

# Abstract for Regional Report at the 7<sup>th</sup> UNISEC-Global Meeting

*Alim Rüstem Aslan*

*UNISEC-TURKEY (UTEB)*



Nov 30 (Sat) - Dec 3 (Tue), 2019  
**7th UNISEC-GLOBAL  
MEETING**



## **Turkish UNISEC (UTEB) 2018 November – 2019 November Activities**



**Prof.Dr. Alim Rustem Aslan, UTEB Coordinator, UNISEC Global PoC  
Manager, Space Systems Design and Test Laboratory  
Istanbul Technical University, Faculty of Aeronautics and Astronautics,  
Istanbul, Turkey  
[aslanr@itu.edu.tr](mailto:aslanr@itu.edu.tr)**



*Space Systems Design and Test Laboratory* USTTL



Prof.Dr. Alim Rüstem ASLAN

Astronautical Engineering Department

Istanbul Technical University, Turkey

- Manager, Space Systems Design and Test Laboratory
- Manager, SmallSat Communication Laboratory
- UNISEC-GLOBAL SC Member, PoC, MIC Coordinator
- IAA Corresponding Member
- IAF Correspondant
- CSO-STO AVT Panel Member
- VP, TAMSAT/AMSAT-TR, TA1ALM



**Area of expertise:** Design, analysis and development of pico- and nanosatellite (5 in orbit – 2 deorbited), manned and unmanned rotorcraft systems (including prototypes), computational fluid dynamics and aerodynamics, propulsion and, defense and education technologies.

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# UNISEC-TR History



- Started Nov 2011, by three Istanbul Universities (ITU, NDU (TurAFA), YTU)
- Over 20 participant universities
- Support of government, aerospace industry and research institutions
- 12 meetings so far hosted by starters and supporting institutions
- Working on establishing UTEB as a legal entity
- Various joint CanSat/CubeSat activities/projects
- International cooperation

# SPACE TECHNOLOGY



Technology required

- To access space,
- To use all kind of tools and systems in space and to sustain them,
- To return to earth

***Major source of wealth and driving force for developed and developing countries***

***It is of paramount importance, to have space technology development capability to increase national wealth and quality of life through exposure to cutting edge technology, knowledge and education***

# History of Local Chapter Activities



Established in 2011, became Local Chapter in Nov 2014

## *Past activities*

- *Participated in CLTP1 and 2 in 2011, 2012, 2015 and 2017*
- *Participated in MIC in 2011, 2012, 2014, 2015, 2016 and 2017*
- *Attended All UNISEC-Global Meeting since 2013*
- *Organized MIC Seminars*
- *Participated in AIAA/APSCO/TEKNOFEST ISTANBUL CanSat*
- *Held CanSat Training Program/Competition since 2014*
- *Practical Space Projects: 5 CubeSats launched, 3 ongoing projects*
- **Keep it multidisciplinary, international and multi institutional**

# UNISEC-Global Activities in 2019



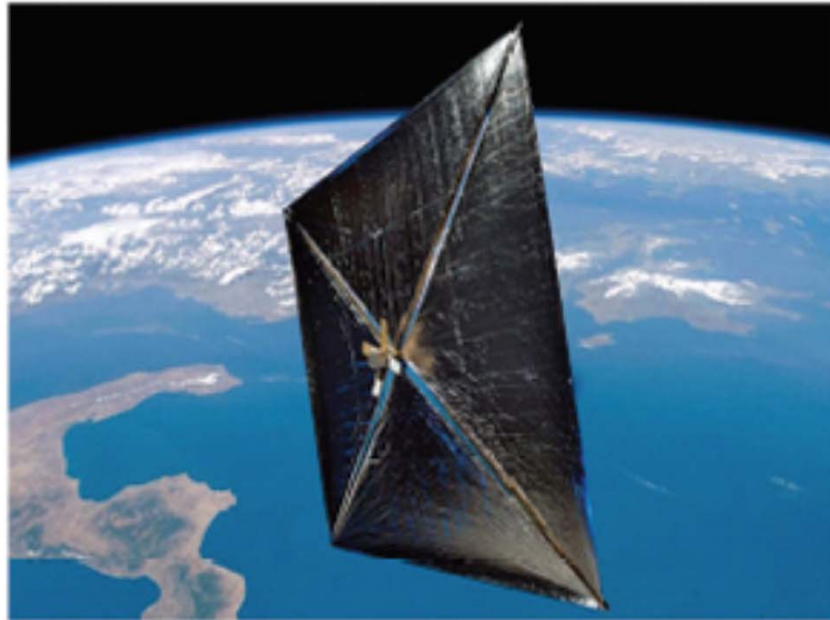
Number of

- Member Universities: N/A no official members (about 20)
- Students: N/A
- Professors: N/A
- Others ( Corporate members, etc.): N/A

- *Organizing a Program/Training/Competition: Seminars, CanSat WS, CubeSAT WS, Teknofest*
- *CLTP10: No*
- *MIC6: No*
- *ARLISS21: May be*
- *UNISEC-Global Meeting: Yes*
- *On-going Practical Space Projects: Yes*
- *CanSat Competition/Training: Yes*
- *HEPTA-Sat Training: Yes*

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# A Handbook for Post-Mission Disposal of Satellites Less Than 100 kg



**International Academy of Astronautics**





# RAST 2019, 11-14 JUNE 2019



## SPACE for SUSTAINABLE DEVELOPMENT GOALS

INTRO ABOUT SCHEDULE INVITED SPEAKERS SUBMISSIONS SPONSORS ANNOUNCEMENTS CONTACT

**RAST 2019**  
9<sup>th</sup> INTERNATIONAL CONFERENCE ON  
RECENT ADVANCES IN  
SPACE TECHNOLOGIES

JUNE 11-14 2019 @ ISTANBUL

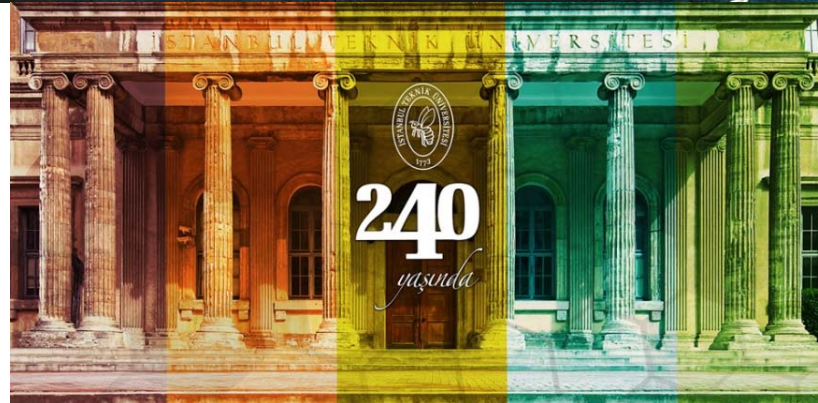
**"Space for the Sustainable Development Goals"**



# RAST2019 TESTING TUTORIAL at ITU



# ITU, Istanbul, Turkey by 360 Degrees by Orhan Durgut



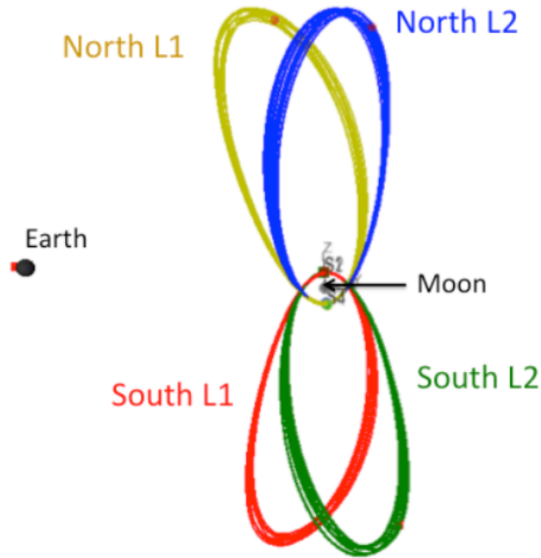
With a history stretching back over 246years (1773), providing technical education within a modern educational environment and strong academic staff, **Istanbul Technical University (İTÜ)** is strongly identified with architectural and engineering education in Turkey

- **Department of Astronautical Engineering since 1983**

# Astronautical Engineering Curriculum

- Education in space science and technologies
- Follows AIAA recommendations
- Fully Accredited by ABET till 2023
- Space related undergraduate courses
  - Introduction to Space Engineering (1st year)
  - **Astronautical Engineering&Design (CanSat Application) (1st)**
  - Aerospace structures (3rd year)
  - Orbital Mechanics, (3rd year)
  - Space environment, (4th year)
  - Spacecraft Attitude Determination and Control (4th)
  - Rocket and Electric Propulsion (4th)
  - **Spacecraft system design with application (SSD) (4th)**
  - Spacecraft communications (4th)
  - Space Law(elective)

# Deep Space Gateway and RLSAV



our NRO Orbit Types: multiple revolutions in a rotating Earth-Moon frame.

## GATEWAY

A spaceport for human and robotic exploration to the Moon and beyond

- HUMAN ACCESS TO & FROM LUNAR SURFACE**  
Astronaut support and teleoperations of surface assets.
- U.S. AND INTERNATIONAL CARGO RESUPPLY**  
Expanding the space economy with supplies delivered aboard partner ships that also provide interim spacecraft volume for additional utilization.
- INTERNATIONAL CREW**  
International crew expeditions for up to 30 days as early as 2024. Longer expeditions as new elements are delivered to the Gateway.
- SCIENCE AND TECH DEMOS**  
Support payloads inside, affixed outside, free-flying nearby, or on the lunar surface. Experiments and investigations continue operating autonomously when crew is not present.
- SAMPLE RETURN**  
Pristine Moon or Mars samples robotically delivered to the Gateway for safe processing and return to Earth.
- COMMUNICATIONS RELAY**  
Data transfer for surface and orbital robotic missions and high-rate communications to and from Earth.

