The 6th UNISEC-GLOBAL MEETING
International Space University
Strasbourg, France
19-21 November 2018

Turkish UNISEC (UTEB)
2017 November – 2018 November Activities

Prof.Dr. Alim Rustem Aslan, UTEB Coordinator, UNISEC Global PoC
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ITU/FAA
Faculty of Aeronautics and Astronautics

Space Systems Design and Test Laboratory

USTTL

Alim Rüstem ASLAN, Ph.D., TA1ALM

Professor of Aerospace Engineering
VP, TAMSAT/AMSAT-TR
Manager, Space Systems Design and Test Laboratory
Manager, SmallSat Communication Laboratory
UNISEC-GLOBAL SC Member
IAF Correspondant
NATO-CSO-STO Panel Member
Astronautical Engineering Department
Faculty of Aeronautics and Astronautics
Istanbul Technical University
34469 Istanbul TURKEY

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

ITU, Istanbul, Turkey

by 360 Degrees by Orhan Durgut

With a history stretching back over 245years (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**

ITU, Space Engineering

- Establishment 1983 (ITU 1773)
- 60 new students per year
- Space related labs
  - Spacecraft Systems Design and Testing
  - Small Satellite communication
- Aim:
  - Research and testing on nano satellites and satellite components
  - To have engineers with laboratory experience to serve the national aerospace industry

Space Engineering Curriculum

- Education in space science and technologies
- Follows AIAA recomendations
- 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)

Curriculum (AIAA/ABET)

- *"Astronautical engineering programs must demonstrate that graduates have knowledge of orbital mechanics, space environment, attitude determination and control, telecommunications, space structures, and rocket propulsion".*
- *"Program must also demonstrate that graduates have design competence that includes integration of astronautical topics".*

- (http://www.aiaa.org/content.cfm?pageid=472)

İ.T.Ü. NanoSat Group + AMSAT-TR + SMEs

- Faculty, researcher and students from Astronautical, Aeronautical, Mechanical, Electrics and Electronics departments, with interdisciplinary team work.
- Joint work, design and manufacturing capabilities of SMEs and AMSAT-TR
- Competencies:
  - Design and development of nano/micro satellites, de-orbiting systems, rocketry
  - Modelling, simulation, CNC manufacturing, otomation, workshop
  - Affordable, reliable and fast environmental tests of nano/micro satellites and satellites subsystems (clean room, upto 50kg and 50*50*50cm),
- Small scale spacecraft subsystem development:
  - EPS, OBC, SDR, Lineer Transponder, Modem, passive and active ADCS, structures and mechanisms (low cost, high precision, power and efficiency)
- Reference projects :
  - ITUpSAT1, TURKSAT 3USAT , UBAKUSAT, ASELSAT
  - FP7: QB50 BEEAGLESAT and HAVELSAT
  - MIC, CLTP, DDC, DMC, NANOSATSYMP
  - Many Industrial aerospace projects

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
- 11 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

UNISEC TURKEY

University Space Engineering Consortium

UNISEC GLOBAL

University Space Engineering Consortium

Acknowledgement

This is to acknowledge

UNISEC-TR(UTEB)

as a Local-Chapter of the UNISEC-Global, due to recommendations made by the Steering Committee, a supreme organ of the UNISEC-Global. This acknowledgement extends one year, effective on November 20, 2014.

Prof.Dr. Alim Rustem ASLAN is designated as Secretary of UNISEC-TR(UTEB) on its behalf and a Point of Contact hereafter.

Rei Kawashima
Secretary General,
UNISEC-Global

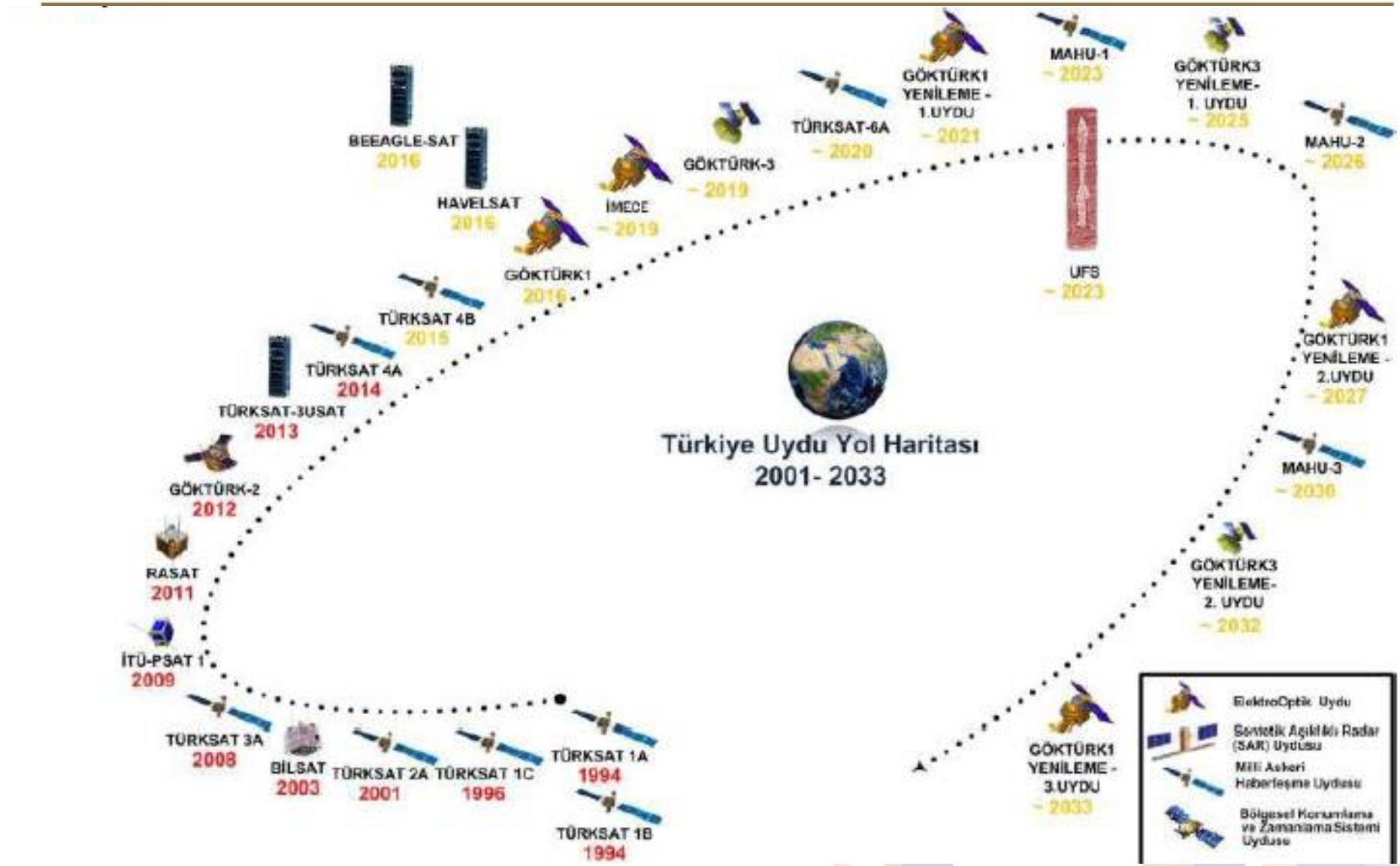
November 20, 2014

2018 Summary

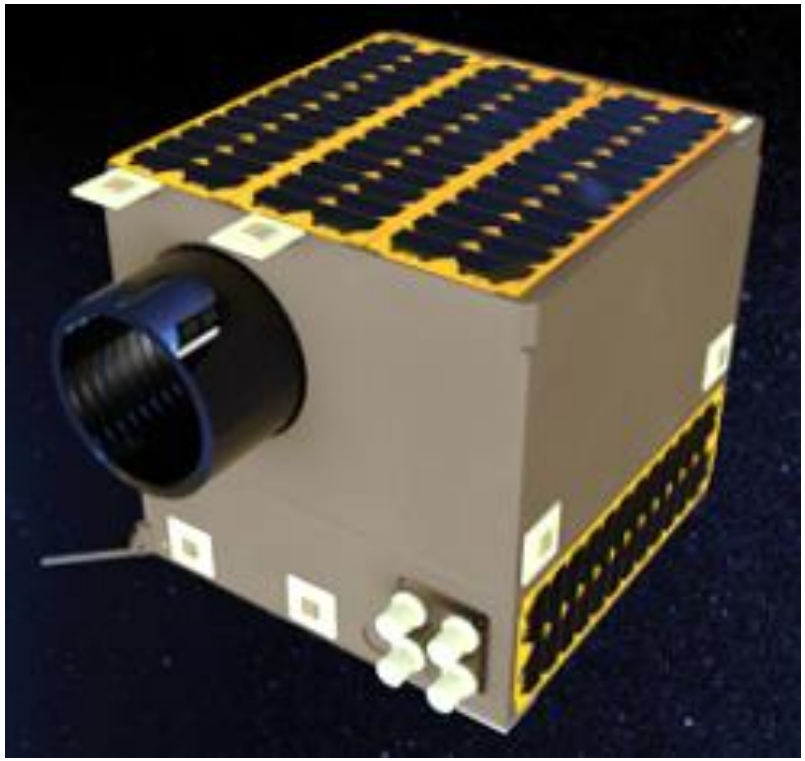
Many National and international space activities:

