



# UNISEC Constellation Mission

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Panel discussion

X-Nihonbashi Tower • 1 December 2023



# Context



Vision of UNISEC Global:

“By the end of 2030, let’s create a world where university students can participate in practical space projects in all countries”



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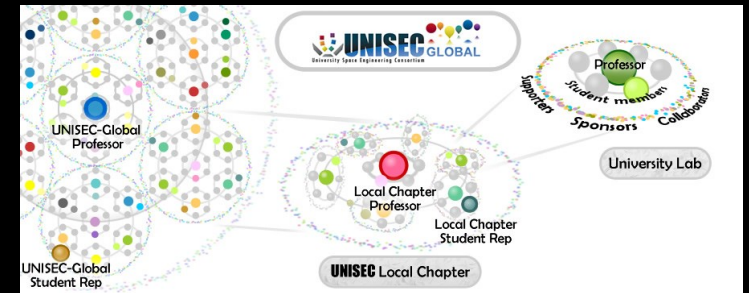
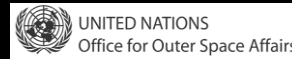


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The 8th Mission Idea Contest for Multiple Nano-satellites





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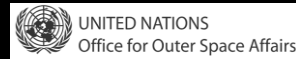


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10<sup>th</sup> anniversary



*(we are here!)*



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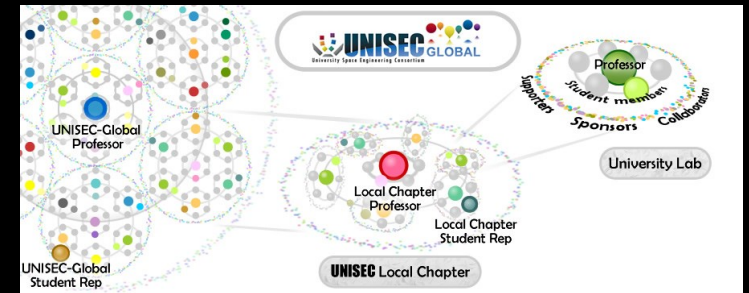
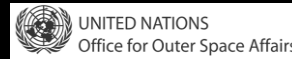


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Next 10 years?



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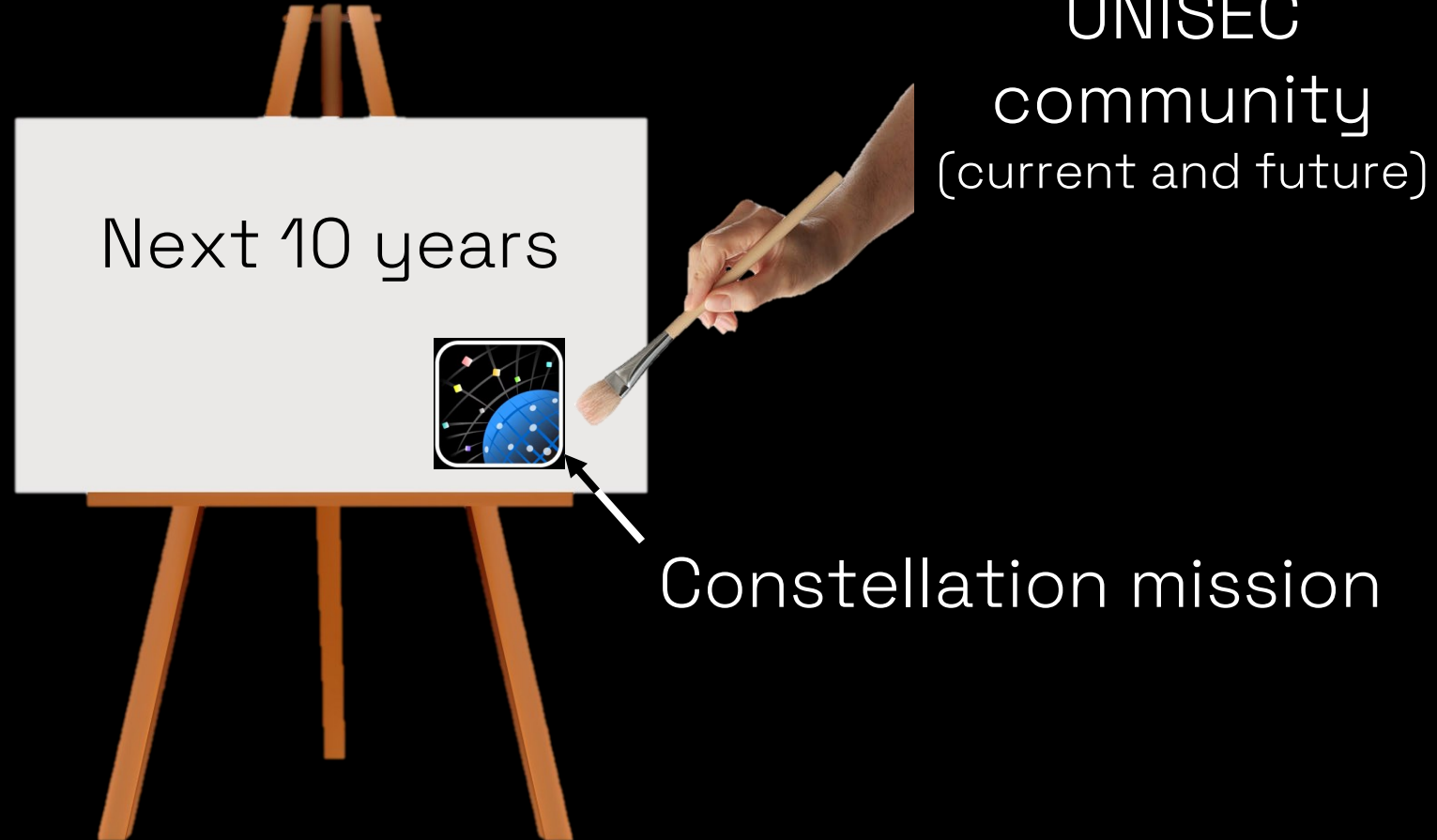
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Next 10 years