**GATEWAY SPECS**

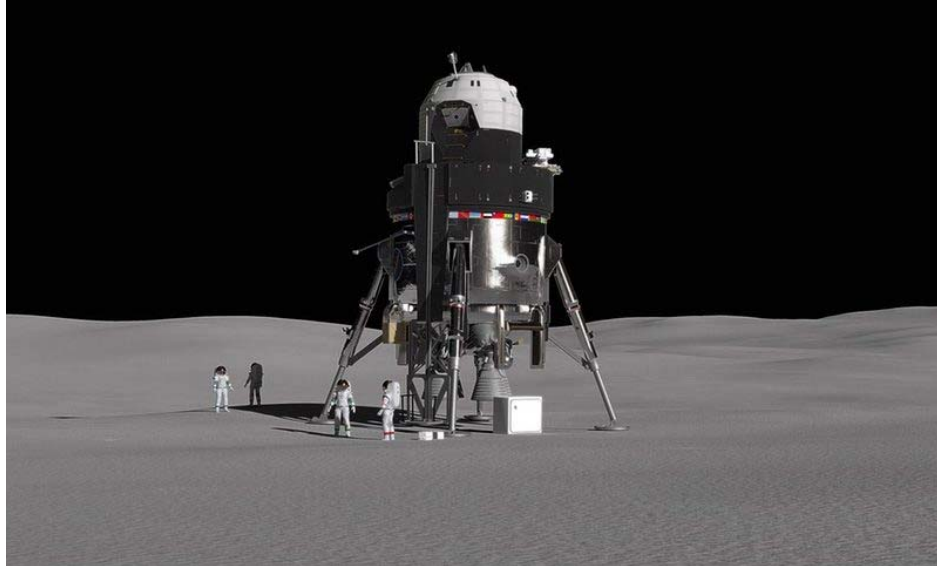
- 4 Crew Members
- 30-90 Day Crew Missions
- 125 m<sup>3</sup> Pressurized Volume
- Up to 75mt with Orion docked

**ACCESS**

- 384,000 km from Earth
- Accessible via NASA's SLS as well as international and commercial ships.

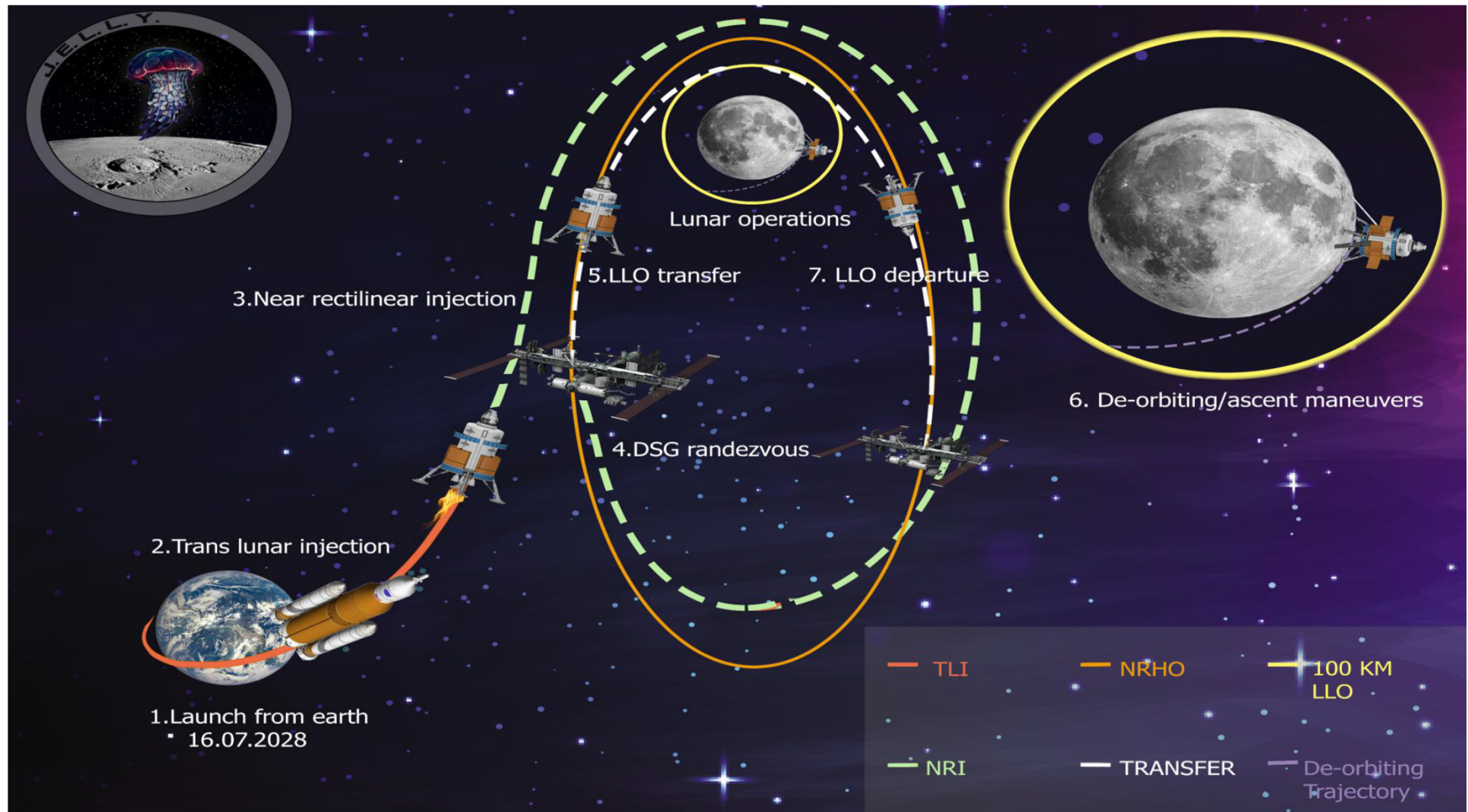
**SIX DAYS TO ORBIT THE MOON**  
The orbit keeps the crew in constant communication with Earth and out of the Moon's shadow.

**A HUB FOR FARTHER DESTINATIONS**  
From this orbit, vehicles can embark to multiple destinations: The Moon, Mars and beyond.



# AIAA SPACE DESIGN CONTEST 3rd PLACE

## Reusable Lunar Surface Access Vehicle



# USA CANSAT 2019 1st PLACE





Sponsors









## 2019 Winners

- First Place**  
Istanbul Technical University, Turkey  
APIS ARGE TEAM
- Second Place**  
Zonguldak Bülent Ecevit University, Turkey  
grizu-263
- Third Place**  
AGH University of Science and Technology, Poland  
AGH Space Systems
- Fourth Place**  
National Technical University of Athens, Greece  
White Noise
- Fifth Place**  
Cankaya University, Turkey  
CanBee

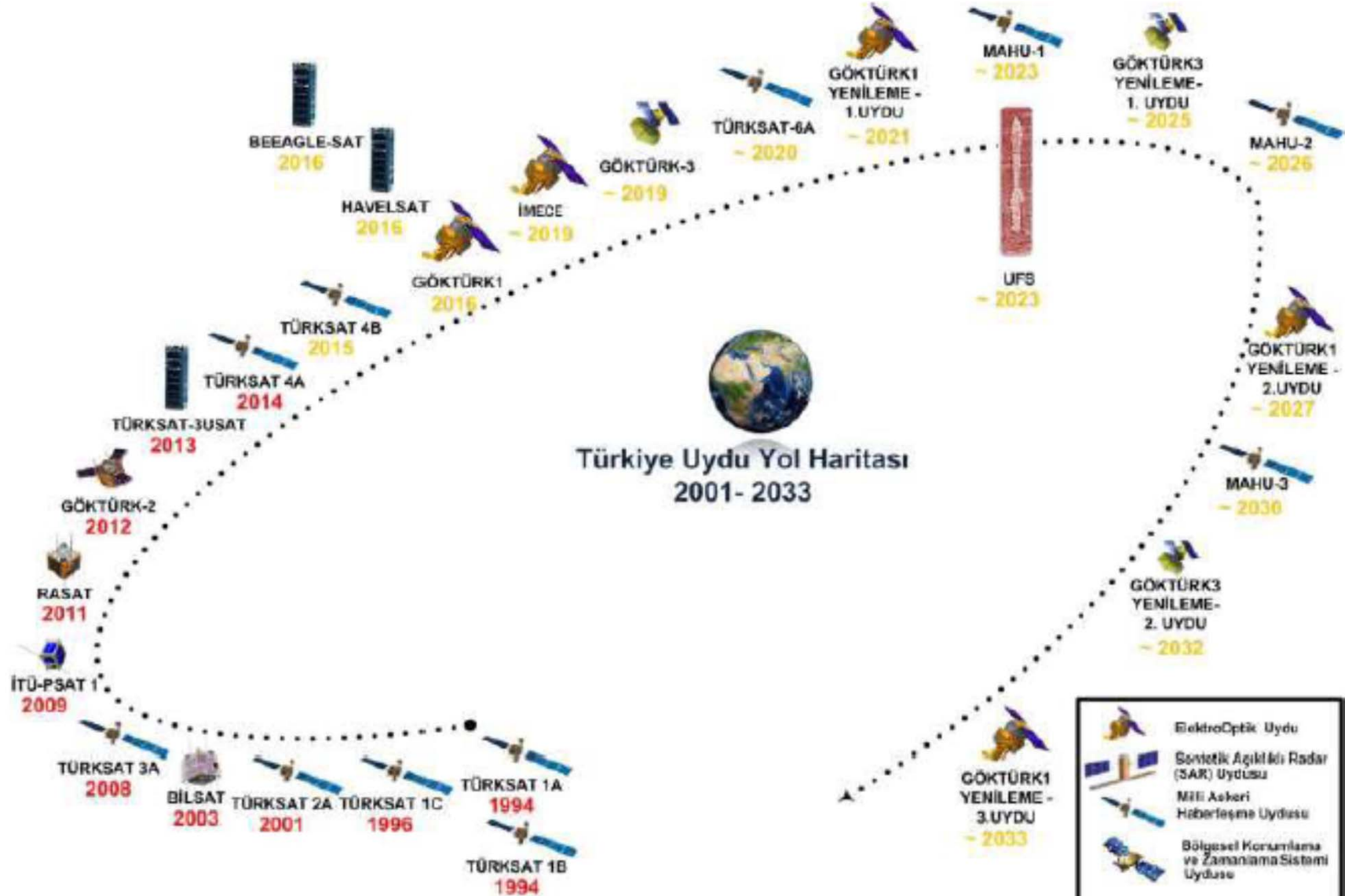
TEAM NUMBER	TEAM SCHOOL	TEAM SCORE	RANKING
6203	Istanbul Technical University	96.432%	1
6160	Zonguldak Bülent Ecevit University	96.355%	2
3193	AGH University of Science and Technology	94.902%	3
4440	National Technical University of Athens	94.756%	4
2806	Cankaya University	94.135%	5
3623	Arizona State University	90.811%	6
6246	Istanbul Gedik University	86.084%	7
2591	The University of Alabama in Huntsville	83.486%	8
5343	University of Alabama in Huntsville	82.135%	9
4999	University of Manchester	80.642%	10



