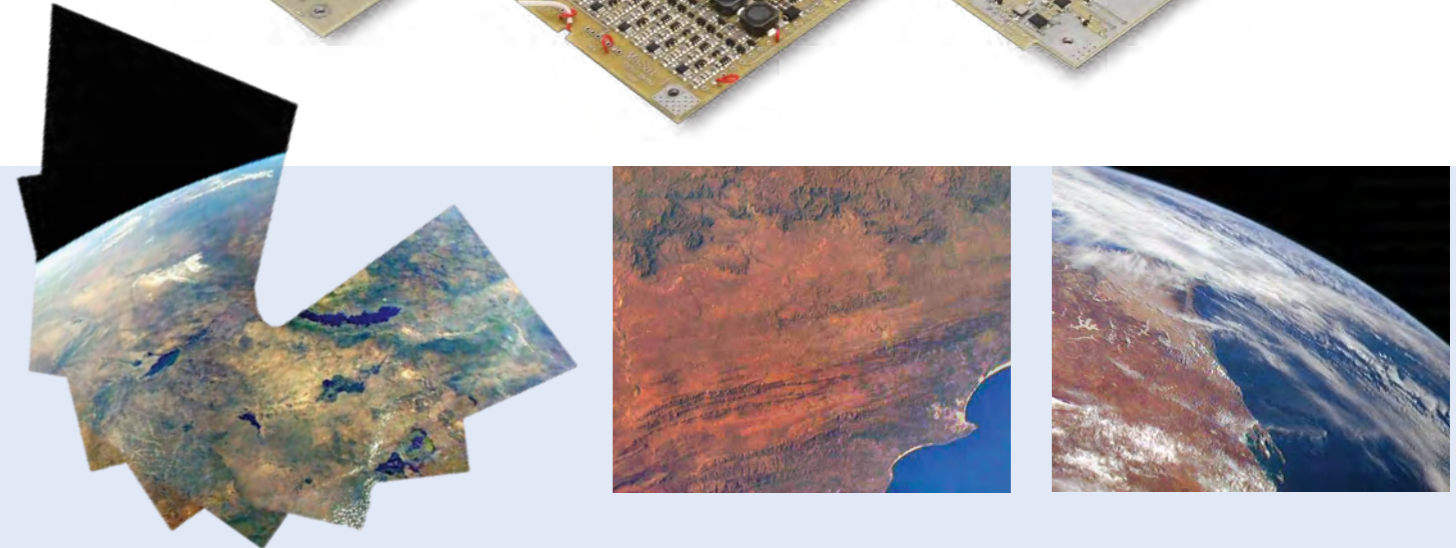
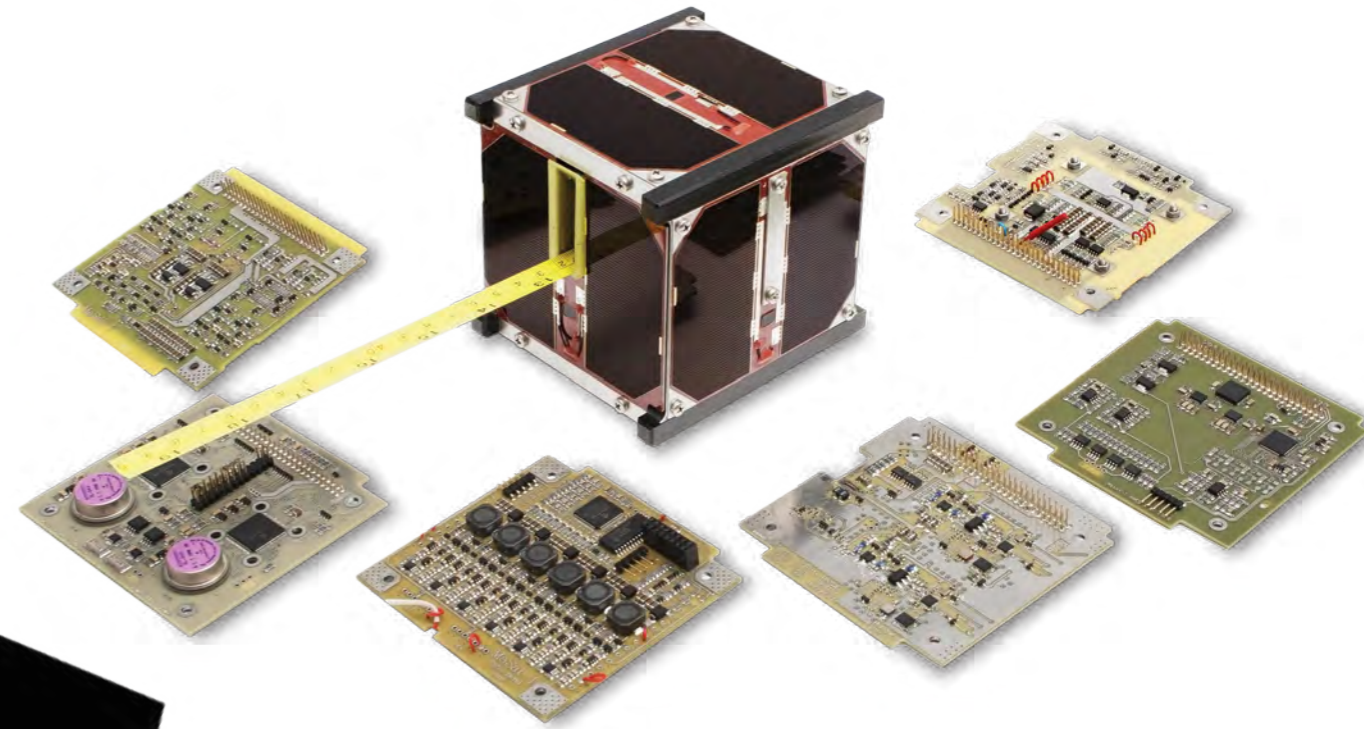
- Mission planning
- Co-development
- Systems engineering
- Product customization
- Payload-bus harmonization
- Support and Training activities
- Ground Support Equipment development
- Hardware, Software and Firmware development

