



# AcubeSAT, the 3U platform for biological experiments in space: a status update

Sunday, 26 Oct 2025



# this is SPACEDOT



Multi-disciplinary  
university team



>40 members



2 CubeSat  
nanosatellites



Open source  
philosophy



Launch groundbreaking  
nanosatellites

## Our Goals



Cultivate the **next generation**  
of engineers and researchers



# AcubeSAT - an autonomous lab for high-throughput space biology



## Mission Goals

Probe the regulation of gene expression of eukaryotic cells in microgravity and radiation environment in **100x higher scale** than previously reported

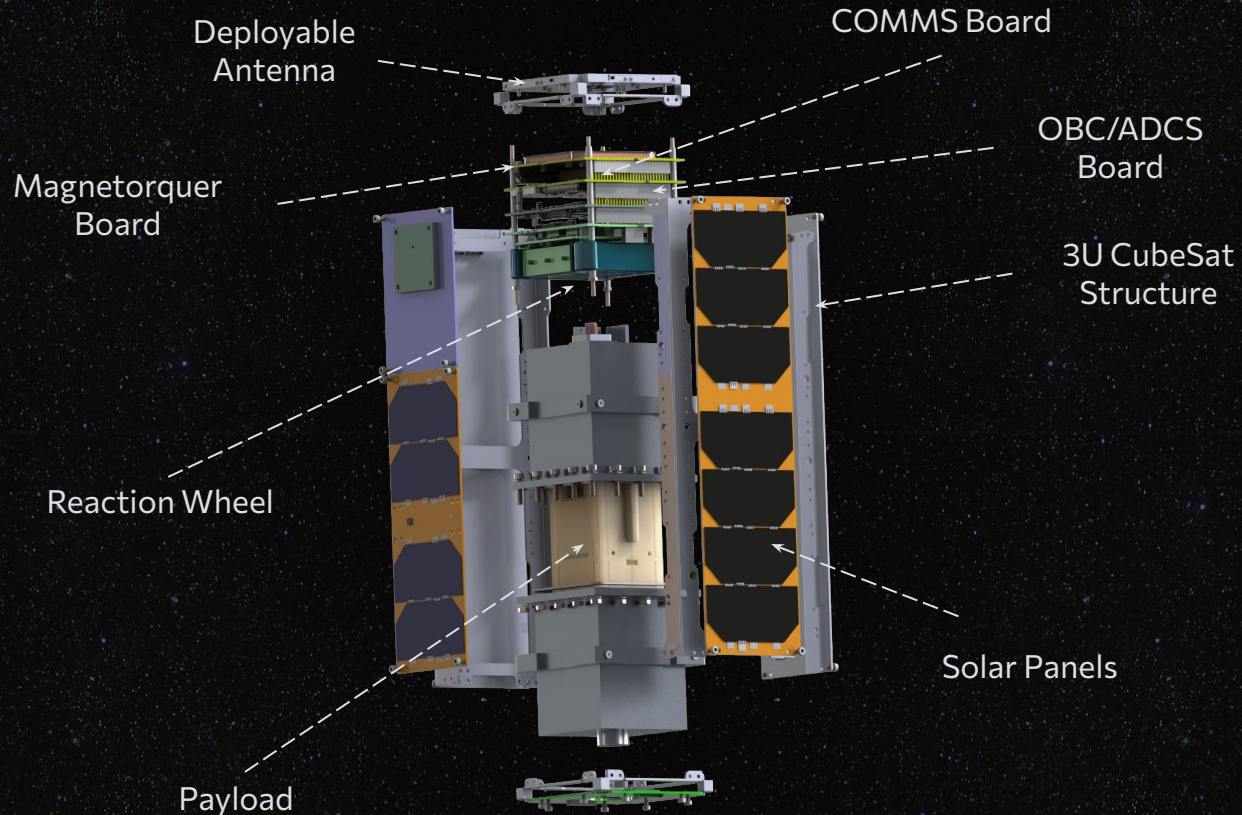
Develop and demonstrate a novel **modular platform for scalable space biology** research



FLY YOUR SATELLITE!