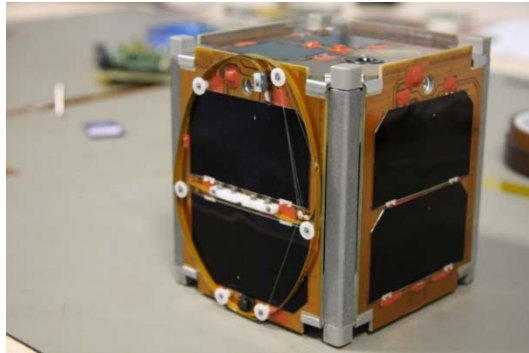




# Turkish Satellite Road Map



# COMPLETED CUBESAT PROJECTS

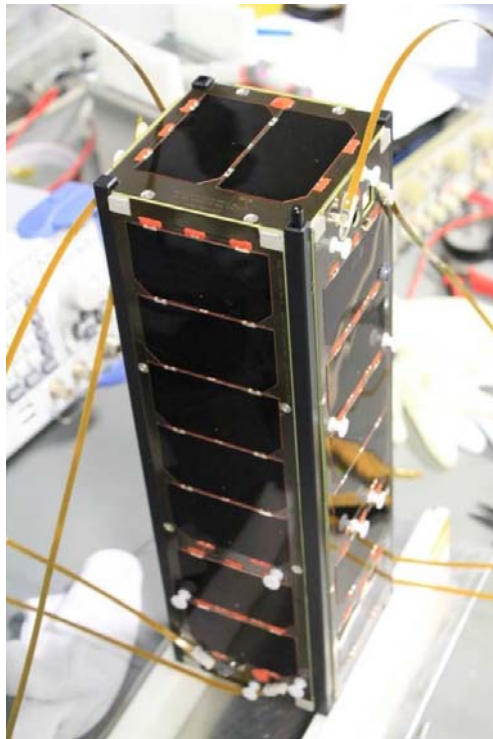


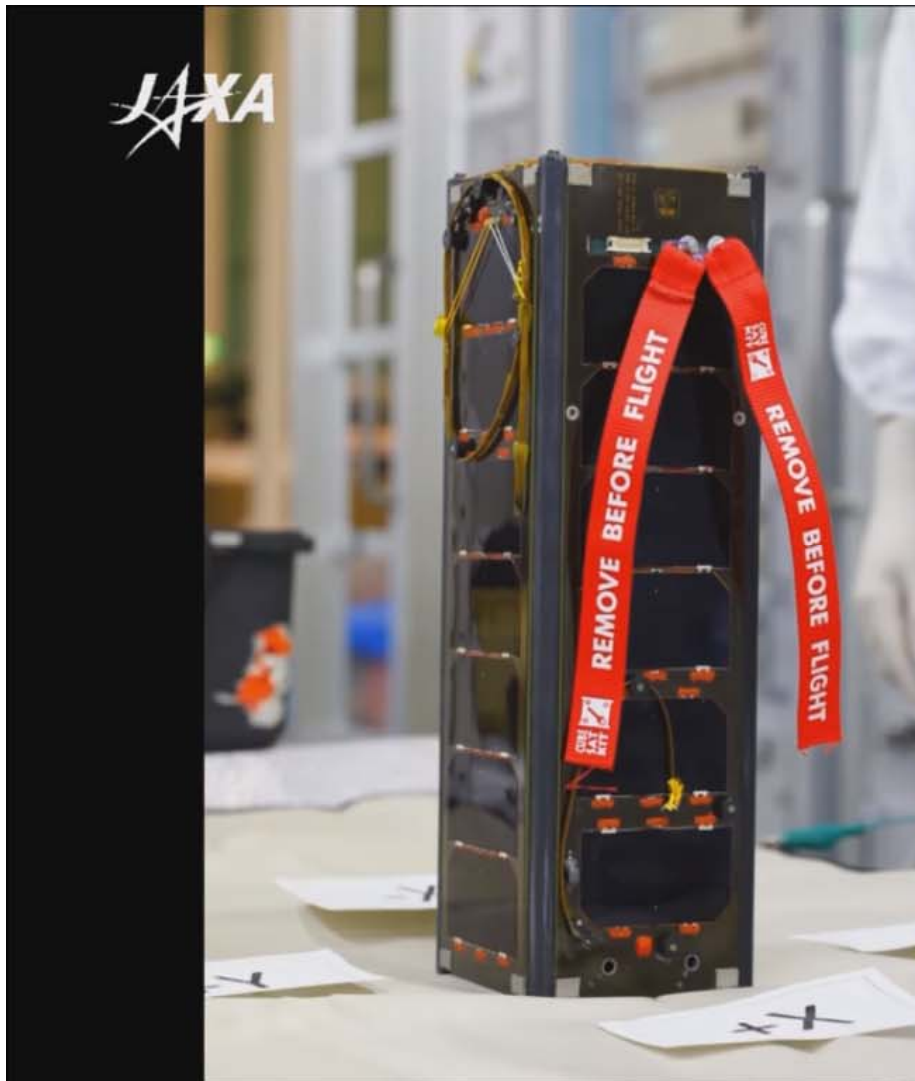
ITUPSAT1: 2009

TURKSAT 3USAT: 2013

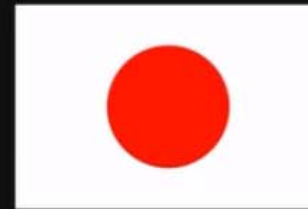
BEEAGLESAT and HAVELSAT: 2017

UBAKUSAT: 2018





Cooperation in the field of space  
and aeronautics  
(宇宙・航空分野に関する協力)



JAXA and Republic of Turkey's Ministry of  
Transport, Maritime Affairs and Communications  
(JAXAとトルコ共和国 運輸海事通信省)

- Provision of opportunity for long duration material exposure  
(材料などの長期曝露実験機会)
- Deployment of one cubesat (3U)  
(超小型衛星1機 (3U) の放出)

# INTEGRATION and TEST at ITU



## X BAND and VHF/UHF GROUND STATIONS at ITU



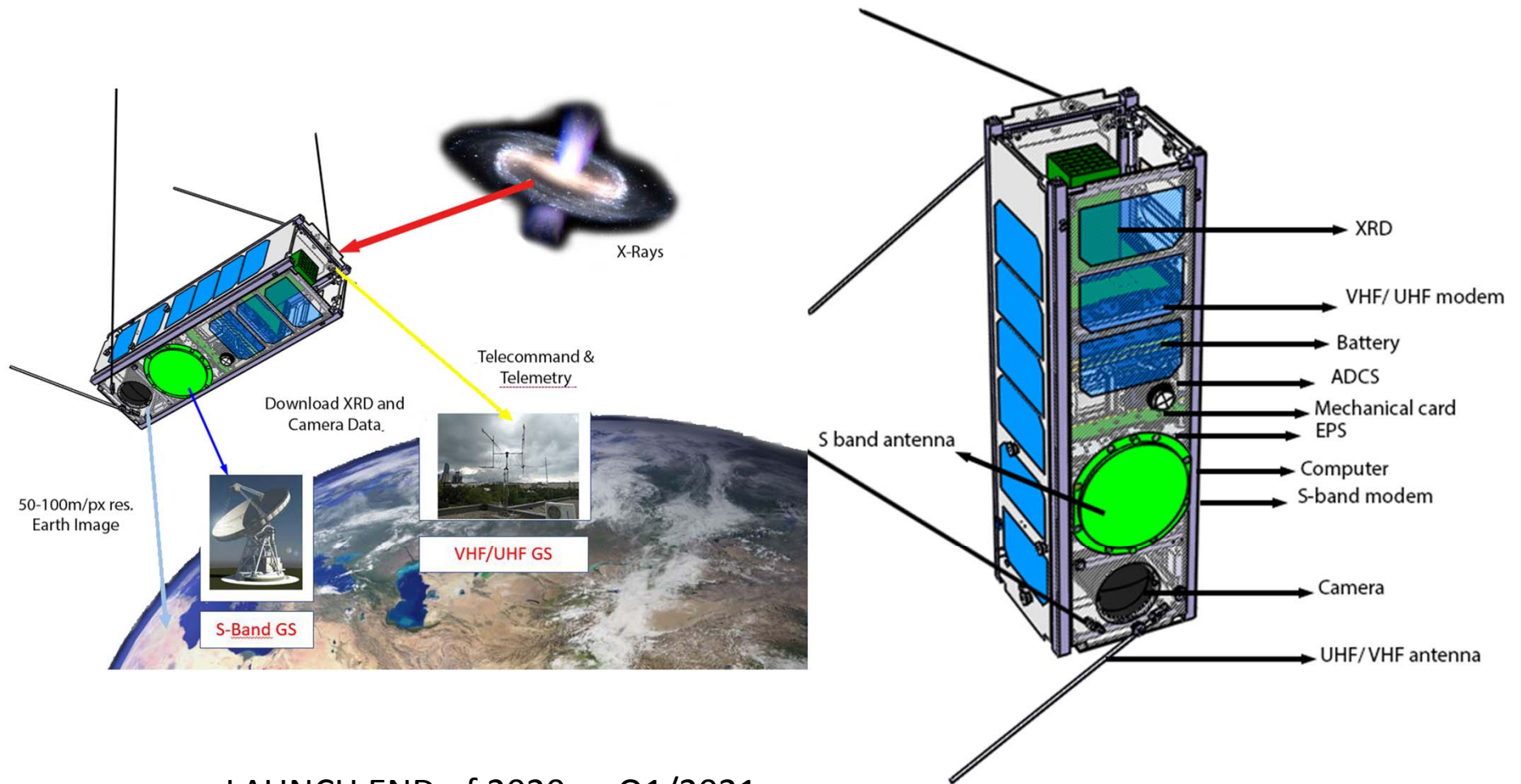
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# SHARJAHSAT-1 MISSION