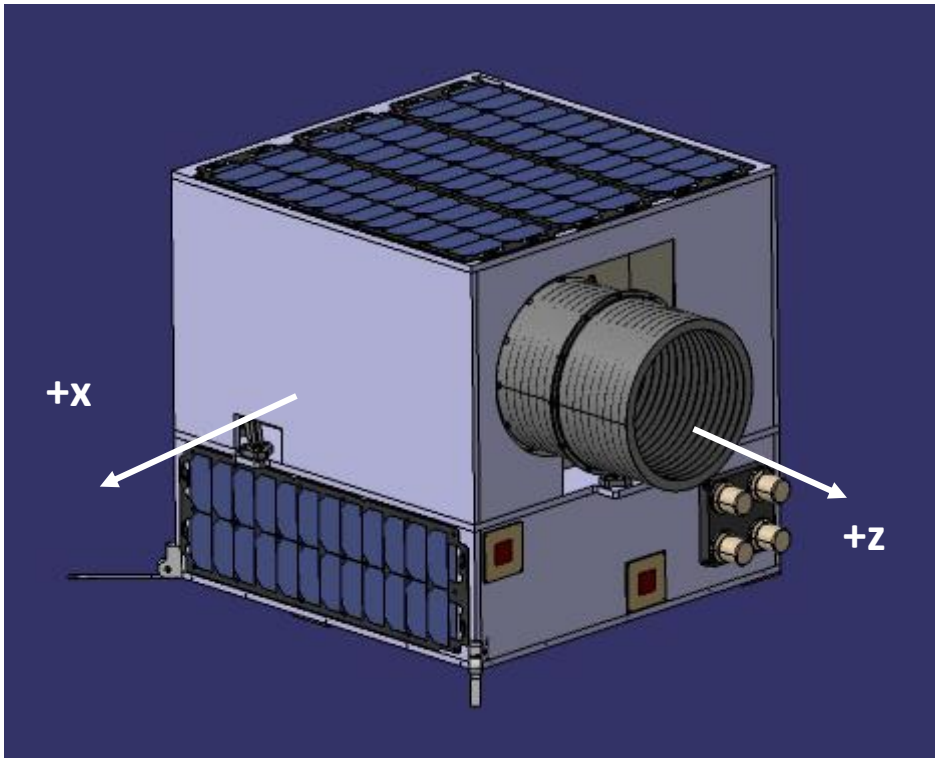
- National and International CanSat/Rocket Competitions
- Model Satellite and Spacecraft Design courses delivered at various places
- UBAKUSAT project with Japan is finished
- Water Quality Project Using Constellation of Nanosats with Tunisia completed
- Antenna Sharing Project is going on
- ASELSAT Project is going on
- Lagari and PIRI sat Projects are going on
- Rocketry studies for hybrid and solid motor rockets
- Turkish Space mining community, 3rd Asteroid Meeting
- Testing of various satellite components/systems at ITU-SSDTL, Istanbul
- Participation and presentations at various national and international events including BSTI in Natal Brazil
- IAA-SG4.23 studies
- Help to other local universities regarding CubeSat development
- Help to many elementary and high schools for “into orbit” contest
- Get ready for RAST2019 in Istanbul
- UNISEC GLOBAL SC work

Turkish Satellite Road Map



STM -- LAGARI



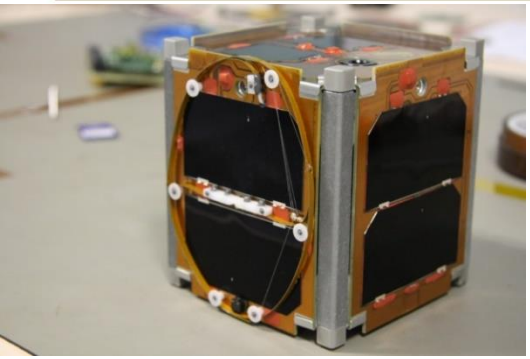


Hi Res EO, PAN <2m, MS<8m

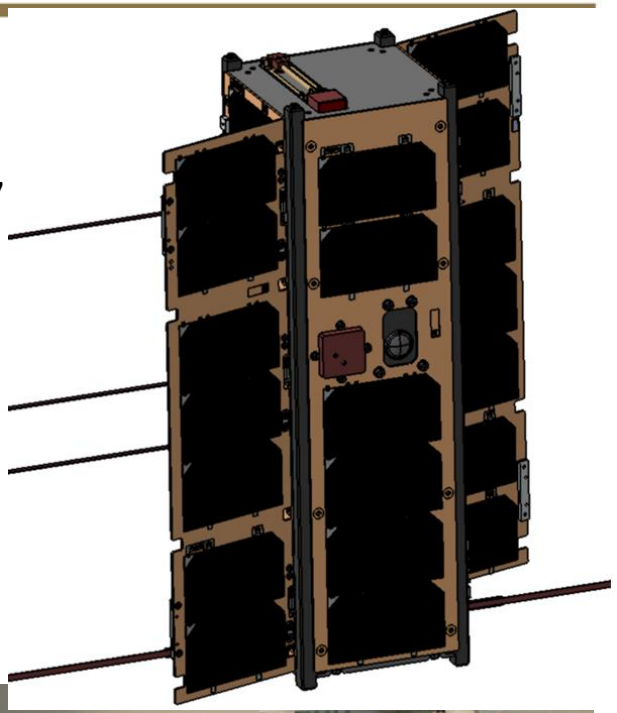
Micro Sat, <70kg, operational satellite

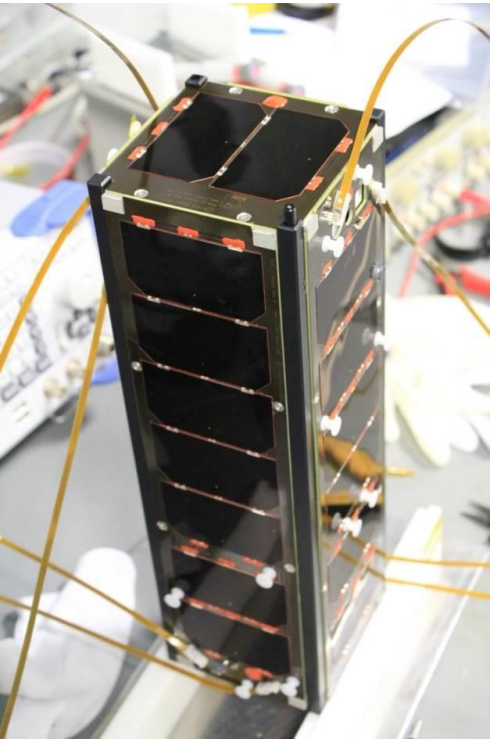
STM LAGARI HI RES MICRO SAT CONSTELLATION