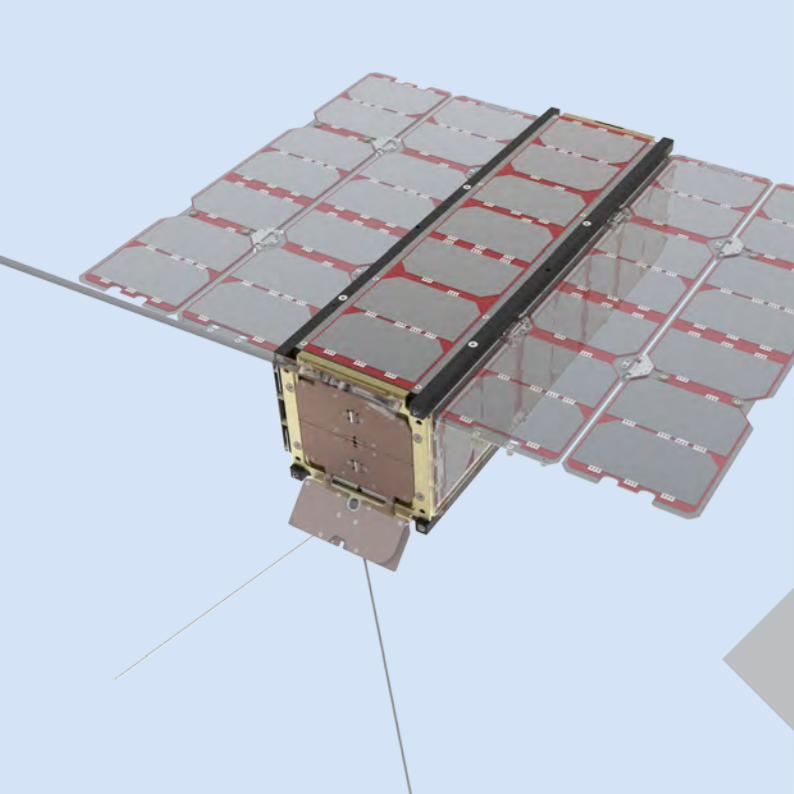
C3S Electronics Development LLC provides services since 2012 spanning all phases of a satellite mission. We work closely with our customers, providing highly reliable solutions to their specific needs.



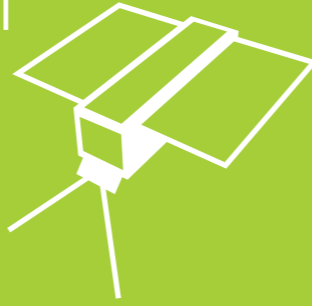
MASAT-1
FLIGHT HERITAGE

- Every subsystem designed in-house
- Redundant subsystems
- 3 years lifetime (deorbited)
- Launched on Vega Maiden Flight
- More than 100 images taken and downlinked including stereo and mosaic





3U CUBESAT PLATFORM



KEY FEATURES

- Single-point failure tolerant
- Double redundancy in all subsystems
- High reliability and availability
- 3 year design lifetime in LEO

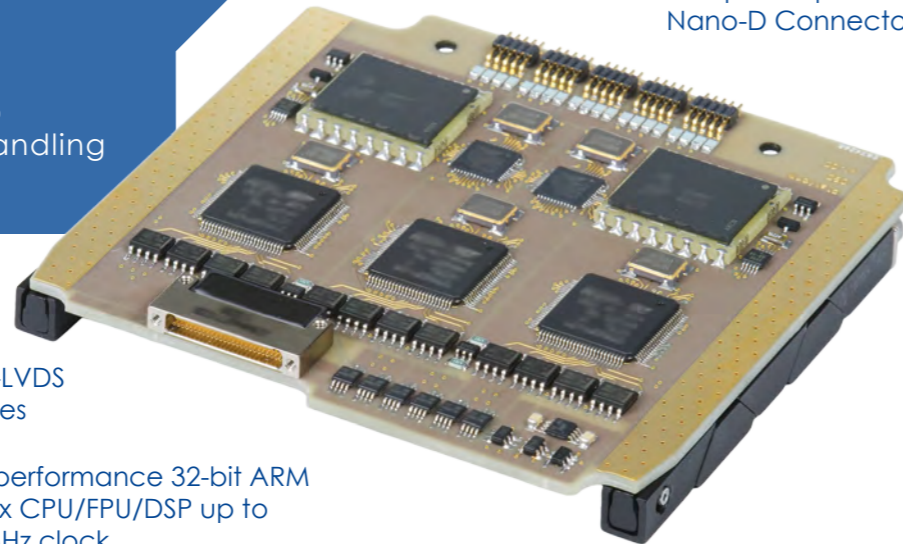
ON-BOARD COMPUTER

KEY FEATURES

- Multi-level Watchdog system
- Integrated debug interface
- Mass Storage capacity up to 32 GB
- ECSS/CCSDS compatible packet handling

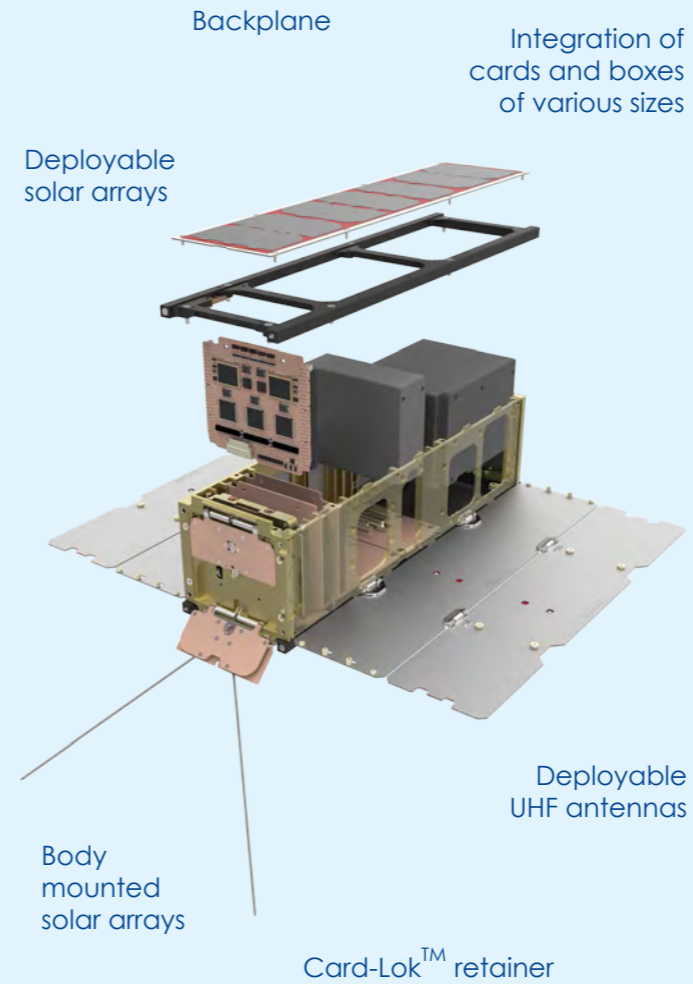
2 identical systems in cold redundancy

Space qualified Nano-D Connector



Redundant CAN and M-LVDS communication interfaces

High-performance 32-bit ARM Cortex CPU/FPU/DSP up to 180 MHz clock



Backplane

Integration of cards and boxes of various sizes

Deployable solar arrays

Deployable UHF antennas

Body mounted solar arrays

Card-Lok™ retainer

3U CUBESAT STRUCTURE

KEY FEATURES

- Backplane and Nano-D connectors
- Easy integration from a single side
- Plug in card integration
- Robust structure