UNISEC  
community  
(current and future)

# Context





# Constellation Mission

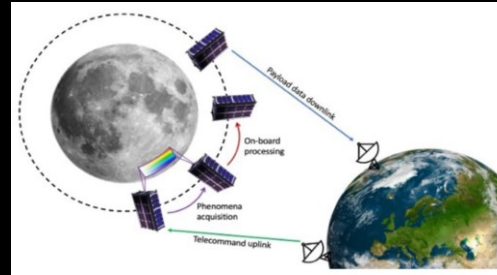
## UNISEC x Constellation Mission

- Theme of 1<sup>st</sup> and 8<sup>th</sup> Mission Idea Contest (MIC)



Examples from MIC 8:  
(among many great proposals)

MOTHS  
(1<sup>st</sup> Place)



LEO BeaNS  
(2<sup>nd</sup> Place)





# Constellation Mission

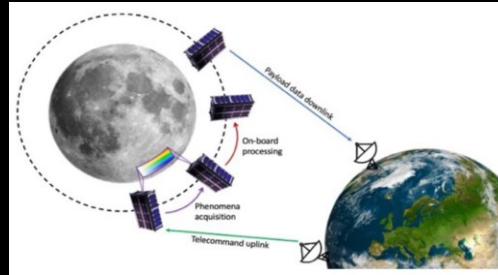


## UNISEC x Constellation Mission

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## World x Constellation Mission

- More and more examples in recent years: Planet's Doves, SpaceX's Starlink, etc.
- Various applications: communication, remote sensing, store & forward, science, etc. Education: e.g., QB50.



(Planet)



(Starlink)



(VKI)



# Session Outline



Aim:

Gather leading practitioners in space engineering, science, education.

Chart a course for a future UNISEC Constellation Mission.



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Chart a course for a future UNISEC Constellation Mission.

1. Introductions (15 mins)
2. Opportunities (15 mins + 10 mins Q&A)
3. Challenges (15 mins + 10 mins Q&A)
4. Path forwards (10 mins)



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3. Challenges (15 mins + 10 mins Q&A)
4. Path forwards (10 mins)



Please ask questions

# Panellists



 A. Rüstem Aslan  
Istanbul Technical University



Mengu Cho   
Kyushu Institute of Technology



 Herman Steyn  
Stellenbosch University



Masashi Kamogawa   
University of Shizuoka

# Introductions

What are you now working on,  
and how is it related to  
“UNISEC Constellation Mission?”