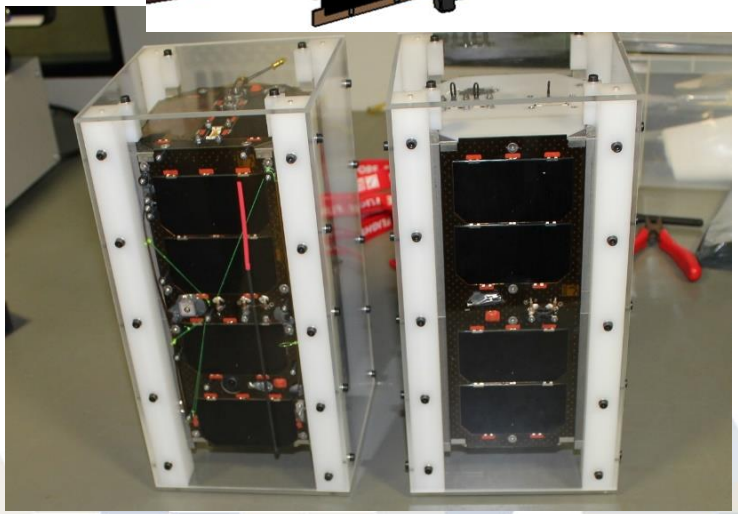
ITU SSDTL CUBESAT PROJECTS



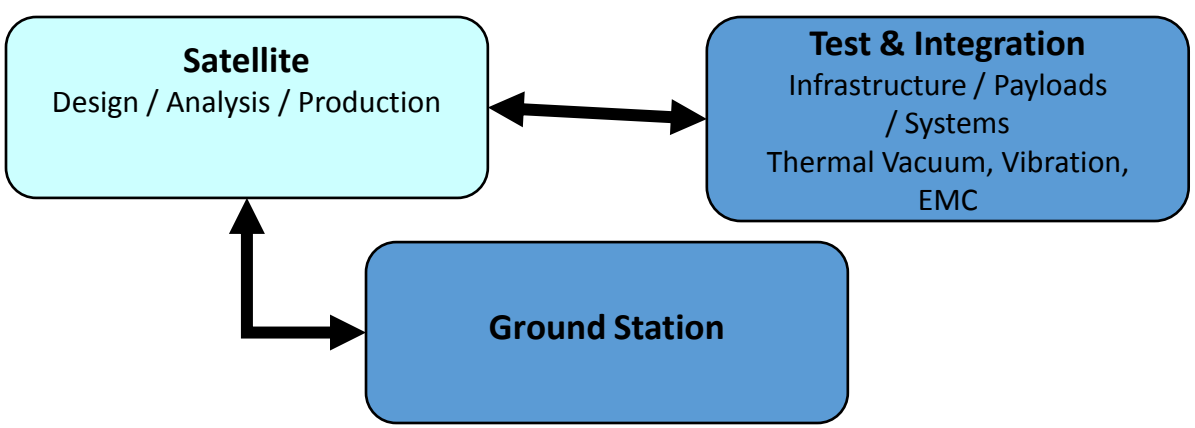
ITUPSAT1: 2009
TURKSAT 3USAT: 2013
BEEAGLESAT and HAVELSAT: 2017
UBAKUSAT: 2018
ASELSAT: 2019

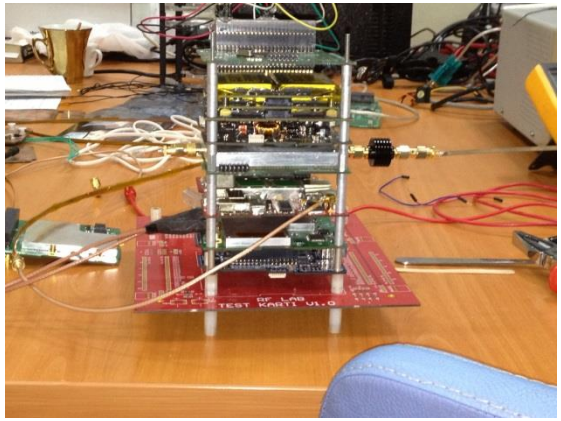


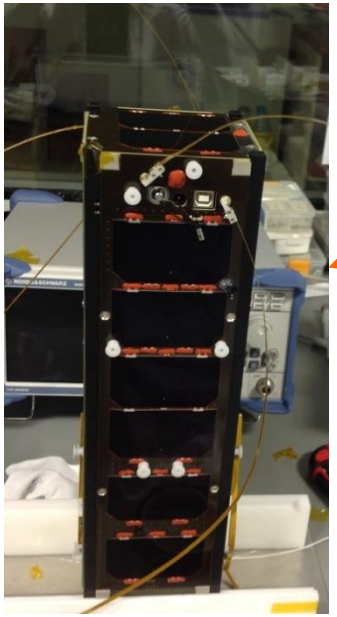


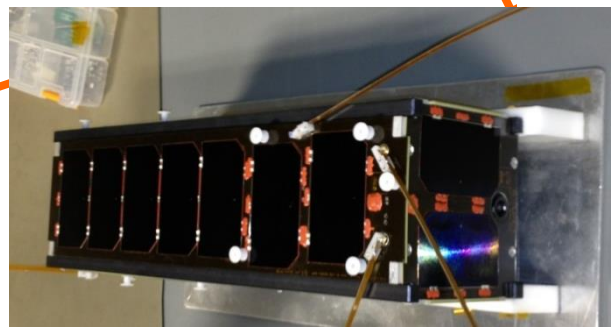


İTÜ-SSDTL Development phases









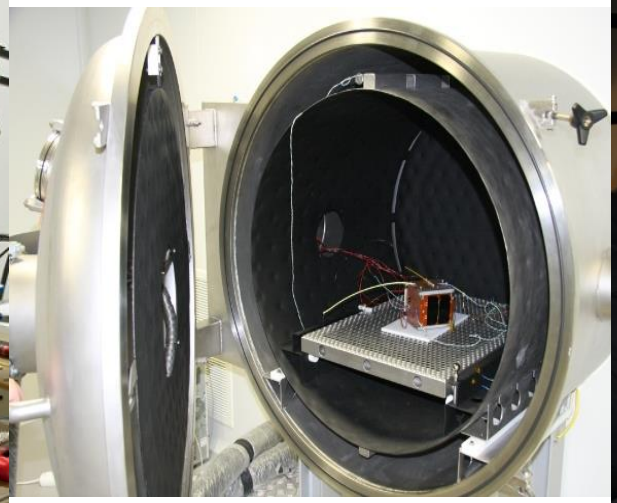
- Conceptual design
- Desktop model
- Engineering model
- Flight Model

- Protoflight Model

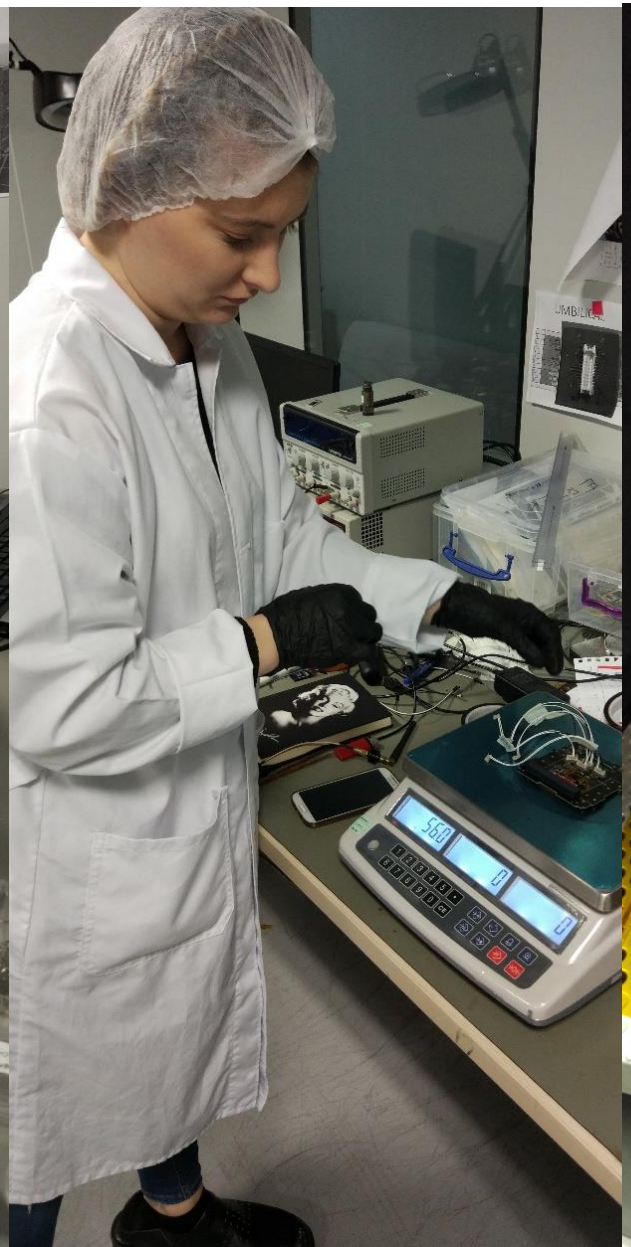
X BAND and VHF/UHF GROUND STATIONS at ITU