- For UNIVERSITY of SHARJAH, UAE
- Capacity development through
  - Science mission: star detection and sun observation
  - Imaging mission: earth and space
- Payload
  - X Ray detector (specifications given)
  - Optical camera (specifications to be determined)

# SHARJAH SAT -1

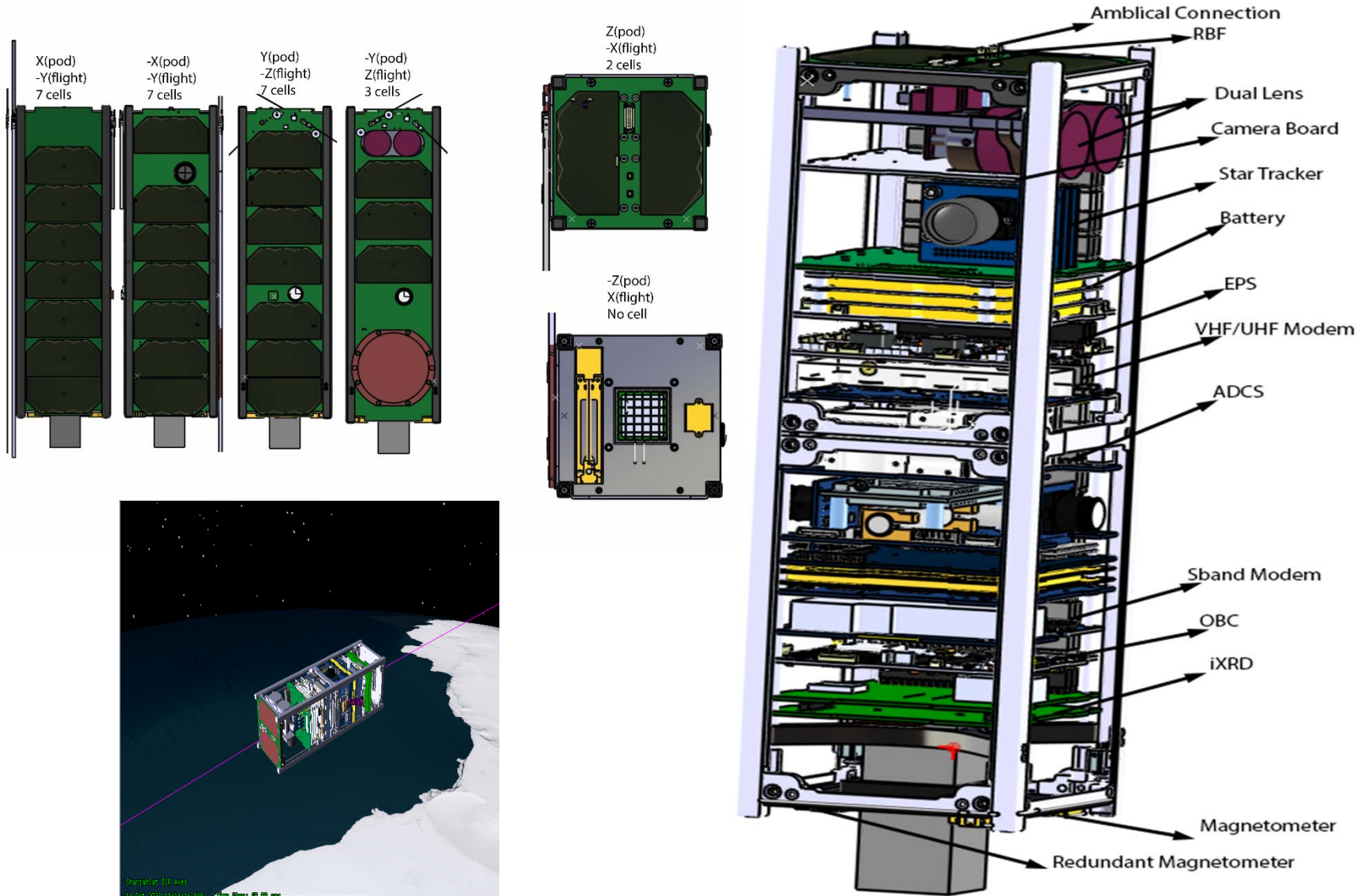


LAUNCH END of 2020 or Q1/2021



LAUNCH END OF 2020

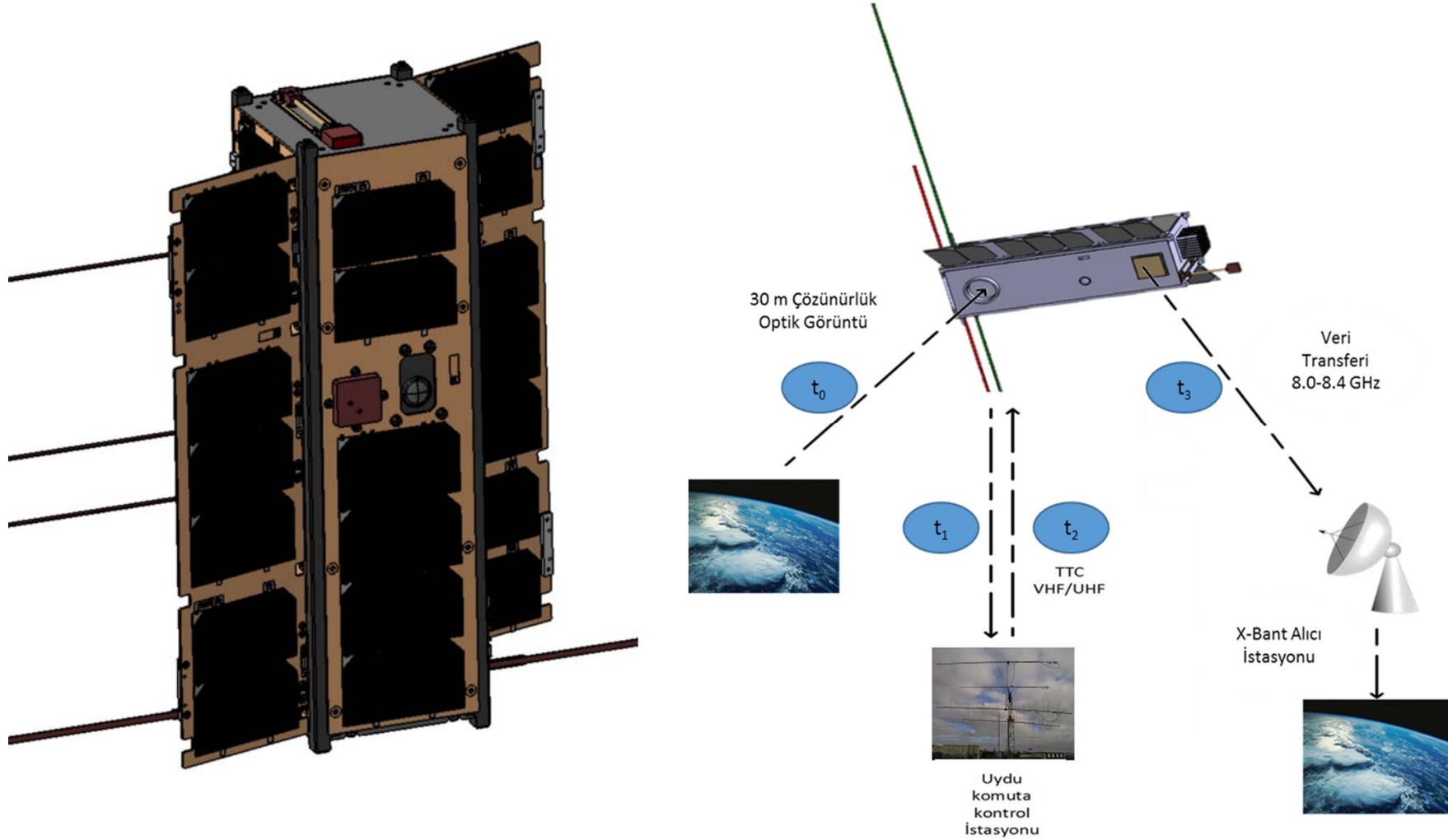
# SHARJAH SAT -1

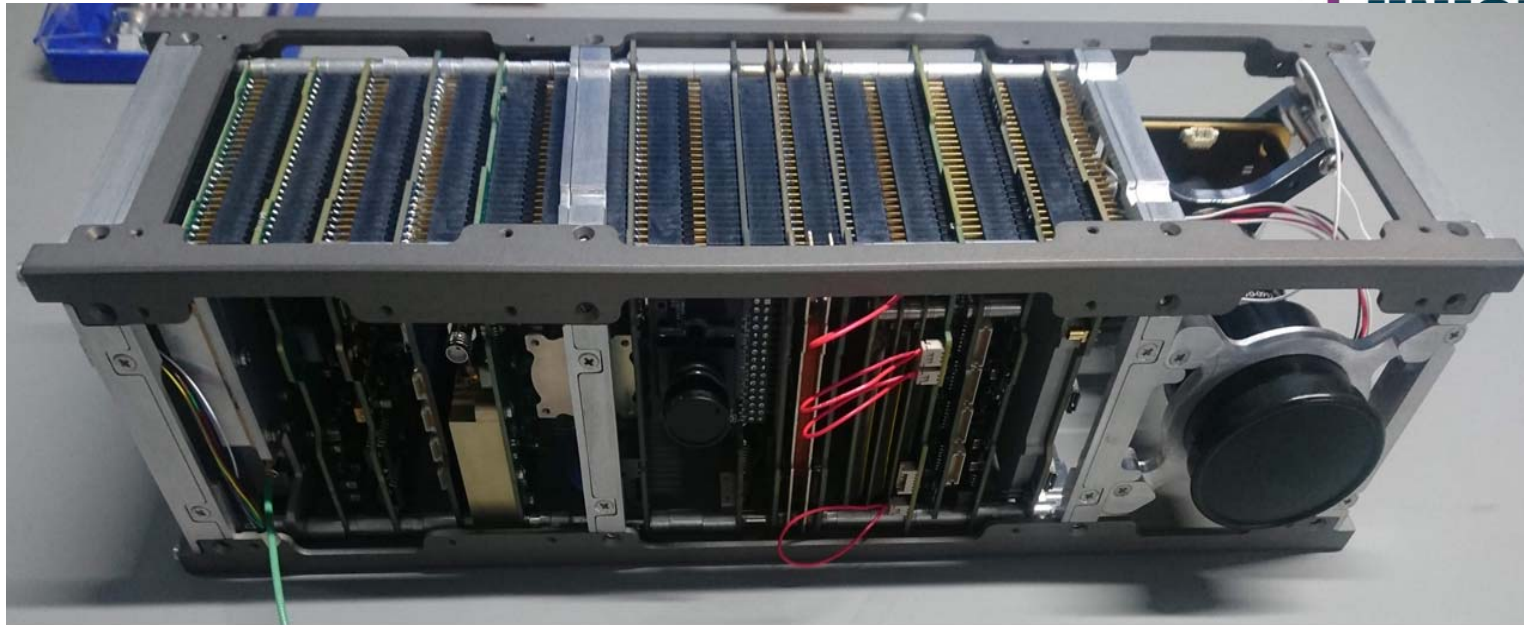