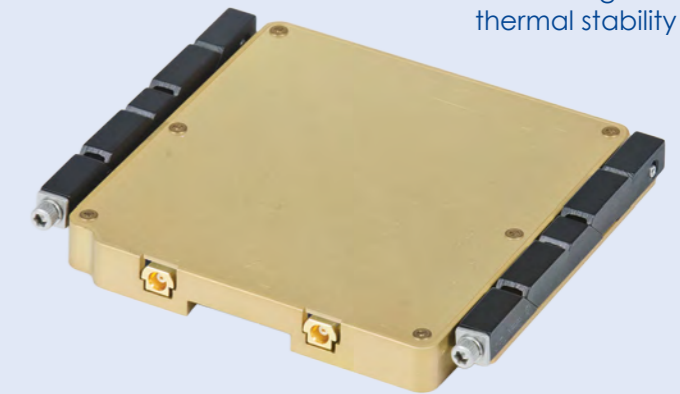
UHF TRANSCIEVER

KEY FEATURES

- Frequency range: 399-401 MHz or 435-438 MHz
- ECSS/CCSDS-compatible packet handling
- 2-OOK, 2-FSK, 2-GFSK, up to 100 kbps
- Up to 1000 mW RF (higher levels available on request)
- Redundant CAN and redundant M-LVDS
- Provides health telemetry incl. temperature and SWR

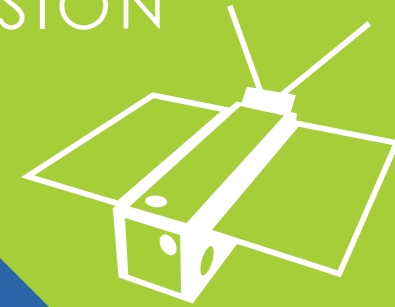
Two independent half-duplex transceivers

Milled aluminum case for EM shielding and thermal stability



Card-Lok™ solution as conduction cooled thermal interface

RADCUBE MISSION



MISSION OBJECTIVES

- In-orbit demonstration of 3U CubeSat platform
- In-orbit demonstration of RadMag instrument
 - In cooperation with MTA Centre for Energy Research

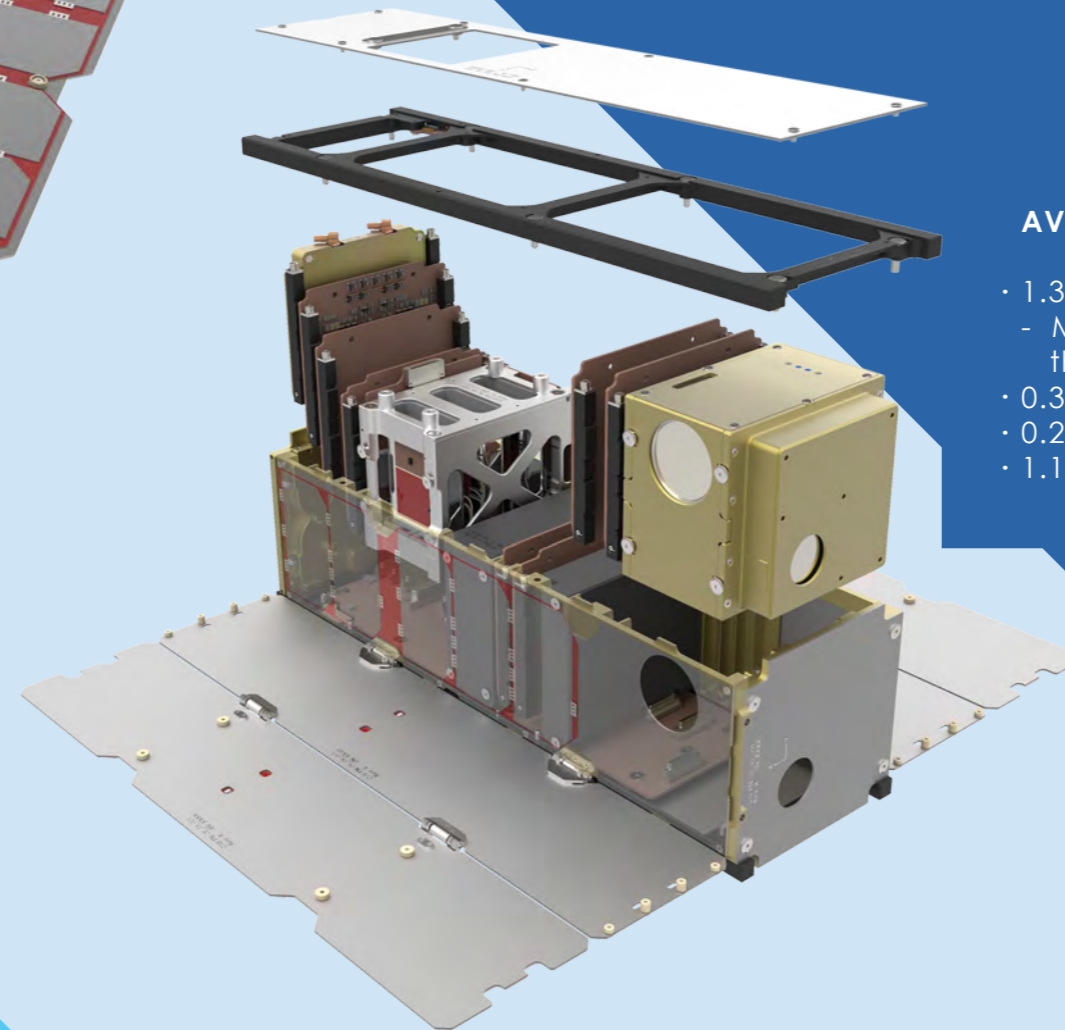
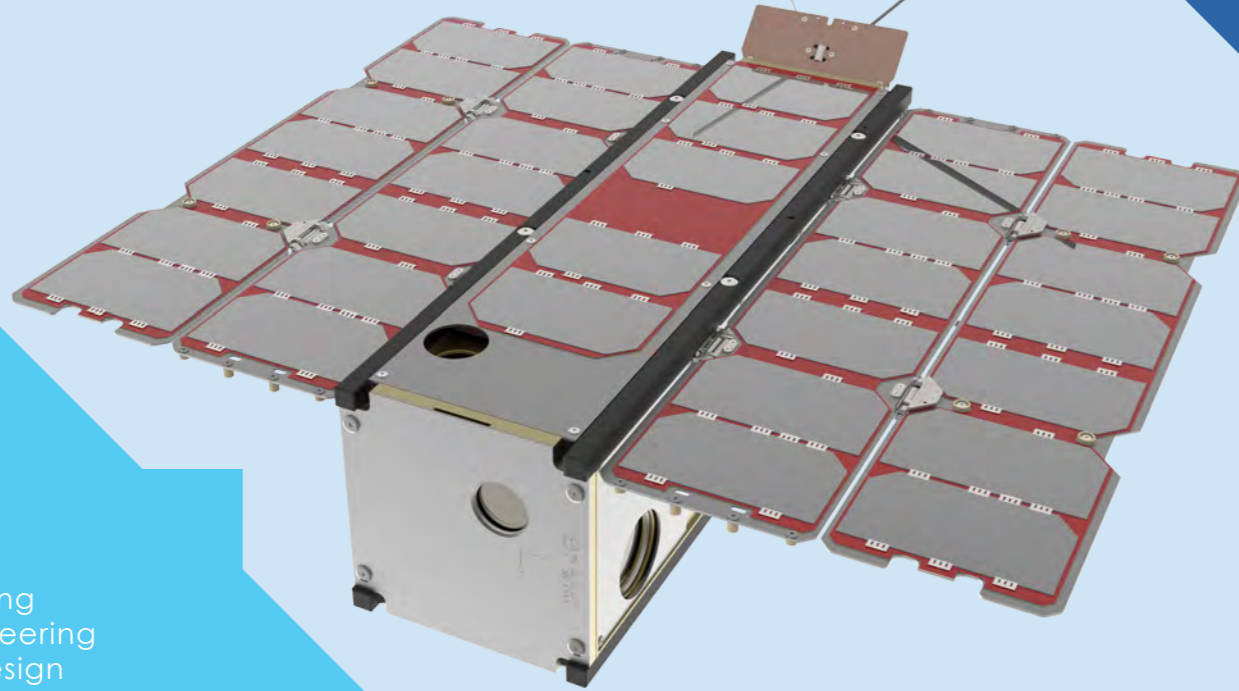
OUR SPECIFIC ACTIVITIES