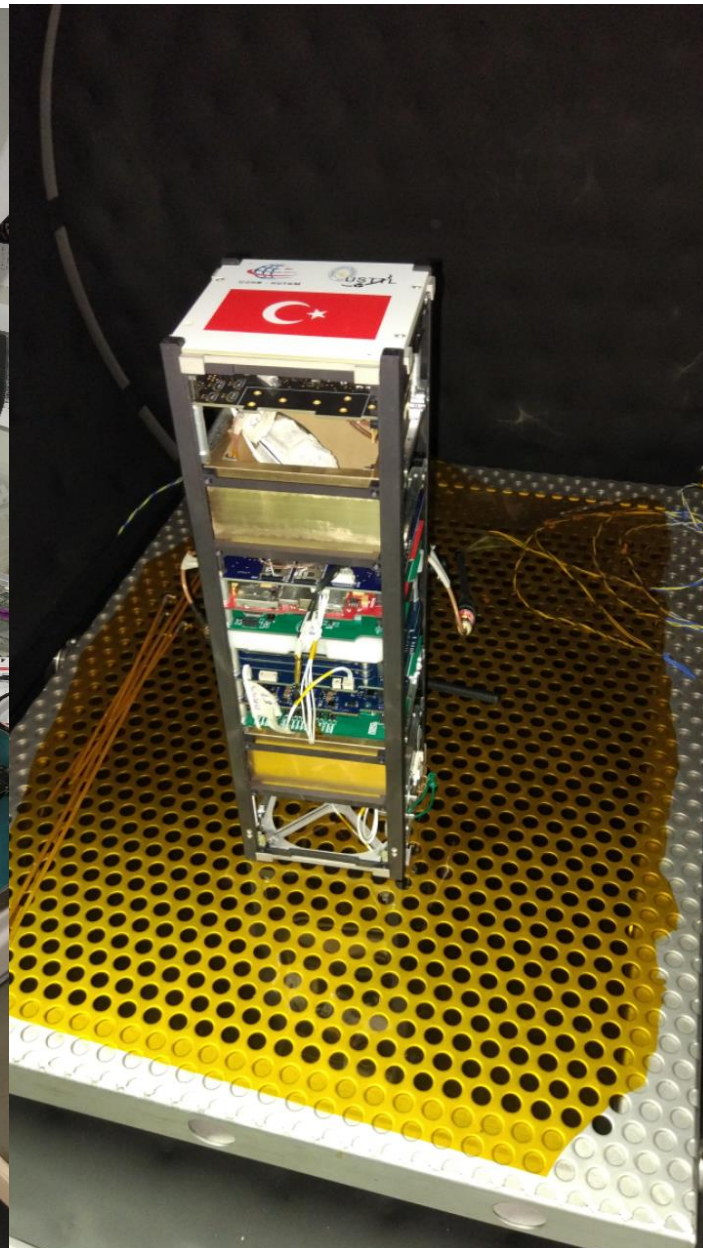
VHF/UHF GROUND STATION

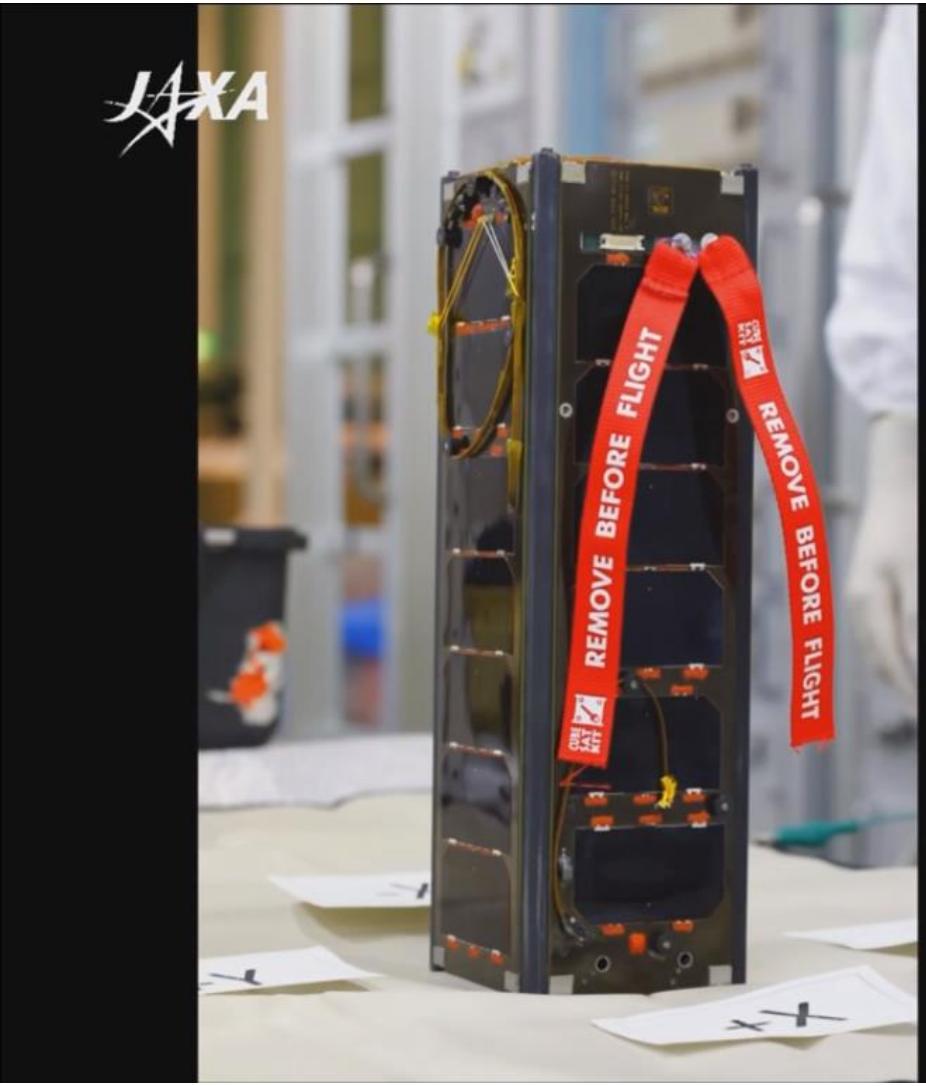
INTEGRATION and TEST at ITU



INTEGRATION and TEST at ITU



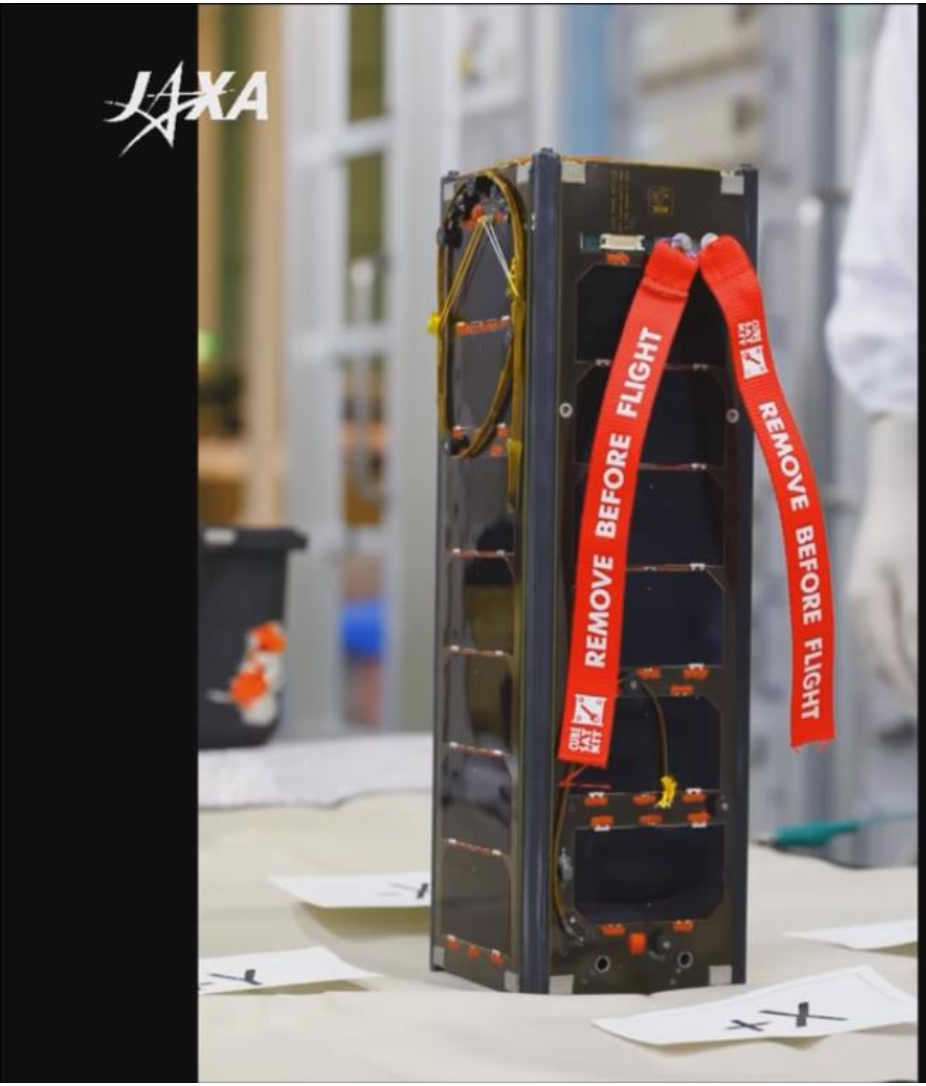




UBAKUSAT

- **Size : 3U**
- **Developed by**

  Istanbul Technical University (ITU)
  Ministry of Transport, Maritime Affairs and Communications (MTMAC)
  （イスタンブール工科大学、
  トルコ共和国 運輸・海事通信省）