A. Rüstem Aslan



Herman Steyn



Mengu Cho



Masashi Kamogawa



# Topic 1: Opportunities





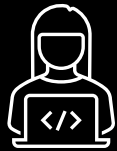
When you think of  
“UNISEC Constellation Mission”,  
what opportunities come to mind?

# Topic 1: Opportunities

A constellation has unique benefits.  
What are expected opportunities for:



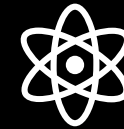
Education?



Engineering  
& Industry?



International  
collaboration?



Science?



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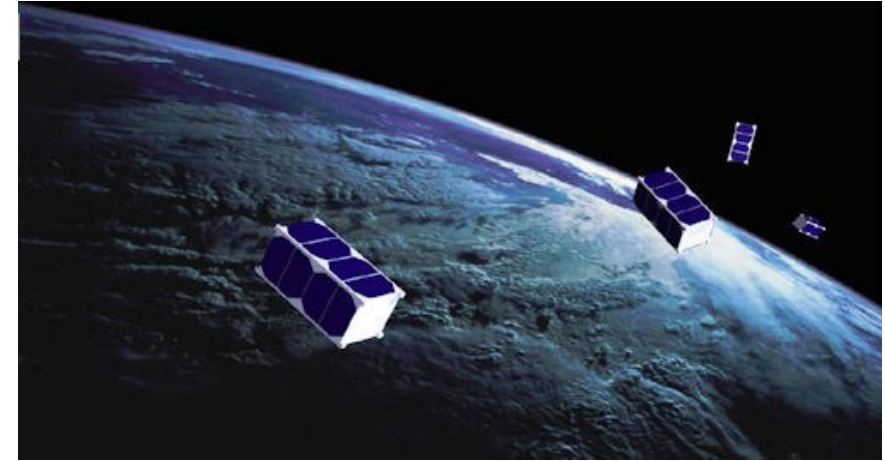


Masashi Kamogawa

# QB50 Science Mission

## ❑ EU FP7 science mission

- ❑ 31 x 2-unit & 5 x 3-unit CubeSats
- ❑ Launched into a 415 km LEO from ISS
- ❑ In-situ science down to 200 km
- ❑ Obtain models for re-entry research
- ❑ Launch of 28 CubeSats in April 2017 using Nanoracks to the International Space Station for release into orbit