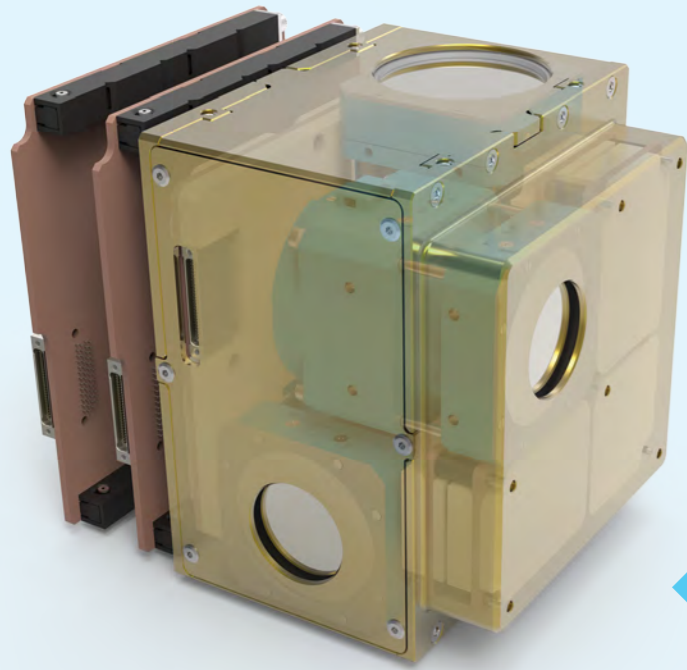
- Mission planning
- Systems engineering
- Sub-system design
- Payload-bus harmonization
- Structure design and analysis
- Radiation effects, Reliability and Thermal Analysis
- Ground Support Equipment development

A Hungarian domestic development can form the world's first complete and comprehensive image of the radiation environment surrounding the Earth. The CROSS network (Cosmic Radiation Observatory Satellite System) designed by Hungarian researchers allows the participants of national and international space activities to ensure the safety of instruments and personnel sent into space far more accurately and effectively than ever. The cornerstone of the system is the RADCUBE mission, the demonstration flight of the CROSS network's first satellite.

AVAILABLE VOLUME FOR THE PAYLOADS

- 1.30 U Avionics without ADCS
 - Mainly determined by the battery pack
- 0.35 U ADCS
- 0.25 U Secondary payload
- 1.10 U RadMag





COMPACT DESIGN

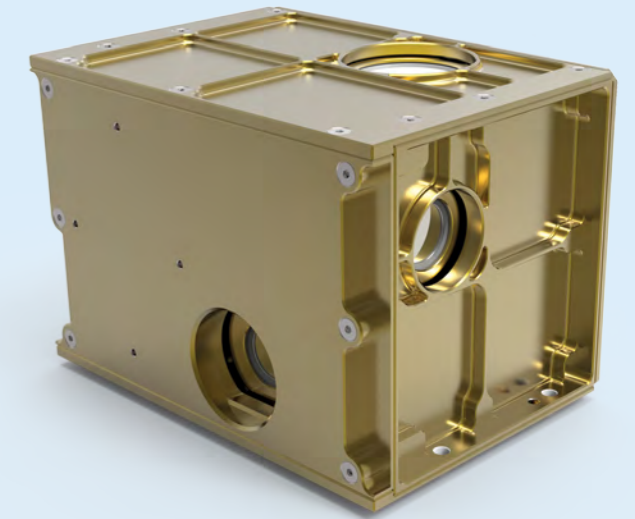
- Can be realised in small, standard dimensions (10x10x10 cm³)
- Low mass: below 1 kg
- Low power consumption: below 5 W
- Mainly COTS components with a fault tolerant and modular design

KEY FEATURES

- Thermal optimised enclosure design
- Easy platform integration
- 3D optimised and highly integrated structure
- Modular and scalable electrical design for multidetector solutions