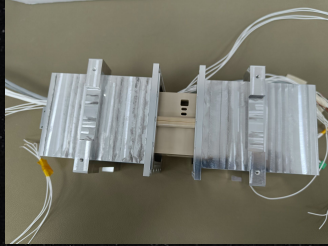


# AcubeSAT: a closer look

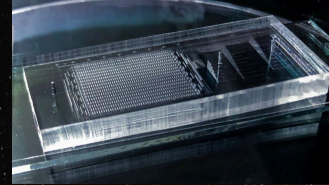




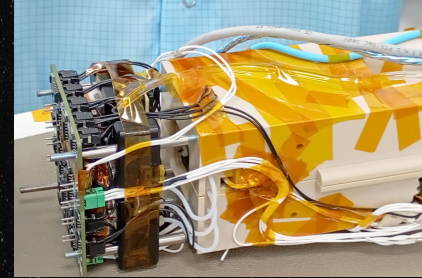
# AcubeSAT's powerful scientific platform



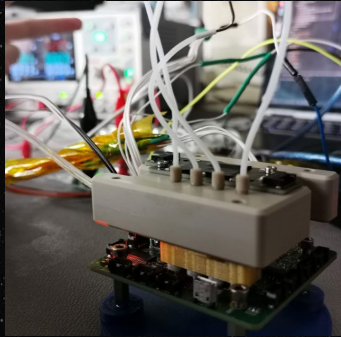
Pressurized housing



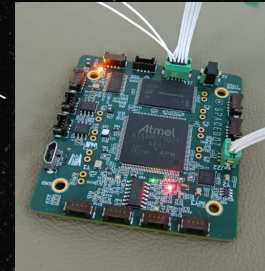
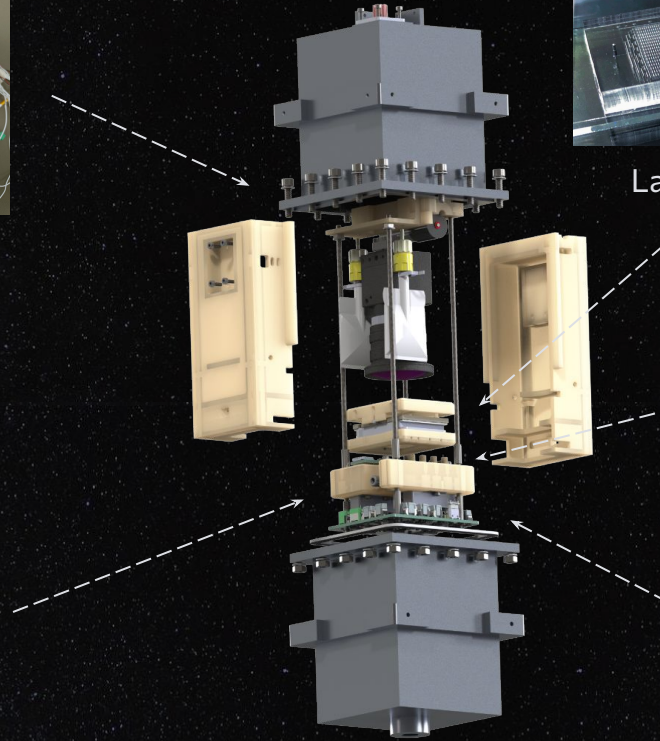
Lab-on-a-chip