# CubeSat Training at SAASST in Sharjah, Clean Room and CubeSat Design Lab

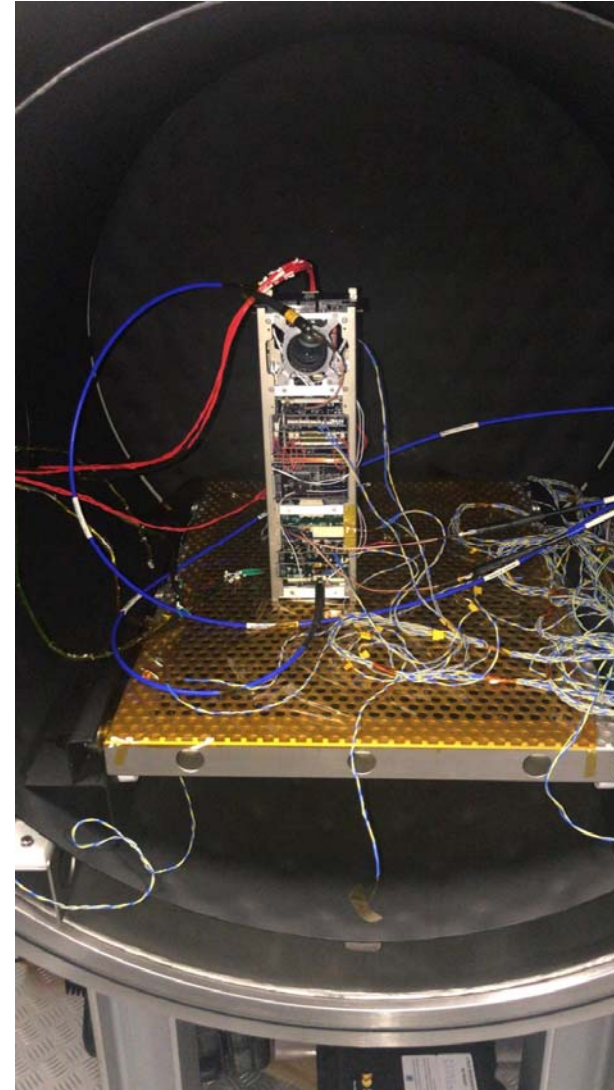
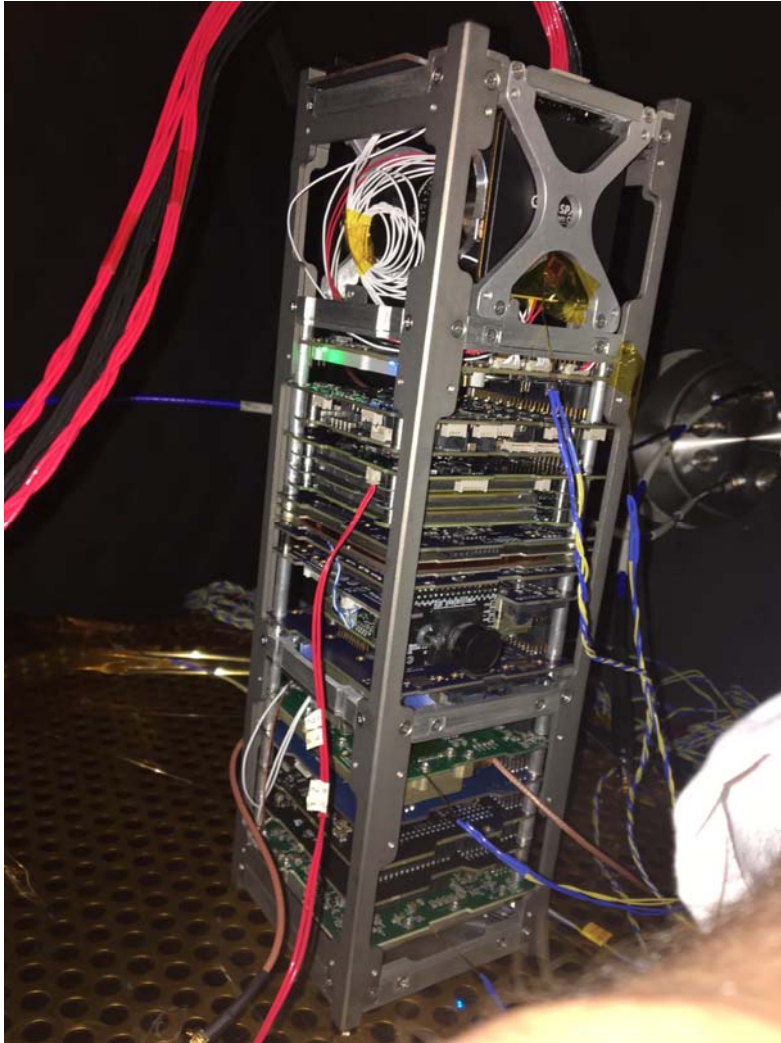


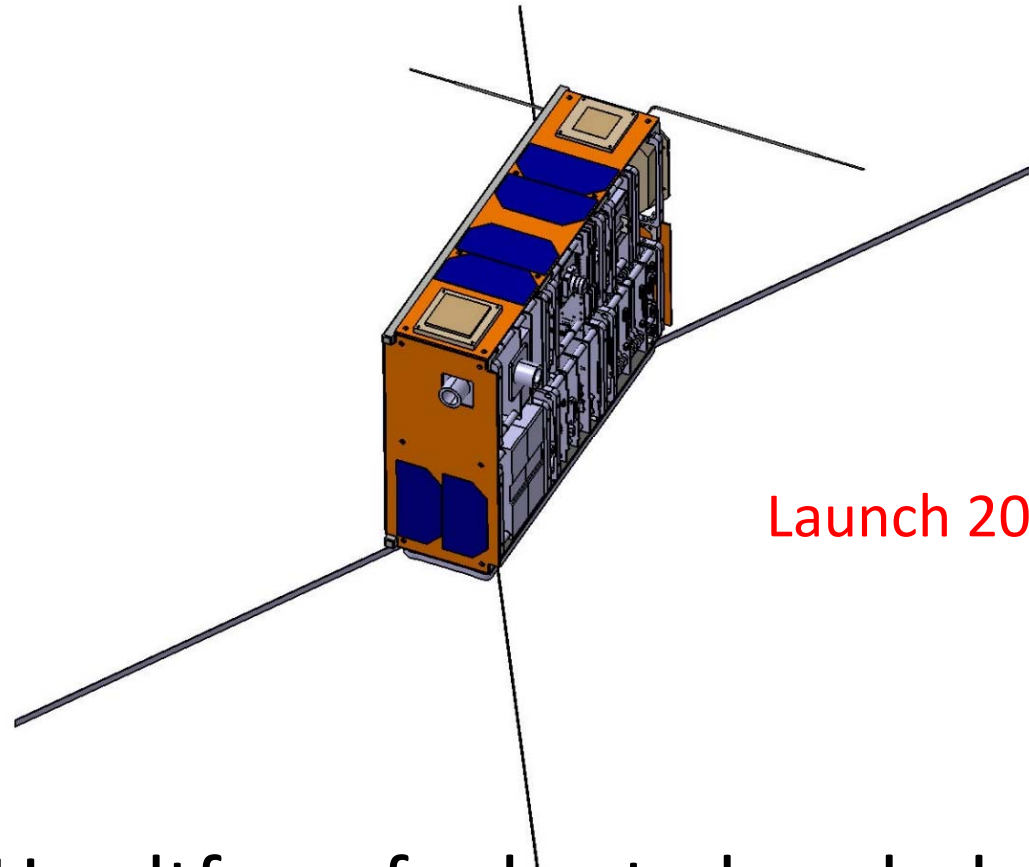
# AELSAT MISSION for AELSAN Company





# TVAC TESTING



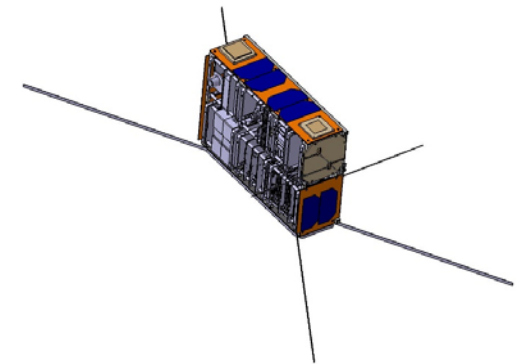


Launch 2020 or 2021

Modular 6U platform for hosted payloads: to provide free platform and launch for payload developers without the burden of finding a satellite/launch