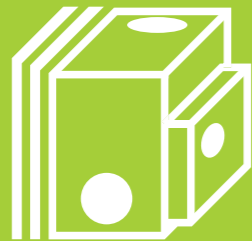
KEY FEATURES

- Enclosure for RadMag for interfacing to other satellites or launch vehicles
- Robust interface for separate vibration and other environmental testing
- Cost optimized for manufacturing and assembly
- High precision enclosure design



RADMAG
INSIDE

1st Payload:
RADMAG

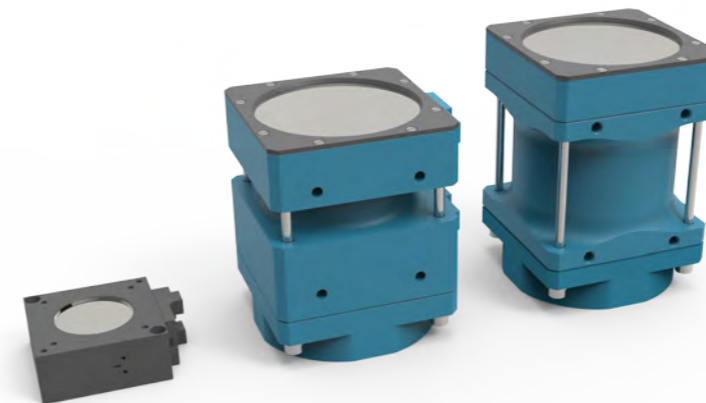


HIGH LEVEL OF SCIENTIFIC OUTPUT

- Dosimetric results
- Energy spectra of GCR/SCR
- LET spectra
- Quality assessment of the cosmic rays
- Directional study of the cosmic rays
- Extension and support with magnetic field detection

VARIABLE DETECTOR ASSEMBLY SOLUTIONS

- Several different types of silicon detectors are available on the market
- Several possible mechanical arrangements
- Different detector solutions for GCR and SCR monitoring



DETECTOR
FIXTURES'
DESIGN

KEY FEATURES

- Enclosure for RadMag detectors
- Easy detector integration
- Optimized for manufacturing and assembly
- Modular and robust design

FOUNDING



FOUNDING



1997

2007

2008

2012

2014

2015

2016

2018

2019

2022

2023

2026

START OF DEVELOPMENT

BME students
C3S founders

CADTERV

DEVELOPMENT COMPLETED
LAUNCH

START OF DEVELOPMENT

END OF SERVICE

START OF DEVELOPMENT

DEVELOPMENT COMPLETED

START OF DEVELOPMENT

DEVELOPMENT COMPLETED

START OF DEVELOPMENT

DEVELOPMENT COMPLETED

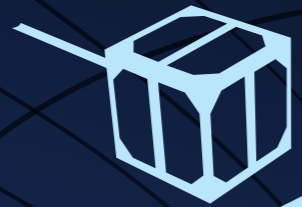
LAUNCH

END OF SERVICE

DEVELOPMENT COMPLETED

LAUNCH

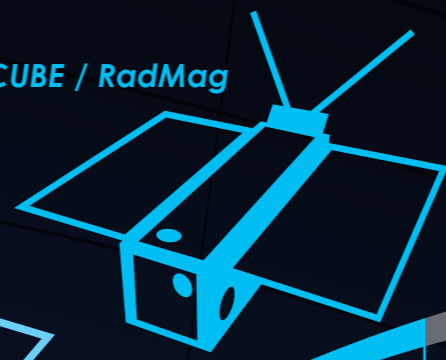
MASAT-1



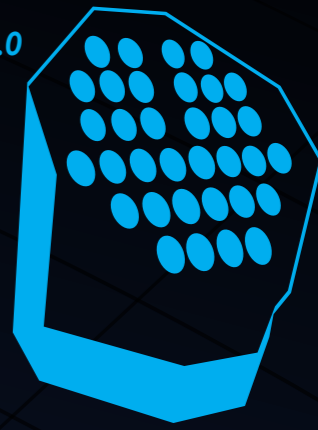
3/6U CubeSat Platform



RADCUBE / RadMag



PLATO 2.0



M-SIZED SATELLITE ACTIVITIES

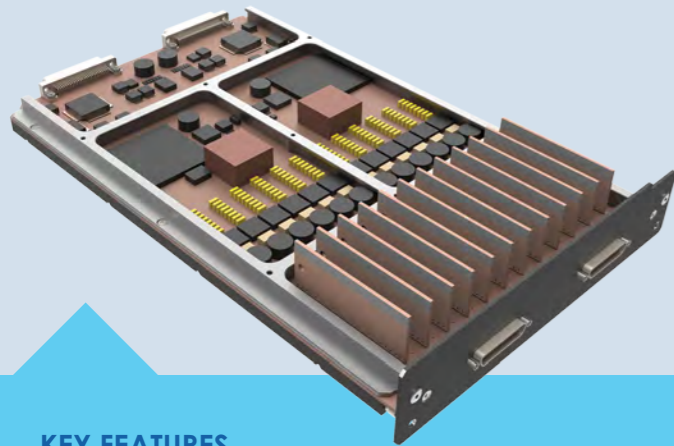
COMPLEX SUB-SYSTEM DESIGN

- Power Distribution Unit design
- Synchronization module development (Sync. of 30 Cameras in PLATO 2.0)
- Data acquisition and payload control
- Structural and Thermal analysis
- Ground Support Equipment development