Complex assembly



Automated fluidic system

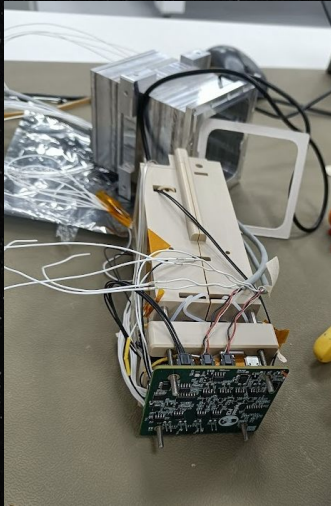


Autonomous electronics system

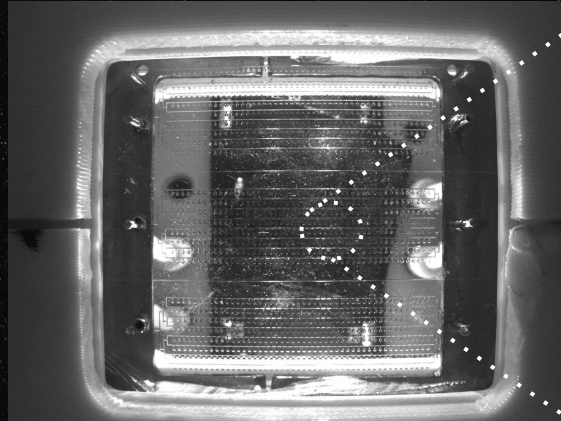


# Interrogating biology in high-throughput on a satellite platform

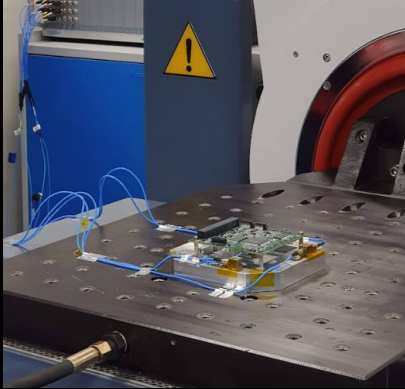
Payload (2U)



Functional testing

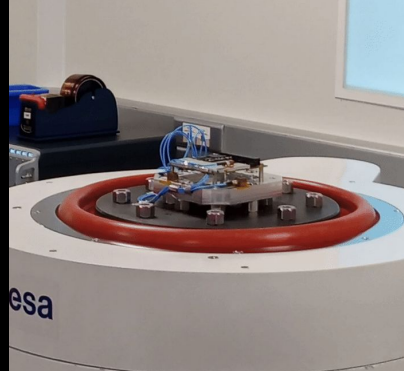


# In-house Subsystems Successful Vibrations Testing



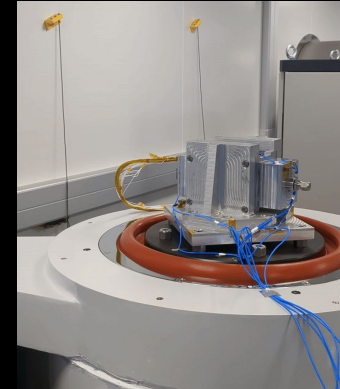
✓ OBC/ADCS Board VIBE Testing

Post testing functionality verified



✓ COMMS Board VIBE Testing

Post testing functionality verified

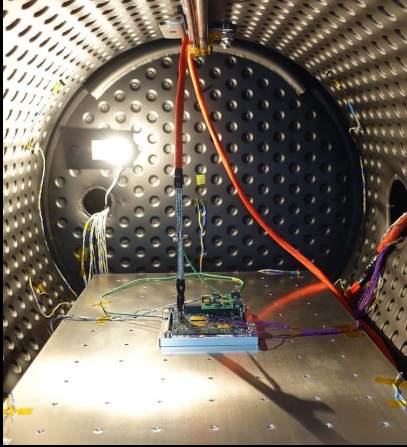


✓ Payload VIBE Testing

Container leak rate not modified

Post testing experiment  
functionality verified (fluidic,  
microfluidic, imaging and  
electrical interfaces)