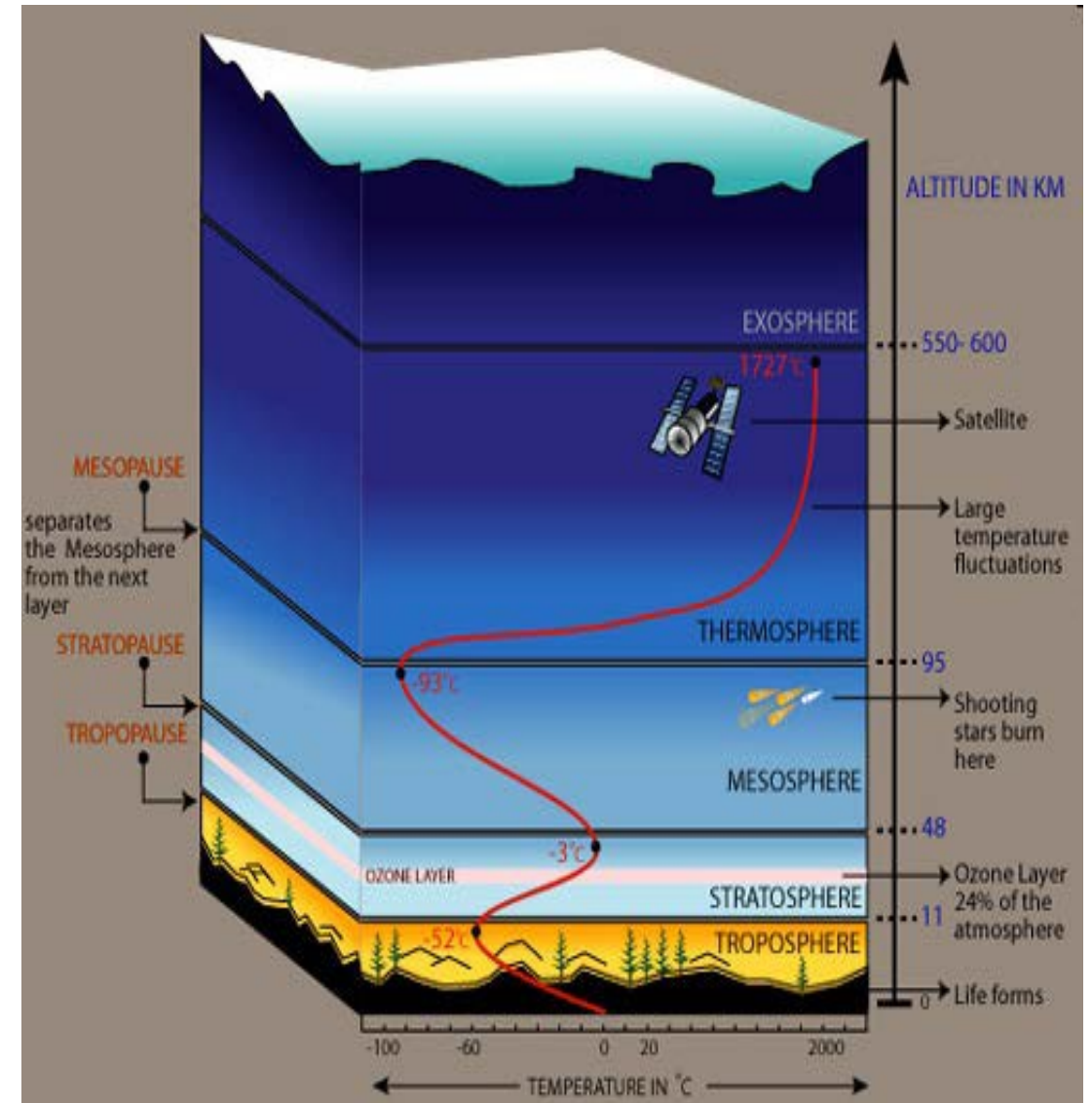
## ❑ International Cooperation

- ❑ Invited participation of teams from 27 countries, Univ of Stellenbosch became involved in 2013
- ❑ Provide a large number (500 to 1000) of university students with practical space science and technology experience
- ❑ About 50 PhD and 250 Masters theses expected internationally as a result of the QB50 project