KEY FEATURES

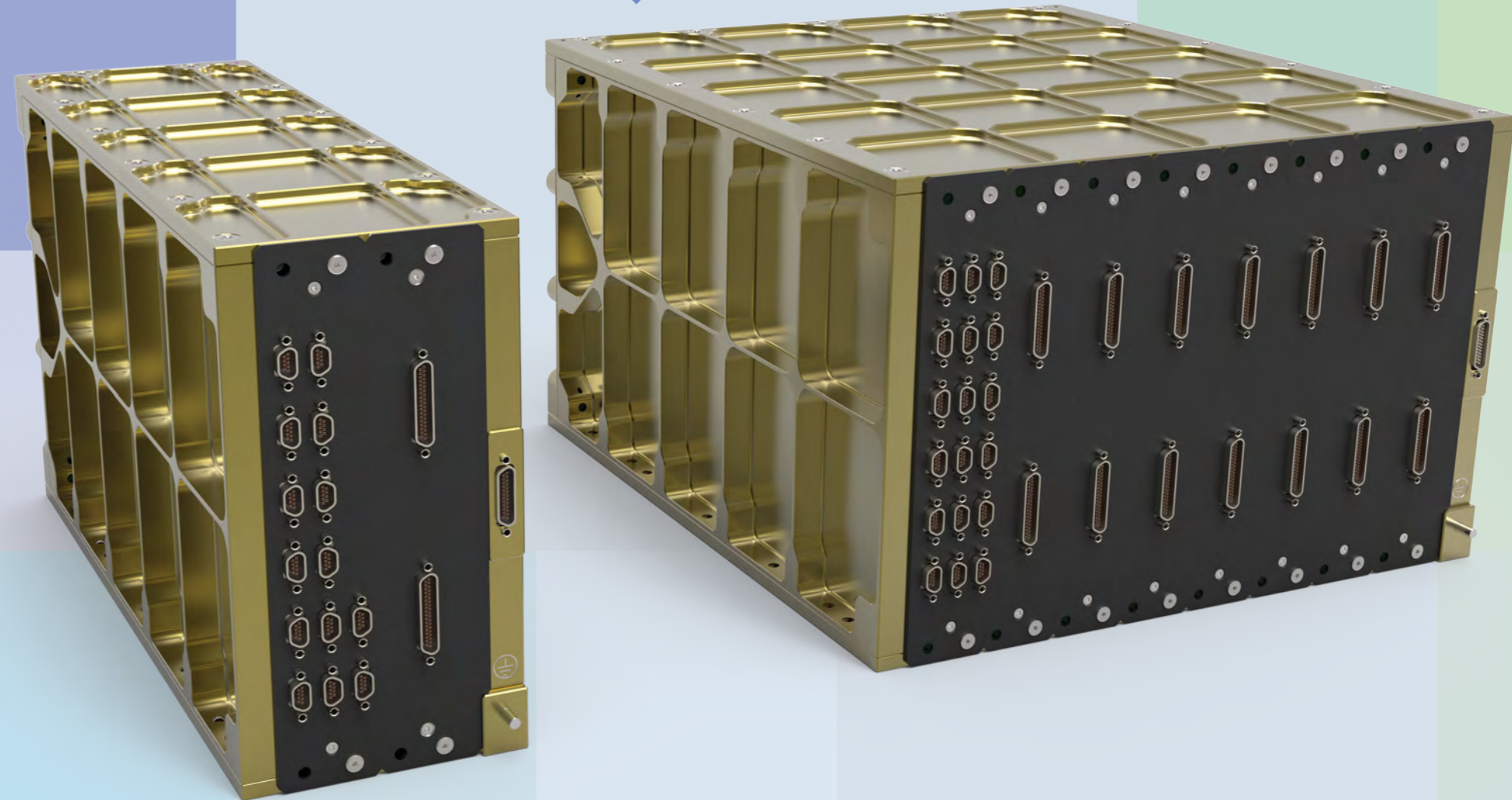
- Mass optimized for manufacturing and assembly
- Modular and robust design
- Plug-in card integration and backplane
- Easy integration from single side
- Optimized thermal interfaces

PLATO 2.0 AEU



KEY FEATURES

- 15% mass saving with compact design
- Easy to integrate on card level and box level
- Thermal optimised card fastening
- Highly integrated DC/DC converters
- FPGA based flexible synchronization solution



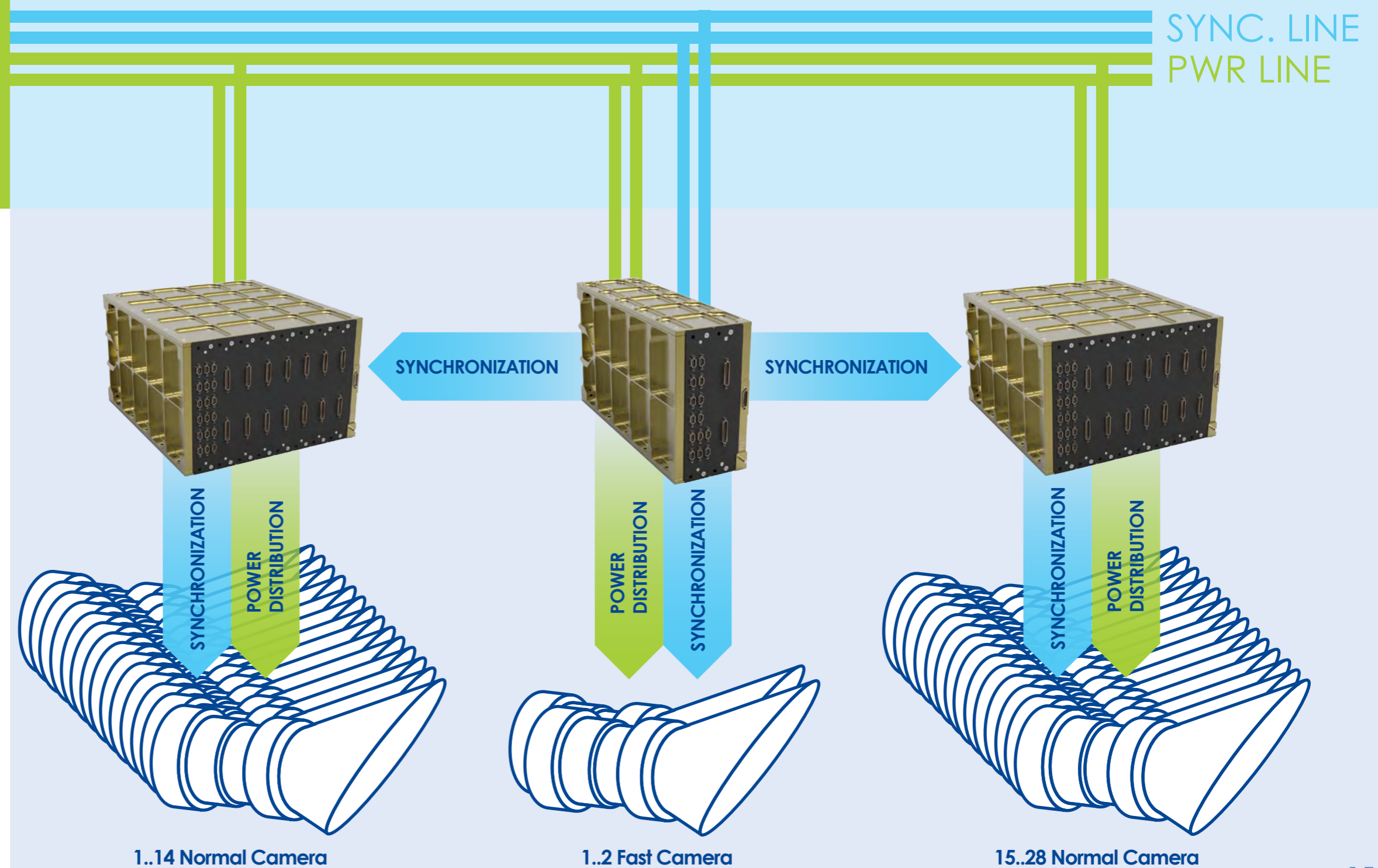
PLATO 2.0 SYSTEM



ACTIVITIES

- DC/DC converters for 30 Cameras
 - Camera synchronization
 - Housekeeping data acquisition
 - Communication via SpW
 - Structural and Thermal analysis
- Ground Support Equipment for coupling tests and for qualification