# In-house Subsystems Successful TVAC Testing

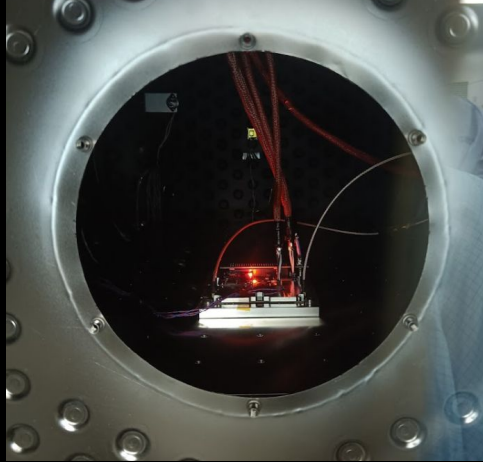


## ✓ OBC/ADCS Board TVAC Testing

Telemetry transmission &  
Telecommand reception

Data storage & recovery

Mission-specific commands execution

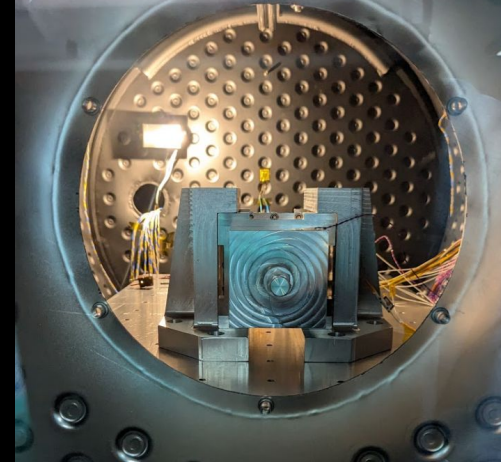


## ✓ COMMS Board TVAC Testing

Telemetry transmission

Payload Data transmission

Telecommand reception



## ✓ Payload TVAC Testing

Thermal control verified

Successful experiment sequence  
verified



# Achievements & Timeline



**Q1 2020**

Accepted in ESA's ["Fly Your Satellite!"](#) program

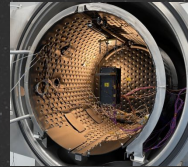
OSCW '19

OSCW '20



**Q1 2022 - Q2 2024**

Qualified ADM and COMMS board for space flight



**Q3 2026**

System Level testing and flight qualification



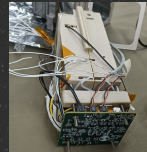
**2027-2028**

Operations and experiment



**Q4 2021**

Passed [Critical Design Review](#) (>1000 technical pages)



**Q1 2025 - Q3 2025**

Qualified Payload and OBC/ADCS board for flight



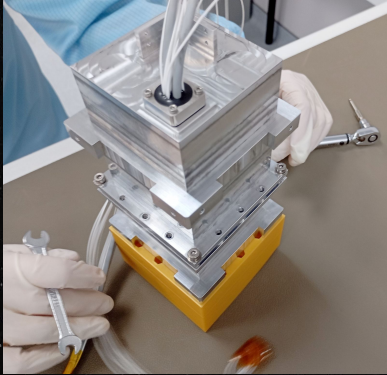
**Q1 2027**

AcubeSAT in orbit!

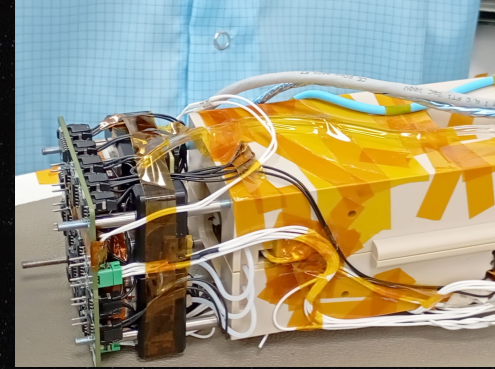
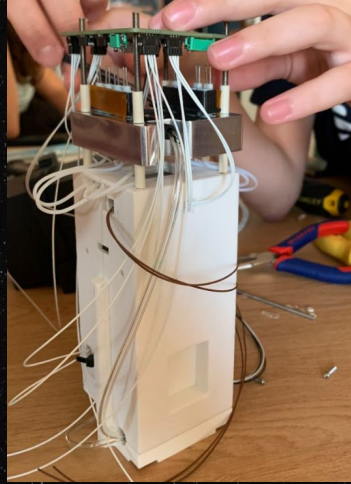