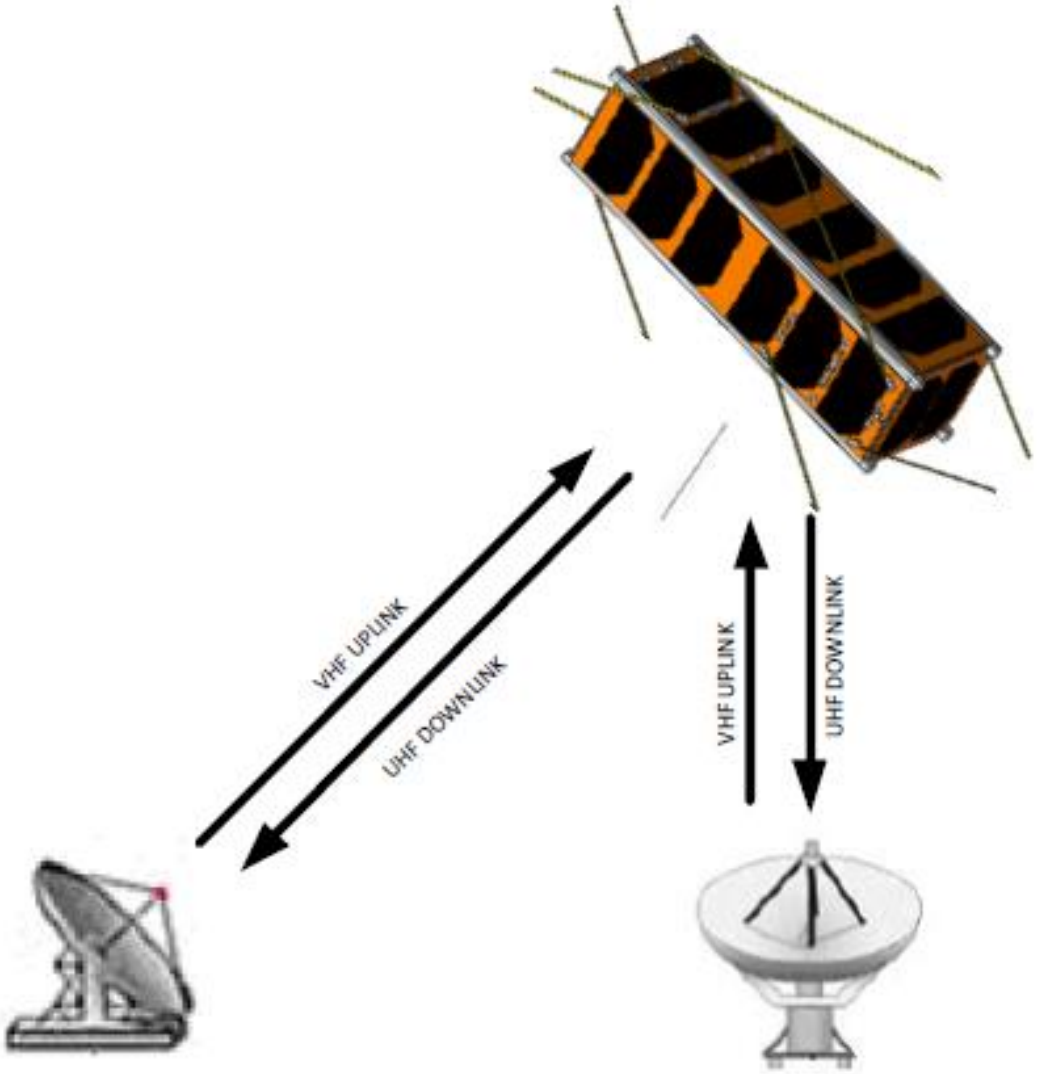


Cooperation in the field of space and aeronautics
（宇宙・航空分野に関する協力）

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）

UBAKSAT MAIN MISSION: Voice Comms



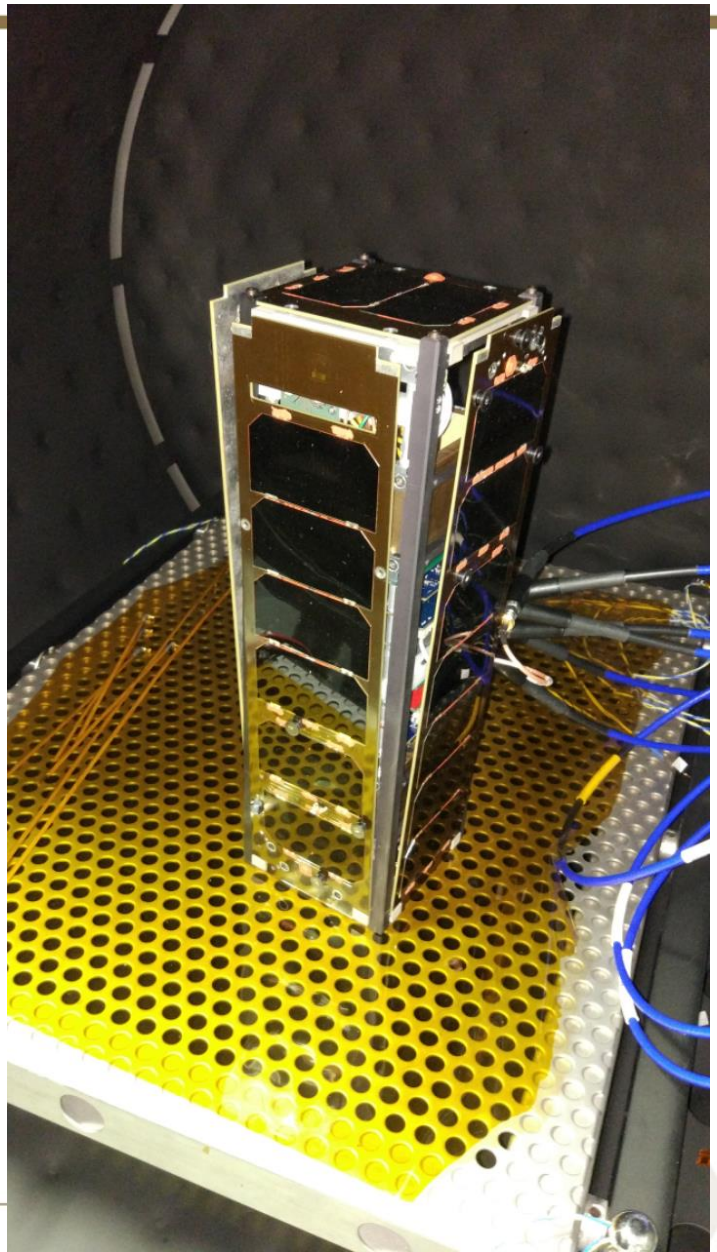
UBAKUSAT, Details

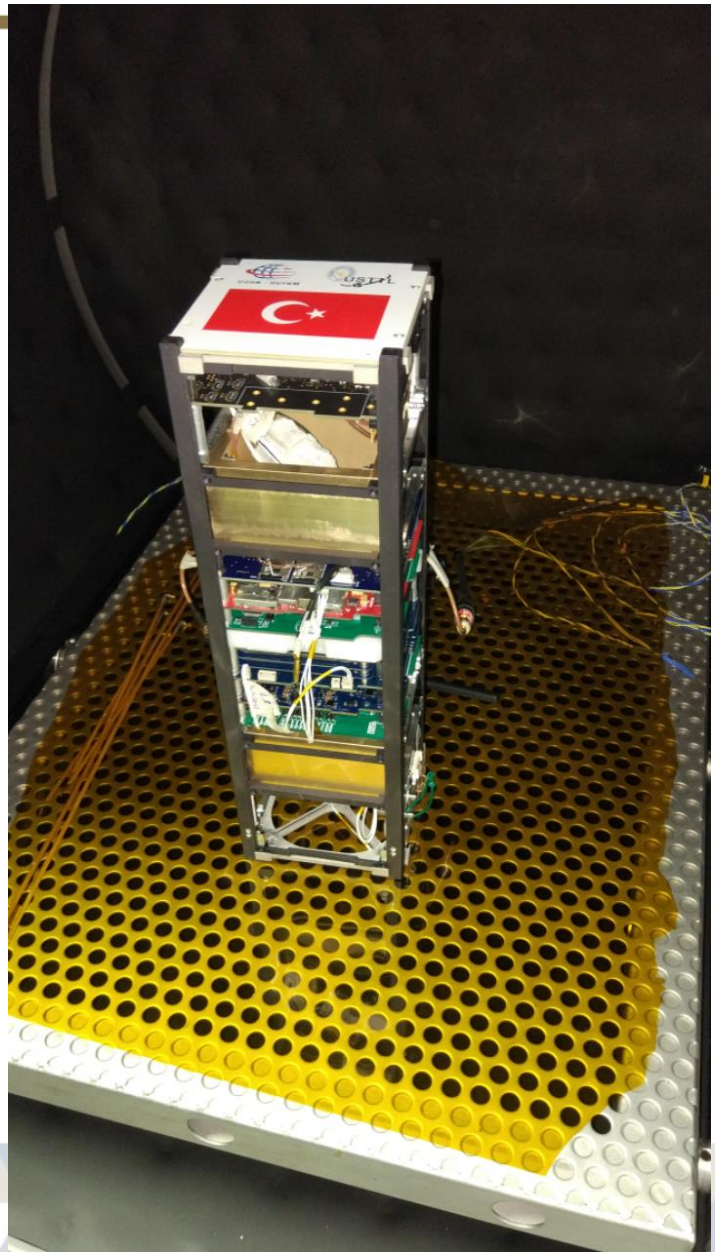
Mass 3.2 kg
10*10*34cm, 3U CubeSat

- Main payload a VHF/UHF Transponder

Input Frequency	145.940 – 145.990 MHz
Output Frequency	435.200 – 435.250 MHz
Transponder Type	Inverting – Linear
Modulation	All Mode (AM, FM, SSB, CW, FSK,etc.)
Bandwidth	50 KHz
RF Power (max)	1 Watt - 30 dB