Developed by **C3S** and **CAD-TERV**
in cooperation with **ESA, DLR, OHB**



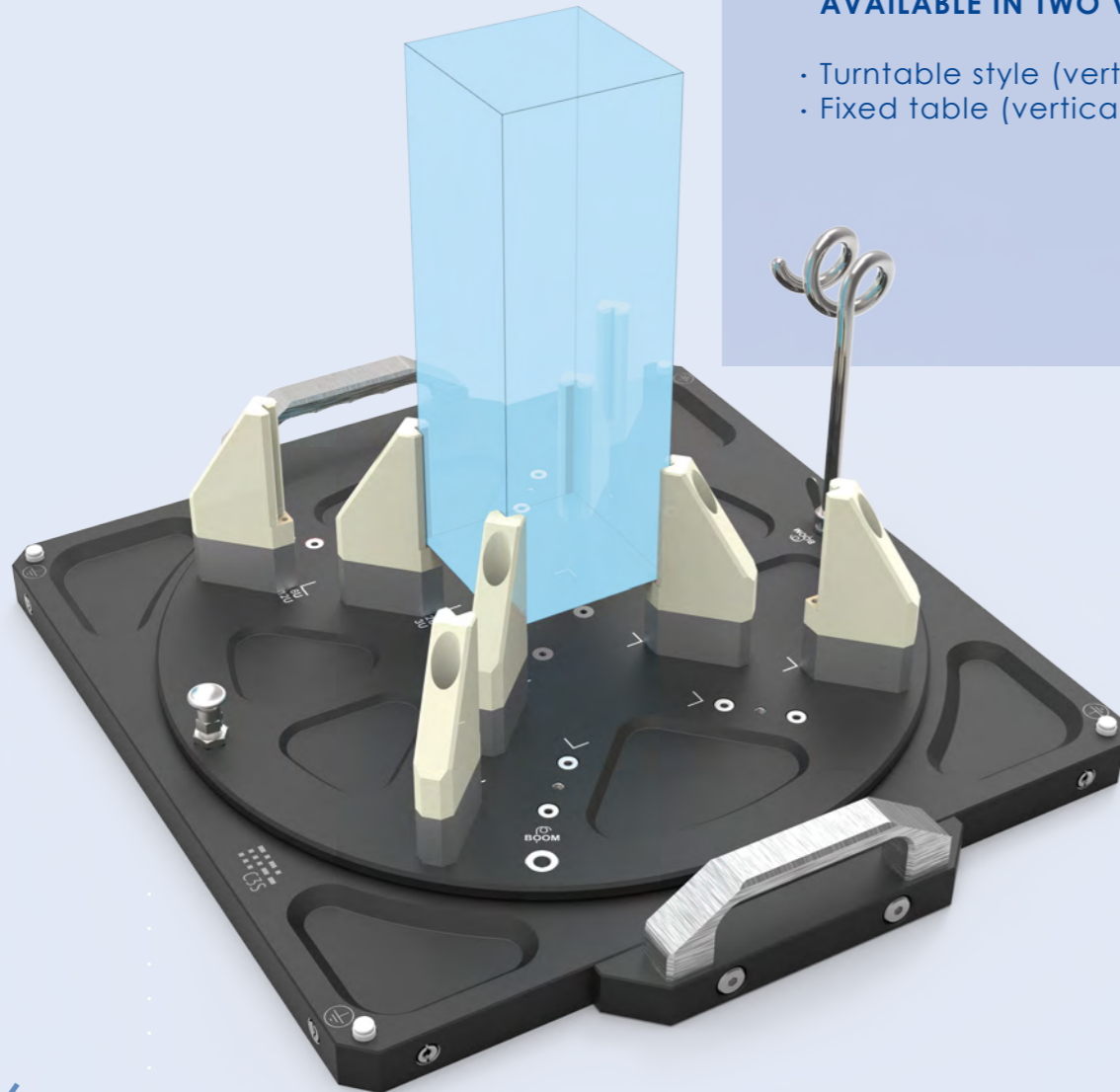
ASSEMBLY & INTEGRATION JIGS

KEY FEATURES

- Configurable for 1 to 12 U CubeSats
- Provides portability to your satellite
- Robust stand for assembly, integration and testing
- ESD protection included
- Vertical and horizontal mounting