# PROJECT TARGETS

- ▶ Develop novel payloads for Turkey
- ▶ Develop a platform that can be used without major validation and verification for subsequent missions
- ▶ Encourage Universities and SMEs to develop nanosatellite payloads to increase involvement of people and institutions/companies in space Technologies
- ▶ Provide the opportunity to developing countries towards helping UN SDG 2030

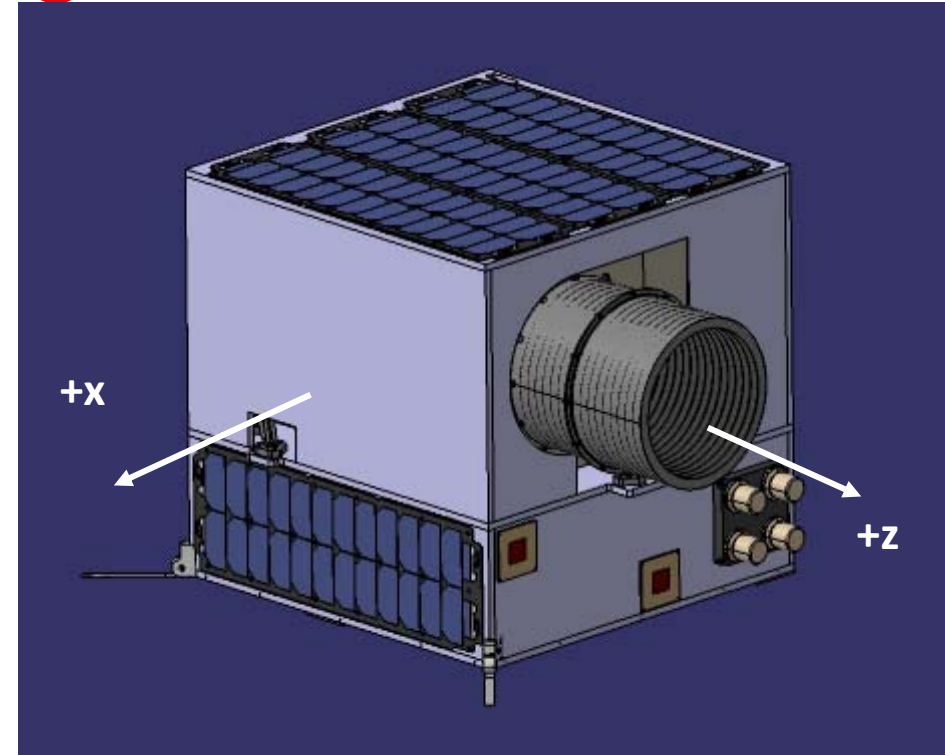
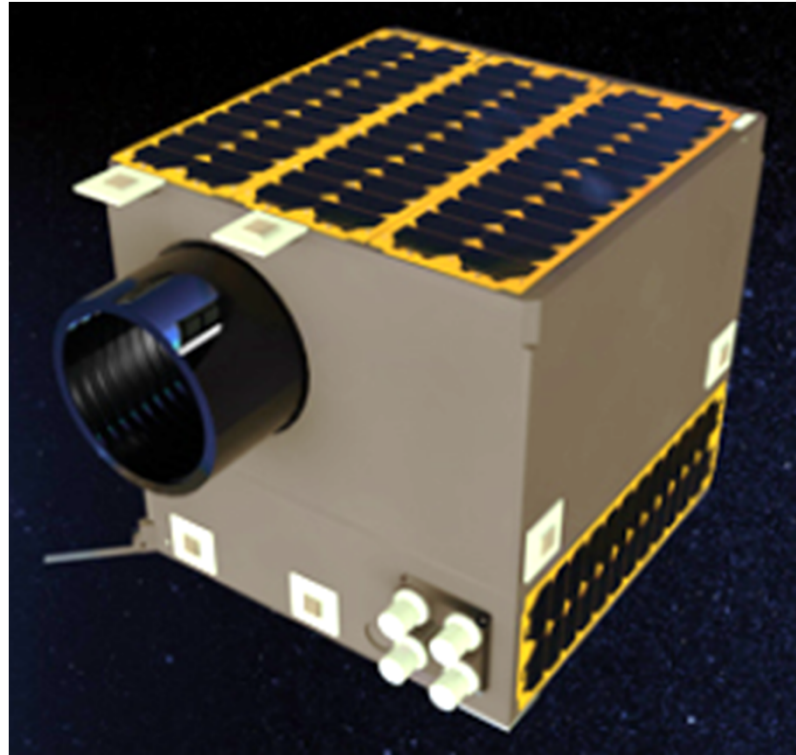




-- LAGARI



Launch August 2020



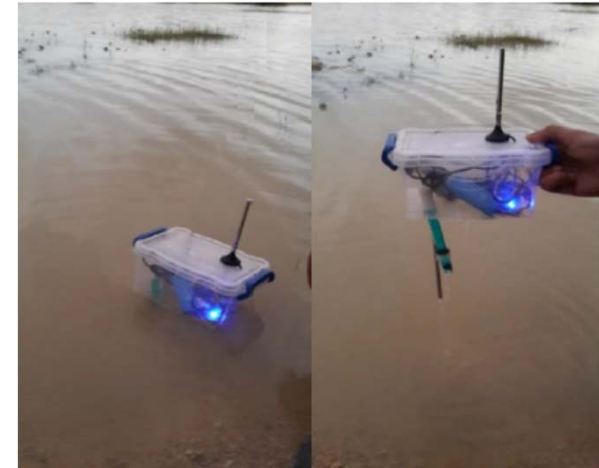
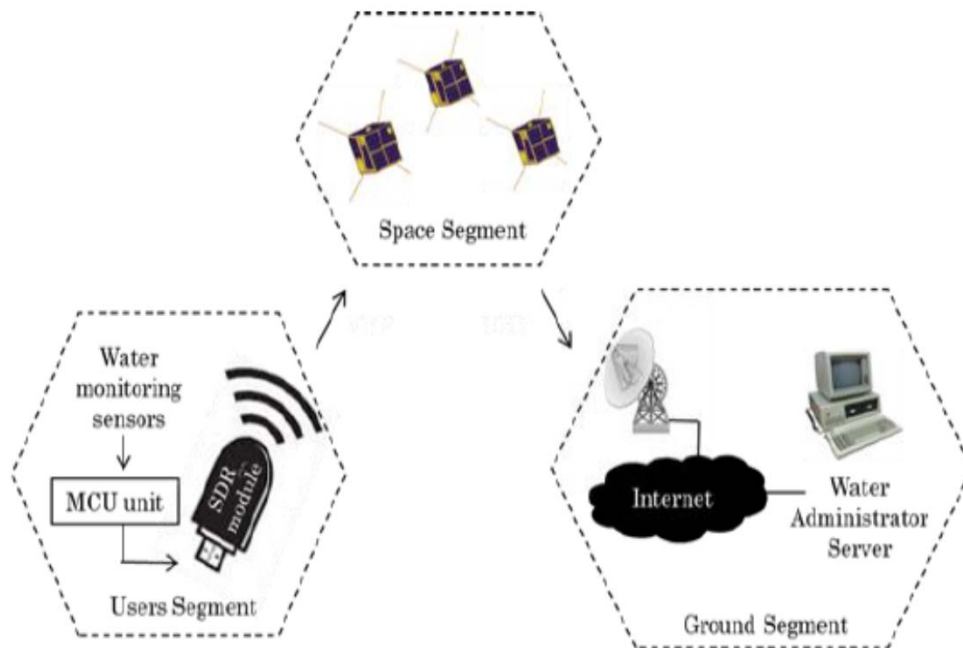
Hi Res EO, PAN <2m, MS<8m

Micro Sat, <70kg, operational satellite



# TURKEY-TUNISIA PROJECT

## Water Quality Monitoring with Network of CubeSats



# CANSAT HANDS ON WORKSHOPS



- CANSAT Design and development WORKSHOPS in
- Turkey
- UAE (Univ of Sharjah)
- Lebanon (LIU-CNRS)
- Efforts towards 2030 goal

**YALOVA ÜNİVERSİTESİ** **UTEB** **Hava Harp Okulu**

## MODEL UYDU İMALAT EĞİTİMİ VE TASARIMI

### III. CanSAT Uygulaması

**CanSAT Nedir?**  
Amerika Birleşik Devletleri'nden dünyaya yayılan bir kavramdır. İngilizce "Can" ve "Satellite" sözcüklerinin birleşiminden meydana gelmiştir. Diğer anlamı ise Model Uydu tanımlanmıştır. Model uydu modern uyduların temeli oluşturmuş yapıların modellenerek öğrencilere tanıtılması ve merak uyandırması düşüncesiyle bugün Dünya'nın pek çok yerinde yarışması yapılan bir etkinlik türüdür. Gerçek uyduların aksine, boyutları (330 mililitrelik kola şişesi) ve kütlesi en fazla 350 gr olan ve bir araştırma roketi ile çok düşük irtifaya (1000 m den az) çıkarılan minyatür uydudur.

**CanSAT Temel Uzak Eğitiminin Hedefi**  
Uzay mühendisliği ve bilimleri alanında yetişmiş insan gücünü artırmak amacıyla CanSAT tasarımı ve imalatını bir eğitim aracı olarak kullanılmaktadır. Türkiye'de CanSAT projeleri gerçekleştirilecek ve uluslararası CanSAT yarışmalarına katılacak kişi sayısını artırmak amacıyla katılımcıları CanSAT tasarımı ve imalatı konusunda uygulamalı olarak eğitmektir. Bu eğitime katılan kişiler üniversite ve kurumlarına döndükten sonra CanSAT projelerine liderlik ve danışmanlık yapmaları beklenmektedir.