- Battery 30Whr
- Passive Magnetic Stabilization system



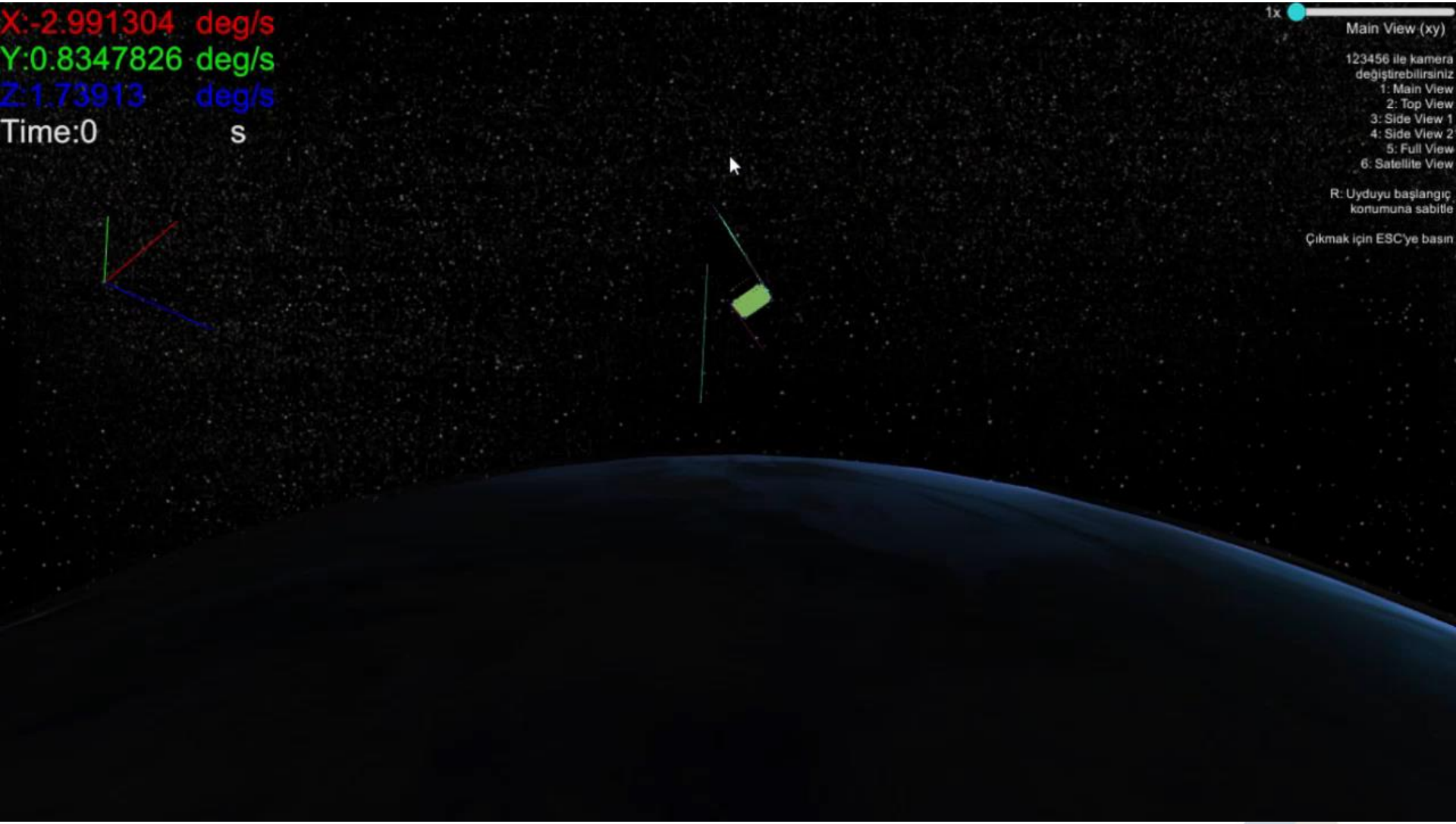


CLEAN ROOM, GETTING READY FOR LAUNCH, JAXA, TSUKUBA

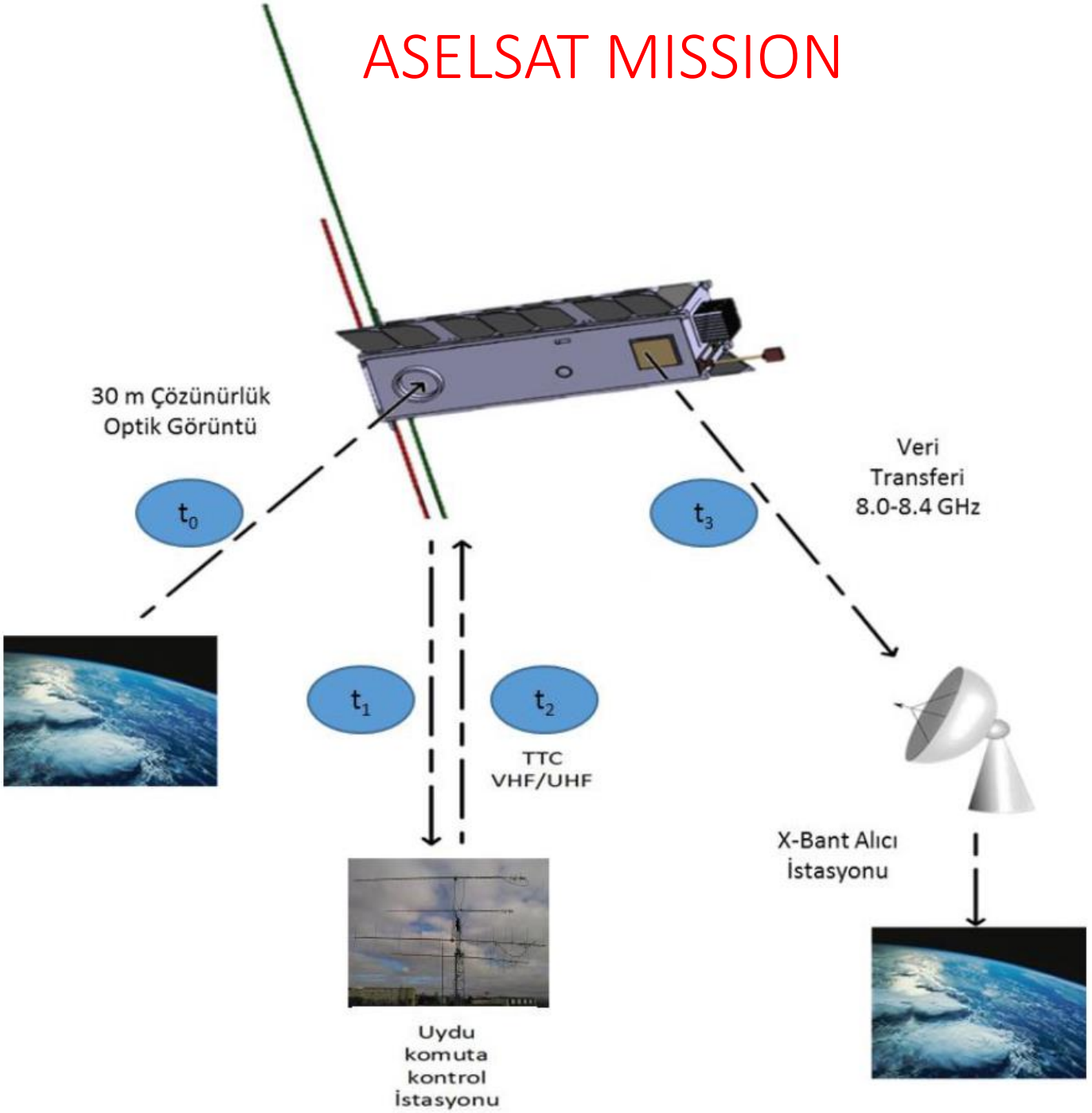
Photo Courtesy of JAXA, TSUKUBA


JAXA
JAXA
JAXA Astronaut
Norishige Kanai

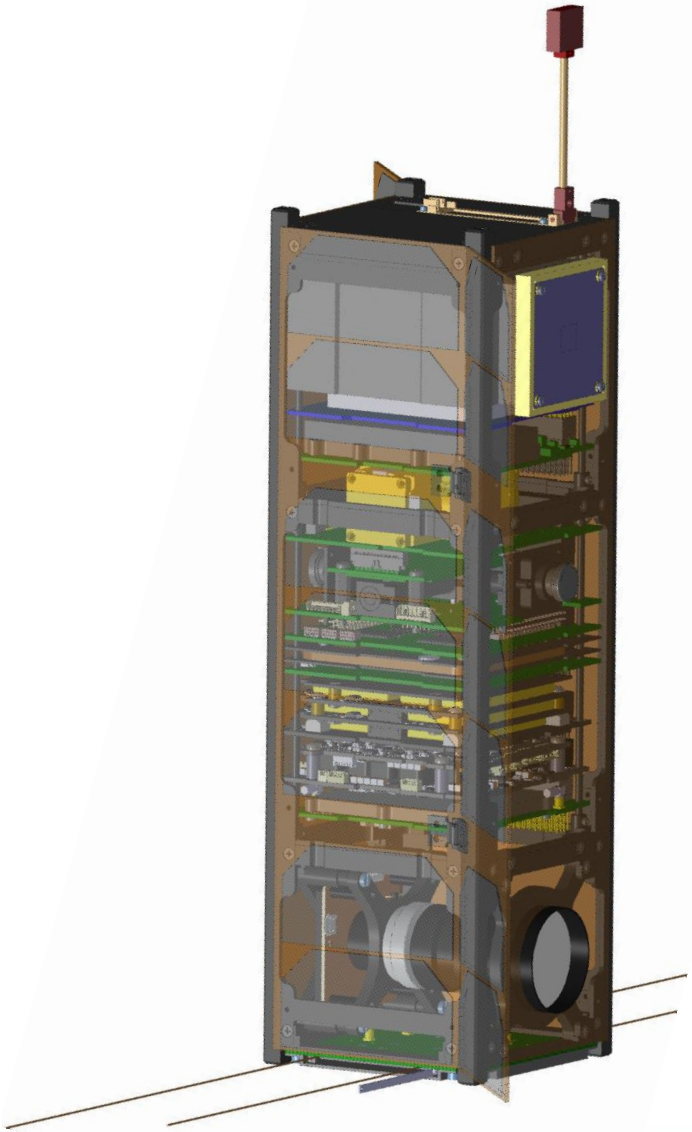

Kibo"
「きぼう」日本実験棟
JAXA


X:-2.991304 deg/s
Y:0.8347826 deg/s
Z:1.73913 deg/s
Time:0 s