## Some AIV recommendations for building CubeSats/complex payloads



Test assembly procedures with dummy hardware beforehand



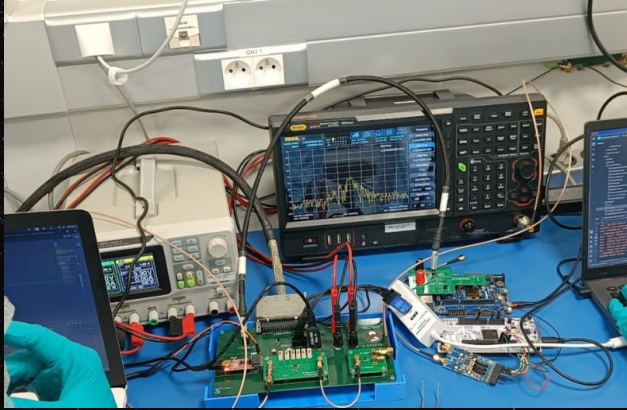
Kapton tape is your best friend 😊



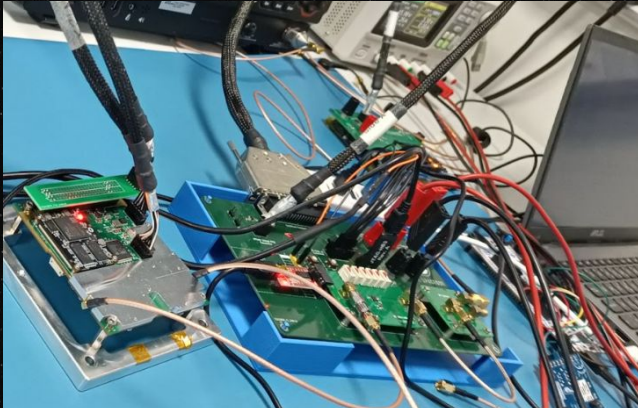
## Some AIV recommendations for building CubeSats/complex payloads (2)



Do



Don't



**Cables can be *pain*.**

1. Follow standard conventions.
2. Triple check your specification.
3. Check cable lengths.
4. Do your pin-to-pin checks once you receive/assemble your cables.



## Some AIV recommendations for building CubeSats/complex payloads (3)



### Two-person rule

Doing anything with AcubeSAT FM requires:

1. One operator
2. One PA

and other roles as needed.

Everyone should have a basic understanding of what the hardware is and how it behaves.

Activity to be stopped in case of uncertainty/disagreement.

Minimize risk of damage to hardware 😊

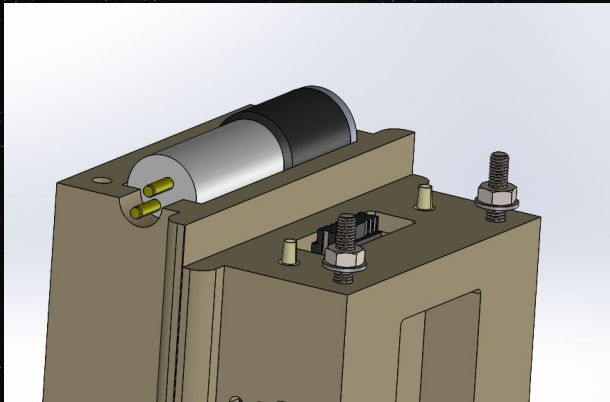


## Some AIV recommendations for building CubeSats/complex payloads (4)



### **CAD is different than real-life**

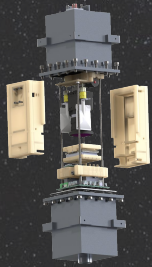
A small sticker on the pump meant that it could not fit inside its designated spot. Stickers have 3 dimensions and material properties as well!