**CanSAT Eğitim Adımları**  
Görev Analizi ve Sistem Geliştirme  
Donanım Entegrasyonu  
Yazılım Geliştirme  
Mikrodenetleyici Programlama  
GPS Entegrasyonu  
Güneş Paneli Entegrasyonu ve Güç Sistemi  
Telenetri Sistemi Entegrasyonu  
Alcalma ve İniş Sistemleri Tasarımı  
Mekanik Tasarım  
Yer İstasyonu Geliştirme  
Test ve Fırlatma  
Görev Sonrası Veri Analizi

**CanSAT Temel Uzak Eğitiminin İçeriği**  
a. Etkili bir disiplinler arası eğitim aracıdır.  
b. Düşük Maliyetle proje geliştirilir.  
c. Görev analizi yapılarak proje süreçleri planlanır.  
d. Tasarım, imalat, test ve fırlatmaya kadar tüm süreç uygulamalı olarak tecrübe edilir.  
e. Risk analizleri yapılır.  
f. Görev sonu ve analizi yapılır ve görev başarı durumu değerlendirilir.

**Kimler Katılabilir?**  
Uzay alanında çalışmak, bilgi sahibi olmak isteyen HERKES, özellikle savunma sanayii firma yöneticileri ve çalışanları, Mühendislik, Temel Bilimler, Astronomi ve Uzay Bilimleri, Uzay Bilimleri ve Teknolojileri öğrencileri veya mezunları katılabilir.

**TARİH**  
8-15 Ağustos 2016  
**YER**  
Yalova Üniversitesi  
Mühendislik Fakültesi  
Stadyum Karşısı  
77200 Yalova

**Launching**  
**Flight Segment**  
**Landing with parachute**  
**Parachute Separation**

**Kurs Ücreti:** 1500 TL  
Kurs ücreti, kurs dokümanlarını, uygulamalı dersleri, uydu yapımında kullanılan malzemeleri ve fırlatmayı içermektedir. Konaklama masraflarını içermez.

**Sponsorlar:**  
İLETİŞİM: bkilic@yalova.edu.tr, ali.dursun@yalova.edu.tr  
sunay.turkdogan@yalova.edu.tr

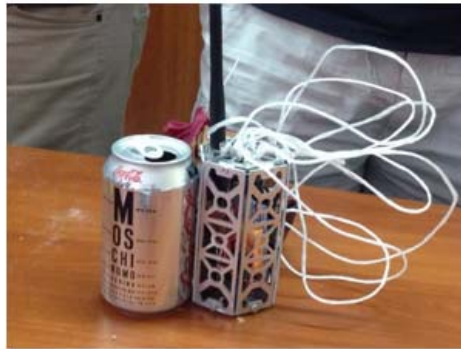
# 100 Graduate Students



**2nd CANSAT( MODEL SATELLITE) TRAINING**  
**LIU, KHIARA CAMPUS, 23-28 SEPTEMBER 2019**



## CanSat – Model Satellite Intro to CanSat, Mission Definition and Sensors



**Prof.Dr. Alim Rustem Aslan**

**Manager, Space Systems Design and Test Laboratory**

Istanbul Technical University, Faculty of Aeronautics and Astronautics,  
Istanbul, Turkey

[aslanr@itu.edu.tr](mailto:aslanr@itu.edu.tr)

ISTANBUL TEKNİK UNIVERSİTESİ  
Aerokosmik Öğretim

## Course Content: “Cansat as an educational tool”

- Formation of the CanSat Teams (of 6 students)
- Intro to CanSat, Mission Definition and Sensors
- Introduction to CanSat Hardware and Software
- Introduction to programming of microcontrollers
- Introduction to programming of GPS
- CanSat Ground Station Development
- CanSat Structural Design
- CanSat Design and Development
- CanSat Decent and landing system design
- CanSat final Integration and functional checks
- CanSat drop test, ground station track and controls
- Post launch (drop test) analysis
- Reporting and presenting

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# DAY by DAY HANDS ON WORK



1. September 23: Intro, teaming, equipments and tooling, CanSat development on breadboard (table top model), STM MCU and buzzer operations
2. September 24: CanSat development on breadboard, rest of subsystems
3. September 25: CanSat development on PCB
4. September 26: CanSat development on PCB, placement in Structure and Drop Testing
5. September 27: Flight test in the field, post flight analysis, reporting
6. September 28: Presentations and grading, Ceremony

# CUBESAT DESIGN and HANDS ON WORKSHOPS



**Arthur C Clarke Institute for Modern Technologies, Katubedda, Moratuwa**



جامعة الشارقة  
UNIVERSITY OF SHARJAH



المجلس الوطني للبحوث العلمية  
National Council for Scientific Research



Sixth International Conference on  
**AEROSPACE SCIENCE  
& ENGINEERING**

November 12-14, 2019  
Islamabad, Pakistan



Workshop  
On  
**Design of the 1st Lebanese Nano-Satellite**  
Organized by  
Faculty of technology – Lebanese University, Saida

In collaboration with  
Pr. A. Rüstem Aslan  
From 30 September to 1 October 2019,  
Faculty of Technology – Library Hall – Saida



الجامعة اللبنانية  
كلية التكنولوجيا

# CubeSat design and hands on training to Lebanese Universities



Up To The  
LEBANESE  
NANO  
SATELLITES

**CUBESAT TECHNOLOGY PROJECT**  
Toward Developing the First Lebanese NanoSatellite.

Join Us →

- Introduction
- Project Scope
- Awareness Project Workshops +
- Capacity Building Trainings +
- Space Program Governance Structure
- First CubeSat Roadmap
- Closing Ceremony +

**CubeSat Technology toward sustainable development**



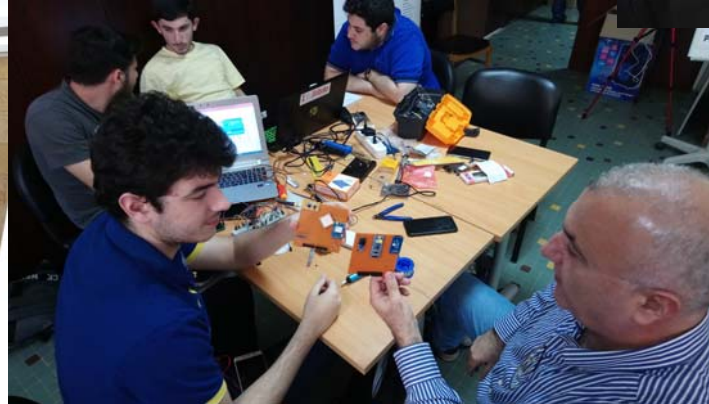
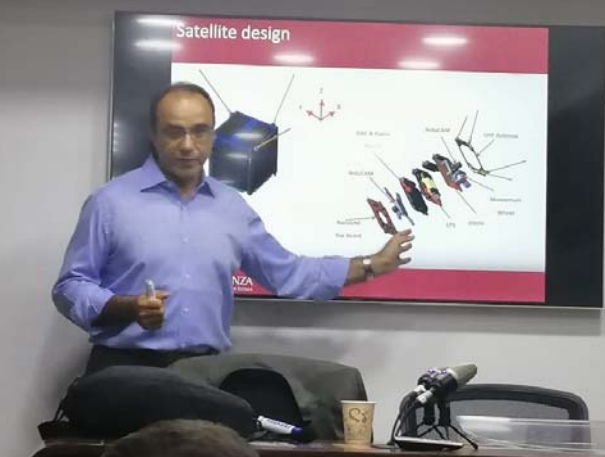
المجلس الوطني للبحوث العلمية  
National Council for Scientific Research

In Lebanon, the National Council for Scientific Research (CNRS-L) is the public institution in charge of science-policy making.

Given the benefit scale of space-related applications, the CNRS-L will leverage CubeSat technology toward sustainable development.

We will do this by supporting the research and education in Lebanon in the space field as well as providing opportunities for space technology transfer to the Lebanese scientific and professional communities.

Under the Technical Assistance Facility program to the Government of Lebanon, the CNRS-L is working in partnership with Crown Agents and OMSAR to launch