1x
Main View (xy)
123456 ile kamera değiştirebilirsiniz
1: Main View
2: Top View
3: Side View 1
4: Side View 2
5: Full View
6: Satellite View
R: Uyduyu başlangıç konumuna sabitle
Çıkmak için ESC'ye basın

ASELSAT MISSION



ASELSAT



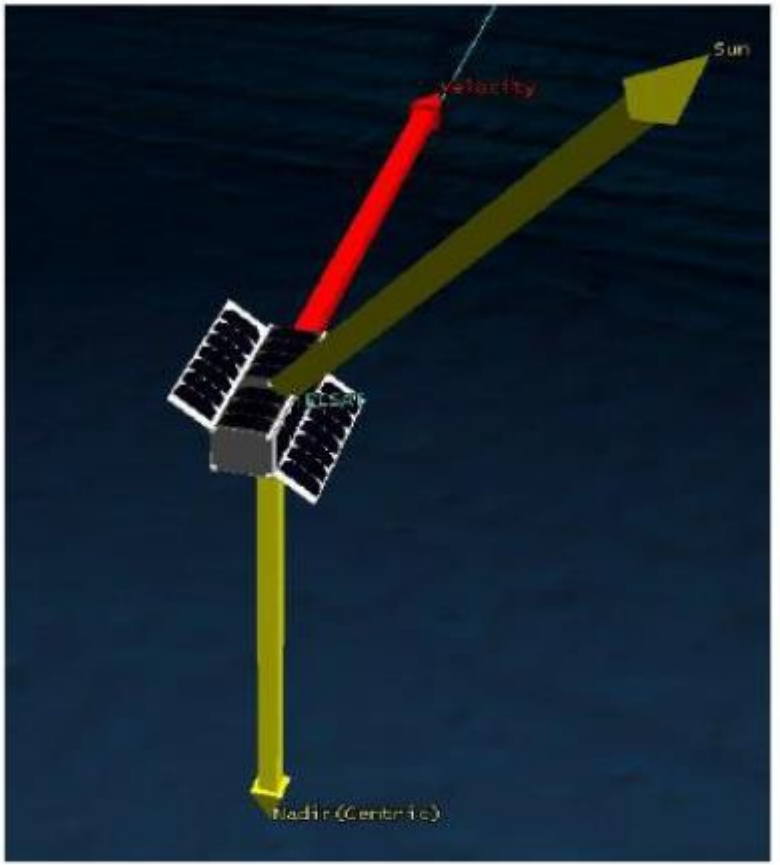
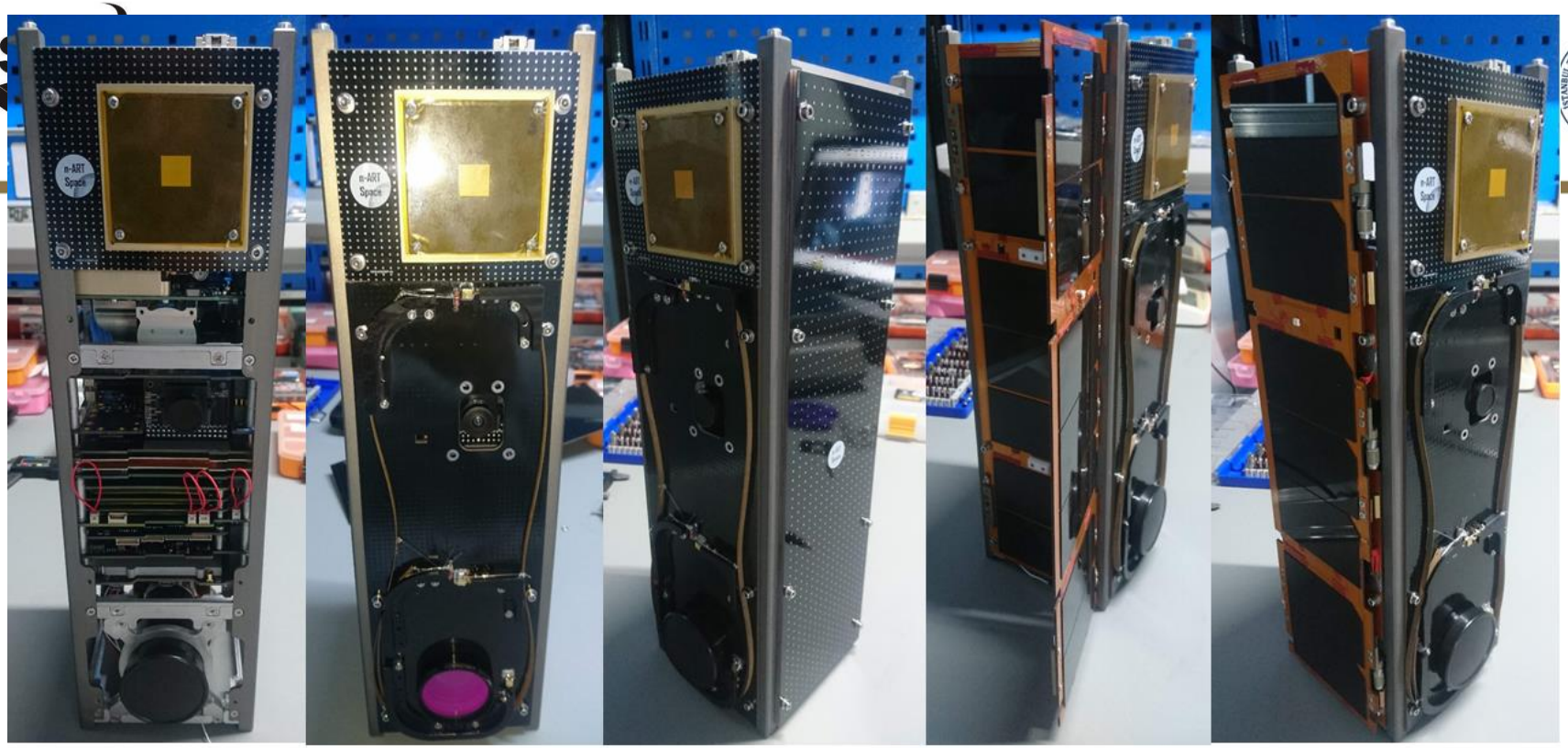
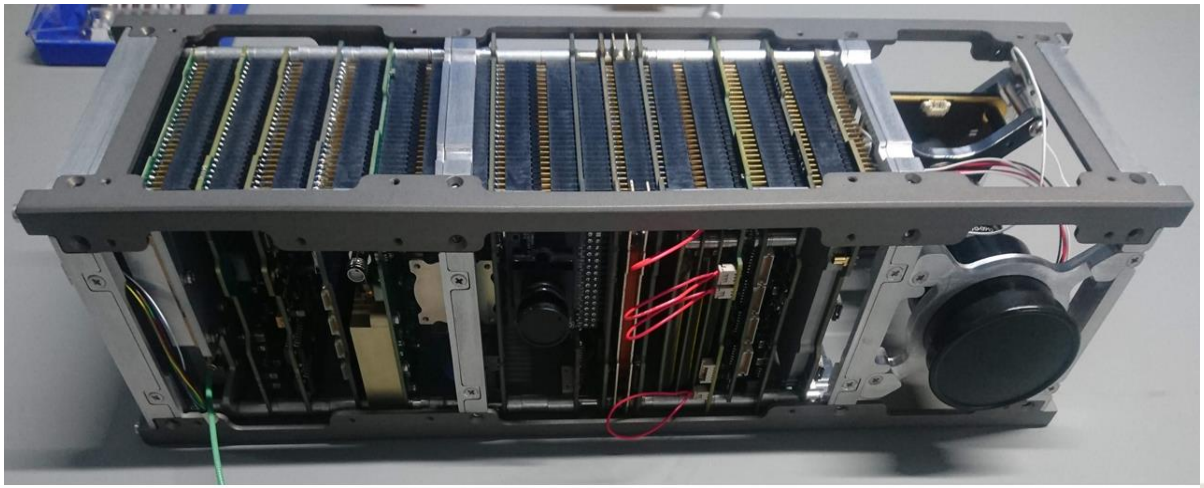
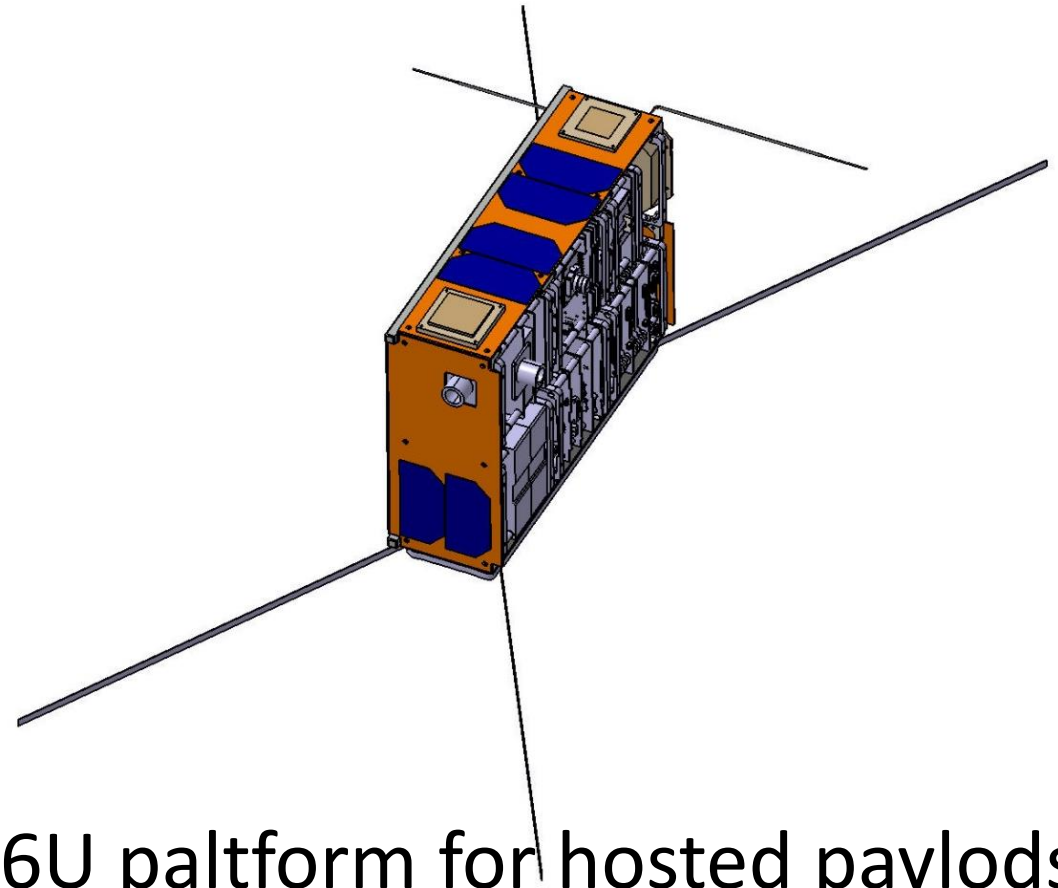