Small deviations from the CAD and tolerances can throw off the entire integration process.

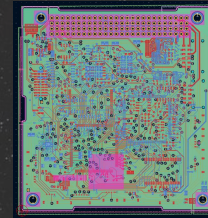
# Random cool open-source stuff you might want to check out - Hardware

 [gitlab.com/acubesat](https://gitlab.com/acubesat)



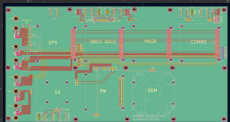
## Payload platform

Detailed design for the entire qualified 2U payload platform to host your own biology-related experiments



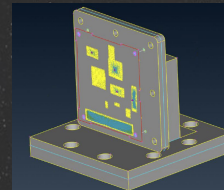
## OBC/ADCS board

A qualified double-sided PCB featuring AcubeSAT's On-Board Computer and the ADCS processing unit



## Flatsat

AcubeSAT's Flatsat board for functional testing and SW development



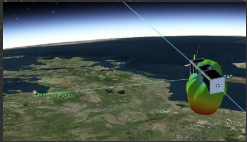
## Test adaptors

A variety of tested adaptors including ones for PC/104 compliant boards for vibration & thermal testing



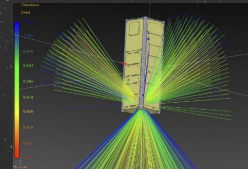
# Random cool open-source stuff you might want to check out - Analysis

[gitlab.com/acubesat](https://gitlab.com/acubesat)



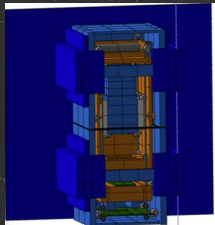
## Link Budget

A verification of AcubeSAT's 2021 link budget using antenna models made in HFSS and STK scenarios



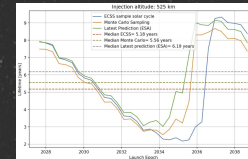
## Radiation analysis

Analysis performed using OMERE and FASTRAD for SSO orbits + description how to do it



## Thermal analysis

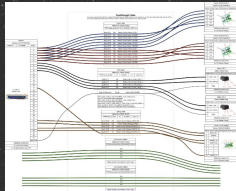
Thermal analysis performed at system level and for the payload qualification campaign in ESATAN-TMS



## SDMR Compliance

Python scripts automating space debris mitigation requirements verification with DRAMA (probabilistic orbital lifetime + collision assessments)





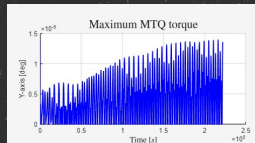
## Harness

Detailed GSE and harness description for AcubeSAT in WireViz (TVAC compatible)



## Documentation

Data package from AcubeSAT's CDR and test specifications & reports from subsystem qualification campaigns



## ADCS SW & Simulation

Full simulation of AcubeSAT ADCS control algorithms (including Thomson sun-pointing) and their software implementation

## Implementation of: ECSS-E-ST-70-41C Services

## A C++ implementation of the ECSS Packet Utilization Standard

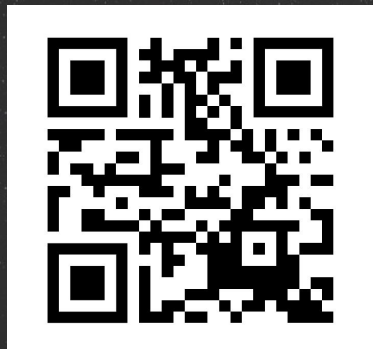


# Thank you!

**Read more:**

[gitlab.com/acubesat](https://gitlab.com/acubesat)

[acubesat.spacedot.gr](https://acubesat.spacedot.gr)



**Contact us:**

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[info@spacedot.gr](mailto:info@spacedot.gr)