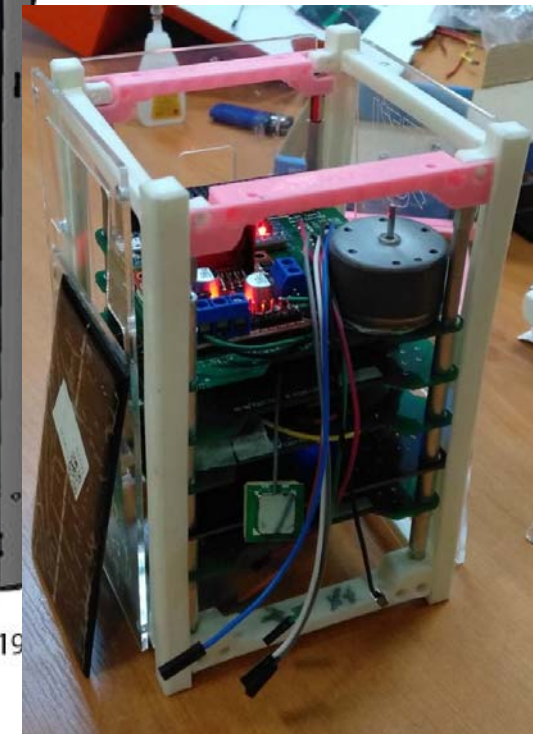
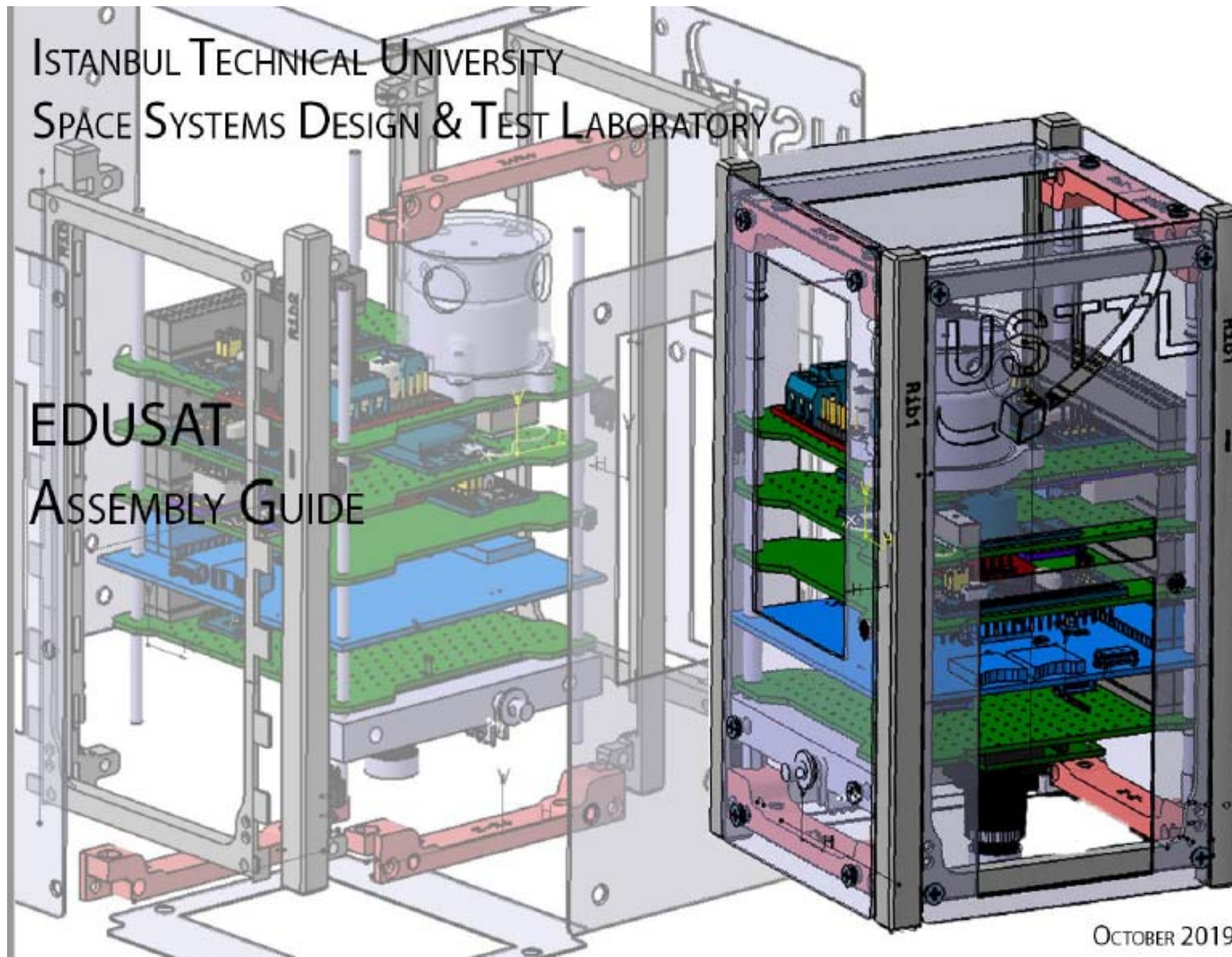


# Amatuer GS Design and Establishment



# Training CubeSat (EDUSAT)

Develop actual mission software for CubeSat



# CanSat WS for BahceSehir High Schools (80 students)



## Başöğretmen'in İzinde Gözümüz Yükseklerde

Bahçeşehir Koleji öğrencileri, uydu tasarımıyla dijital yetkinliklerini geliştirmek için CanSat Nano Uydu Çalıştayı'nda buluşuyor, en hakiki müşhidin izinde Başöğretmen Mustafa Kemal Atatürk'ü anıyor.

Son Başvuru Tarihi: **14 Ekim 2019, Pazartesi**

#gözümüzyükseklerde

**8-9 Kasım 2019**  
Bahçeşehir Koleji  
Nakkaştepe Kampüsü

**10 Kasım 2019**  
Bahçeşehir Koleji  
Atakent Tema Kampüsü



# SPACE MINING WORKSHOP



## III. ASTEROİT MADENCİLİĞİ VE METEOR BİLİMİ ÇALIŞTAYI



16 ARALIK 2019 EGE ÜNİVERSİTESİ  
FEN FAKÜLTESİ KONFERANS SALONU



### Konuşmacılar

Serdar Hüseyin YILDIRIM (Türkiye Uzay Ajansı Başkanı)

Prof. Dr. Alim Rüstem ASLAN

Doç. Dr. Lokman KUZU

Doç. Dr. Ozan ÜNSALAN

Dr. Öğr. Üy. Selçuk Topal

Uzm. Yücel KILIÇ

Arkeolog Altay BAYATLI

Halit MİRAHMETOĞLU

Amt. Ast. Zafer EMECAN

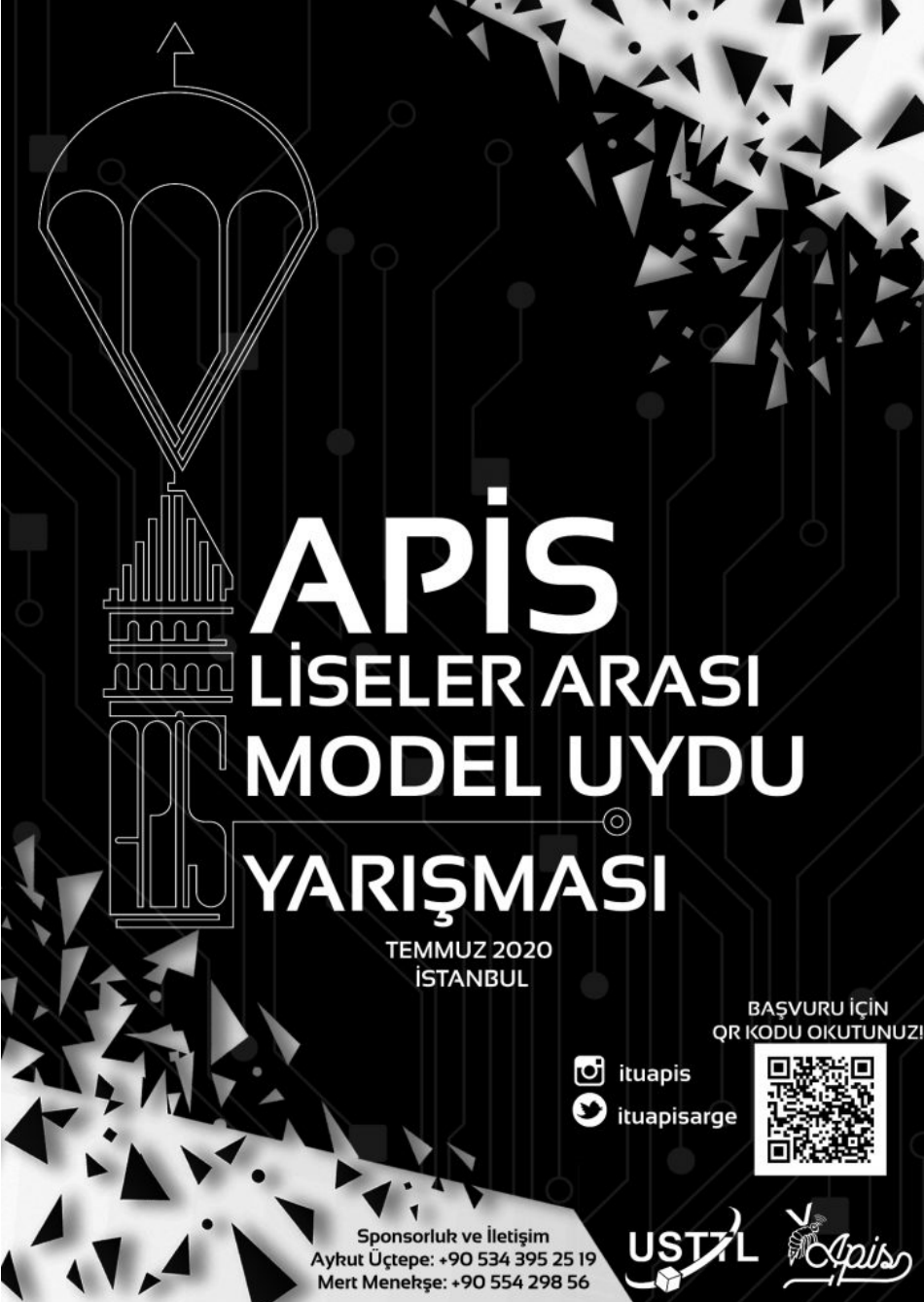
Mehmet Ekin YALÇINKAYA



**KAYIT VE BİLGİ İÇİN**  
[www.ozanunsalan.com/astminmet](http://www.ozanunsalan.com/astminmet)



# APIS HIGH SCHOOL CANSAT COMPETITION July 2020



The poster features a dark background with a white circuit board pattern. On the left, there is a stylized white outline of a hot air balloon with a basket and a small house-like structure inside. The text is in white, bold, sans-serif font. At the bottom, there are social media icons for Instagram and Twitter, a QR code, and logos for USTUL and Apis.

**APIS**  
**LİSELER ARASI**  
**MODEL UYDU**  
**YARIŞMASI**

TEMMUZ 2020  
İSTANBUL

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TURKSAT

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MODEL  
UYDU  
YARIŞMASI



# TeknoFest 2020 National CanSat Competition

# ITU-USTTL ROCKET, 2 CanSats



# Plan for 2020 and beyond

- 8 th UNISEC GLOBAL and 10th NanoSatellite Symposium in Istanbul, July 2020
- Continue CubeSat projects
- Support to Regional Space Projects
- Support to schools and other educational institutions (space technology seminars)
- Keep it multidisciplinary, multi institutional and international



# We Look Forward To a Sustainable Fruitful Cooperation Towards being a civilization living in the Solar System

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