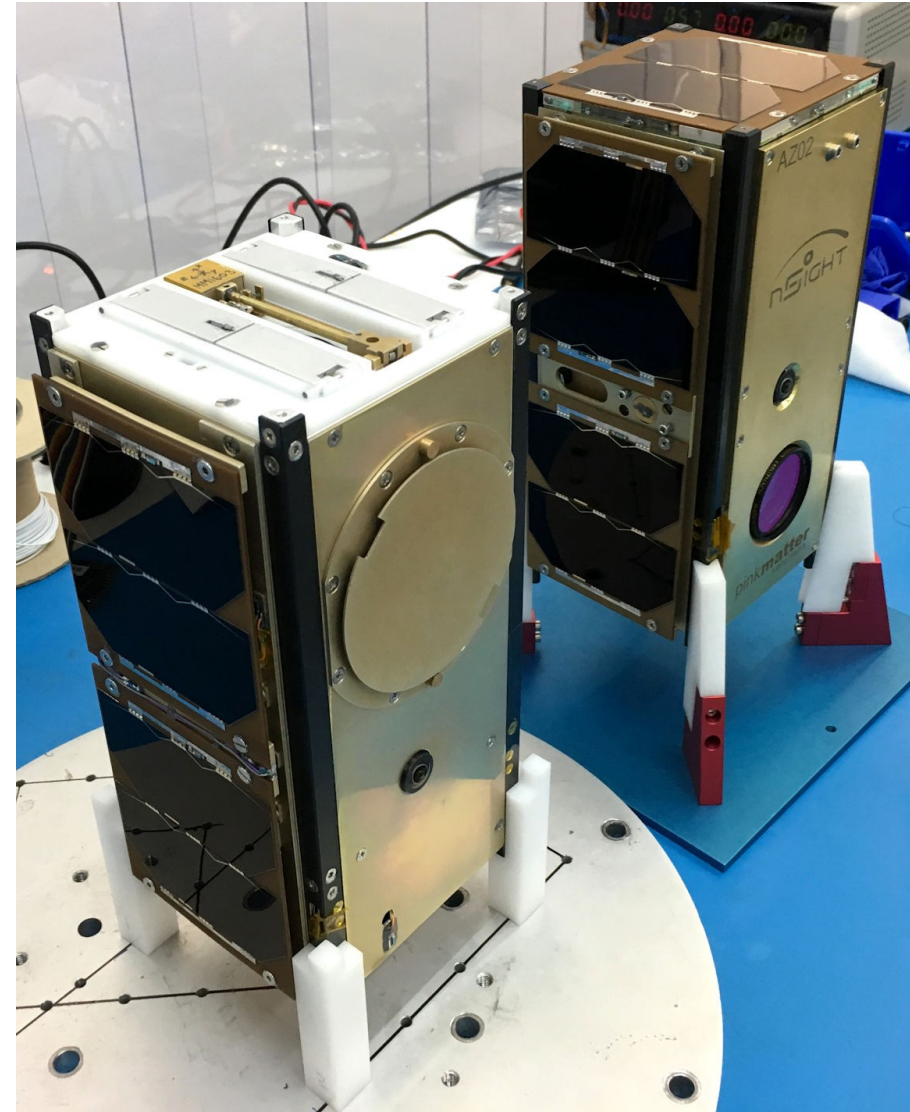
# QB50 Mission Objective

- To study the spatial and temporal variations of key elements (neutrals, ions, plasma) and parameters in the largely unexplored lower thermosphere
- Improve currently existing atmospheric / ionospheric models for reentry research
- Science can only be done with low cost nanosatellites due to the short mission life



# Our contribution to QB50

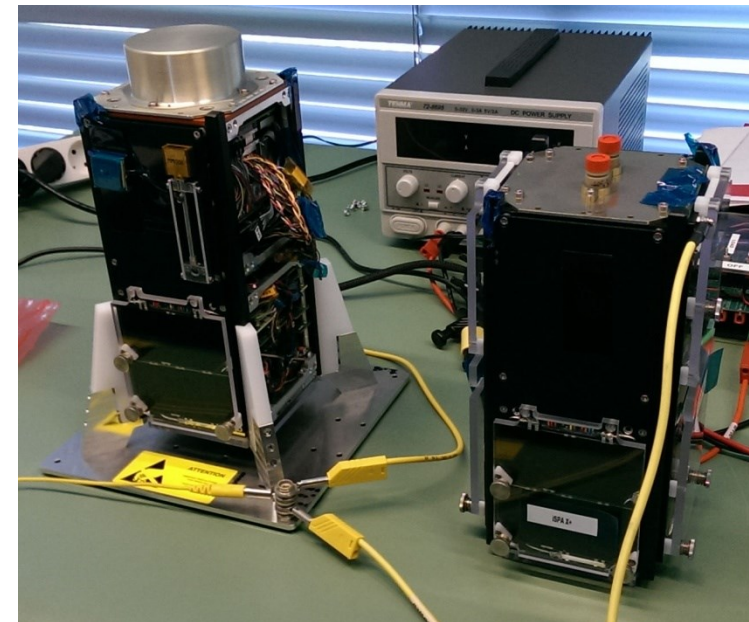
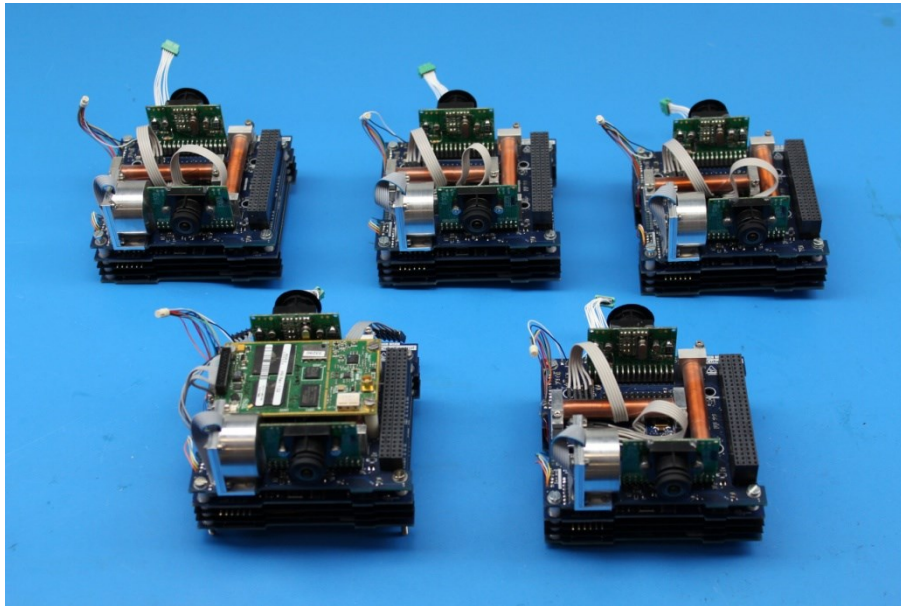
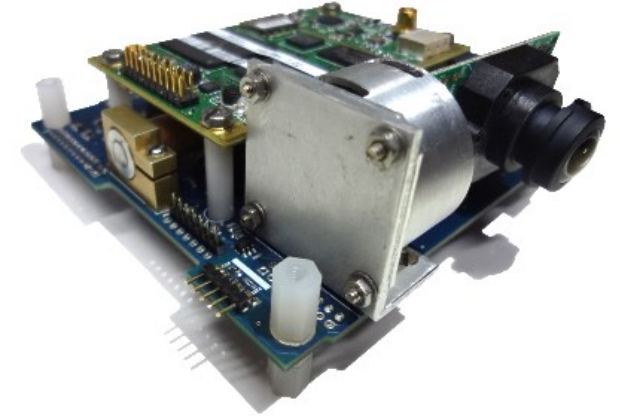
- ❖ ZA-AeroSat 2U CubeSat from the University of Stellenbosch (ESL & CubeSpace)
  - ❖ Fipex science sensor
  - ❖ CubeStar nano star sensor
  - ❖ Gravity wave sensor
  - ❖ Aerodynamic stabilisation
- ❖ nSight-1 2U CubeSat from Space Commercial Services (SCS)
  - ❖ Fipex science sensor
  - ❖ Gecko CubeSat imager
  - ❖ SU avionics and OBC