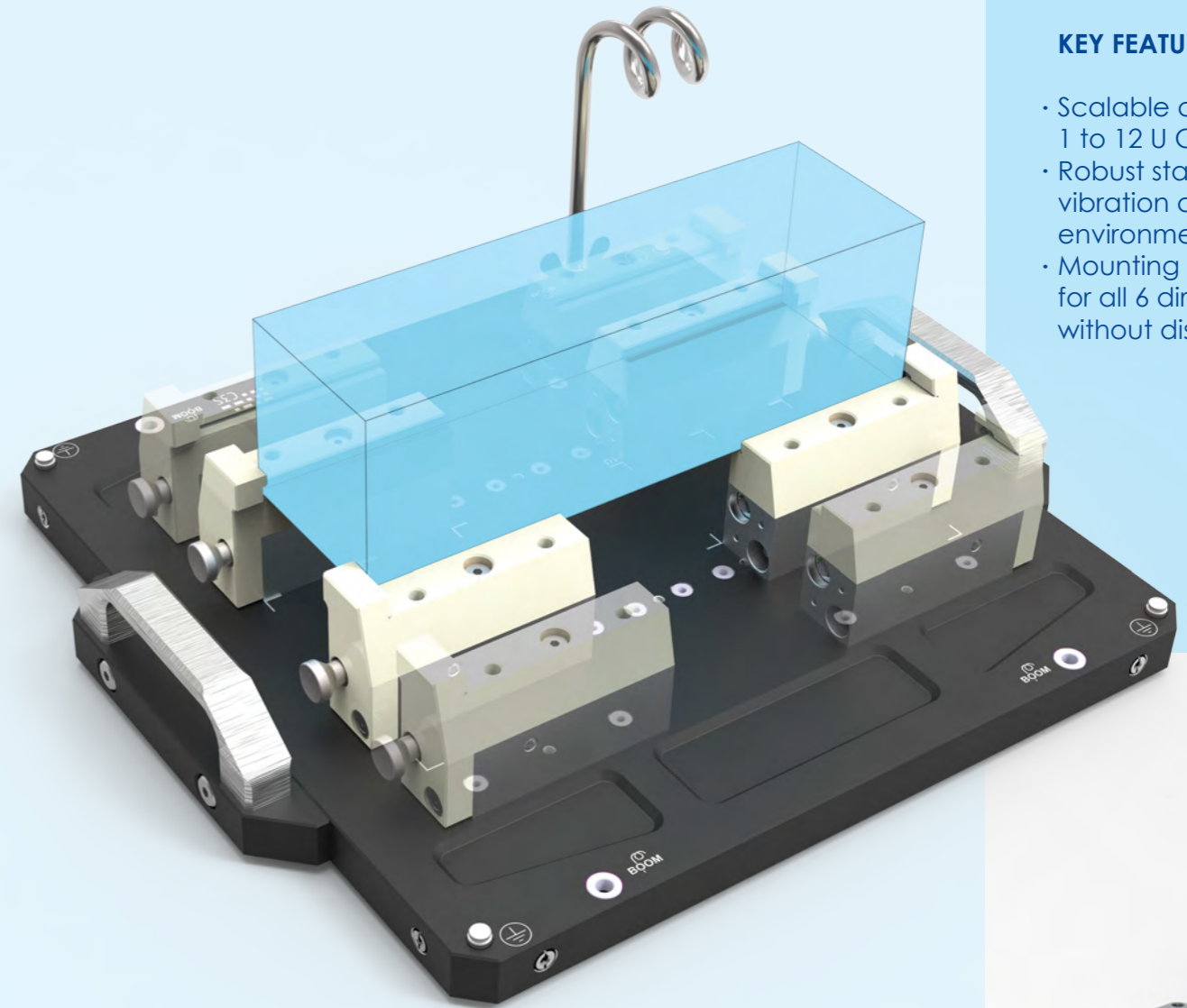
AVAILABLE IN TWO VARIETIES:

- Turntable style (vertical)
- Fixed table (vertical and horizontal)



KEY FEATURES

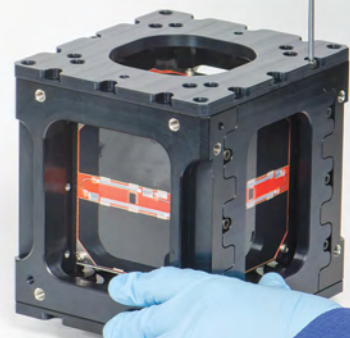
- Scalable design for 1 to 12 U CubeSats
- Robust stand for vibration and other environmental testing
- Mounting possibilities for all 6 directions without disassembly



VIBRATION TEST FIXTURES

KEY FEATURES

- Provides robust test fixture for 1U CubeSat
- Mounting possibilities for all 6 directions without disassembly
- For vibration and other environmental testing



OTHER CAD-TERV LTD ACTIVITIES



INDUSTRIAL EQUIPMENT DEVELOPMENT

As main contractor we undertake the development, optimization and manufacturing of unique single-purpose machines and industrial appliances. For manufacturing tasks we are aided by our partners. Our main customers: **Electrolux**, **Bosch**, and **Johnson Electric**.

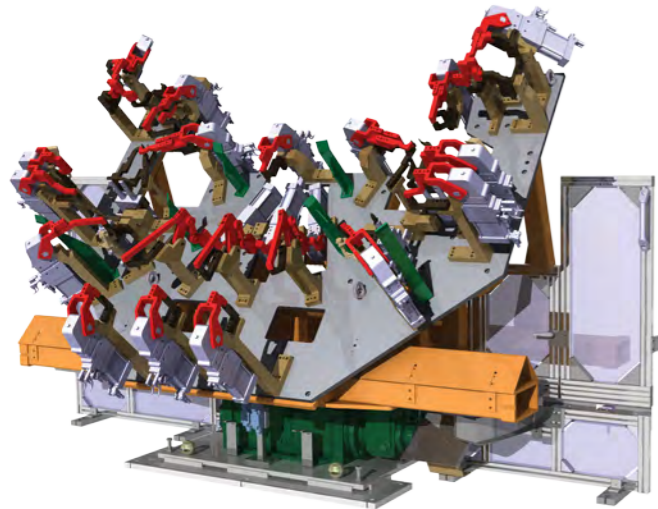


CONSUMER GOODS, HOUSEHOLD PRODUCT DEVELOPMENT

We undertake product development from the design to detailed tool appropriate finish phase. We cooperate mainly with Hungarian, respectively European (Belgium, Norway, Germany) procurers. Our special partners are **Electrolux**, **Bosch**, and **Ontime Networks**.

AUTOMOTIVE INDUSTRY

We are engaged in designing and manufacturing logistic containers. Besides we develop equipment and grippers for BIW. Our main partner is **Audi**.



OTHER C3S LLC ACTIVITIES



DEVELOPMENT OF EMBEDDED SYSTEMS

- Emphasis is on computation elements and technologies
- Preliminary conceptual design
- Overall systems engineering
- Analog and Digital Signal processing



DIGITAL HARDWARE DESIGN

- Microcontroller and microprocessor based system design
- FPGA and CPLD based system design and firmware development
- System on chip (SoC) based system design
- Solid-state storage design and implementation



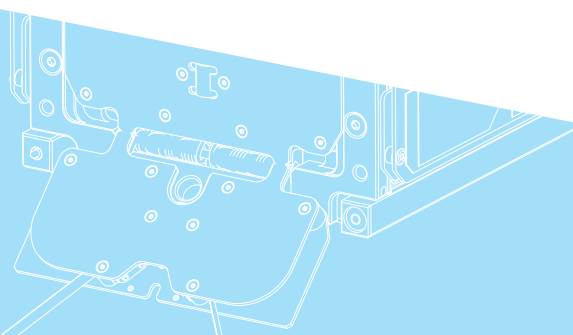
ANALOG AND MIXED-SIGNAL HARDWARE DESIGN

- Sensor, transducer interfacing
- Switching and linear power supply design
- Battery screening, testing, and emulation
- Solar cell and array screening, testing, and emulation



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Email: info@c3s.hu



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