# QB50 ADCS Bundles

## ***Contribution to other QB50 teams***

- SU and the Surrey Space Centre at the Univ of Surrey in the UK developed these ADCS bundles
- 20 ADCS units for 2U CubeSats will be supplied to teams lacking ADCS capability
- Delivery of 3 units in January 2014 to precursor QB50 flight (2 x 2U CubeSats) launched 18<sup>th</sup> June 2014, ADCS commissioned and still operational
- All other units were completed and delivered to teams by the end of 2014

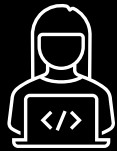


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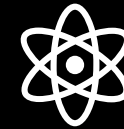
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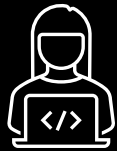
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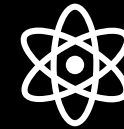
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Q&A



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# Topic 2: Challenges



When you think of  
“UNISEC Constellation Mission”,  
what challenges come to mind?

# Topic 2: Challenges

Lessons from QB50: pain points?  
Space ecosystem in aspiring space nations: how?  
How to choose a suitable mission objective?



A. Rüstem Aslan



Herman Steyn



Mengu Cho



Masashi Kamogawa



# Extended Discussion



Total space system: how to grow ground segment?  
Standardisation: challenge or opportunity?



A. Rüstem Aslan



Herman Steyn



Mengu Cho



Masashi Kamogawa

Lessons from QB50: pain points?

Space ecosystem in aspiring space nations: how?

How to choose a suitable mission objective?

Q&A



A. Rüstem Aslan



Herman Steyn



Mengu Cho



Masashi Kamogawa

# Path forwards

Imagine we are in the future.  
The UNISEC Constellation Mission is flying.  
What do you hope will be the impact?



A. Rüstem Aslan



Herman Steyn



Mengu Cho



Masashi Kamogawa



If you want to go fast, go alone

If you want to go far, go together