Figure 7. ASELSAT's attitude for life time analysis



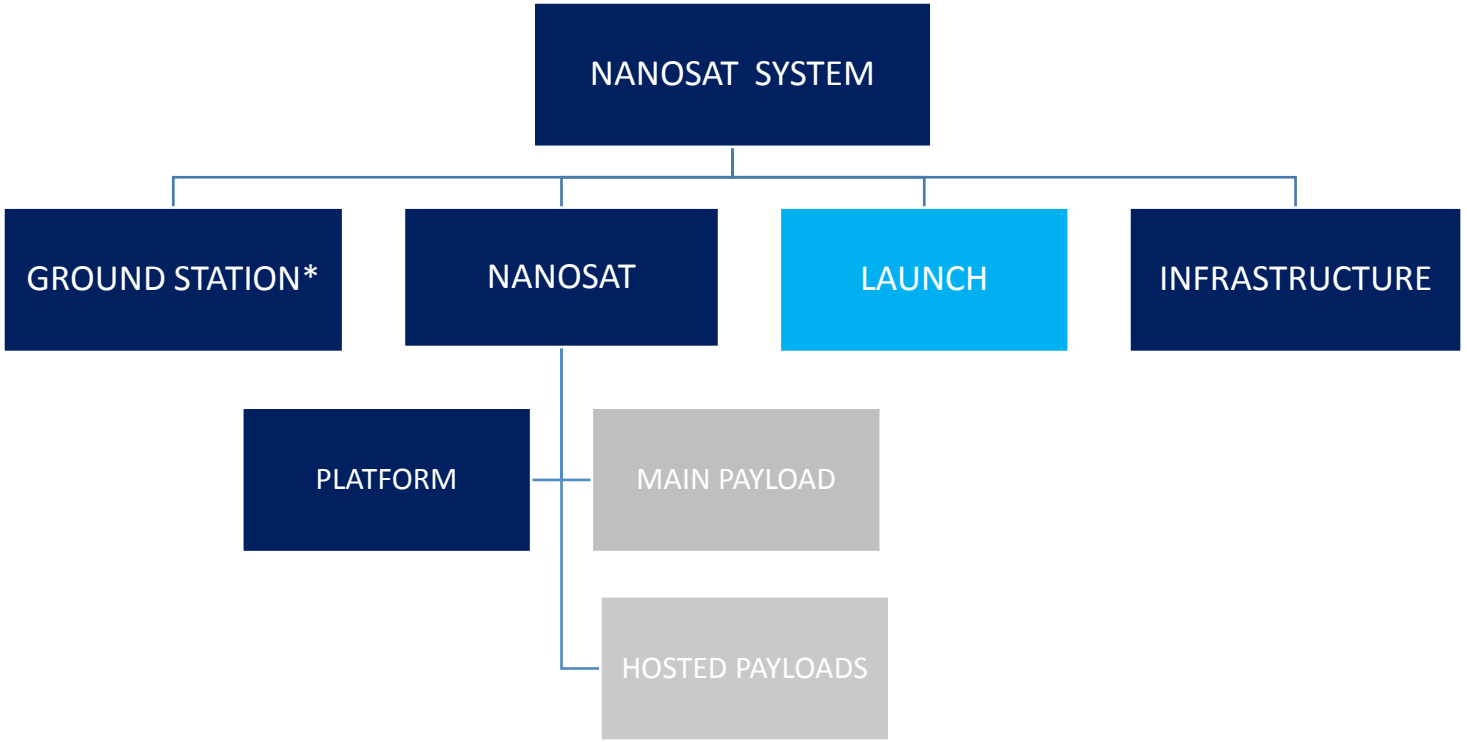


STM -- PIRI-SAT



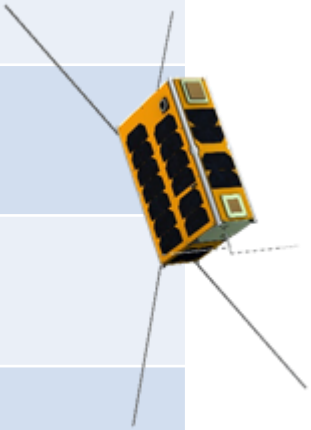
Modular 6U paltform for hosted paylods: to provide free platform and launch for payload developers without the burden of finding a satellite/launch

PROJECT ELEMENTS



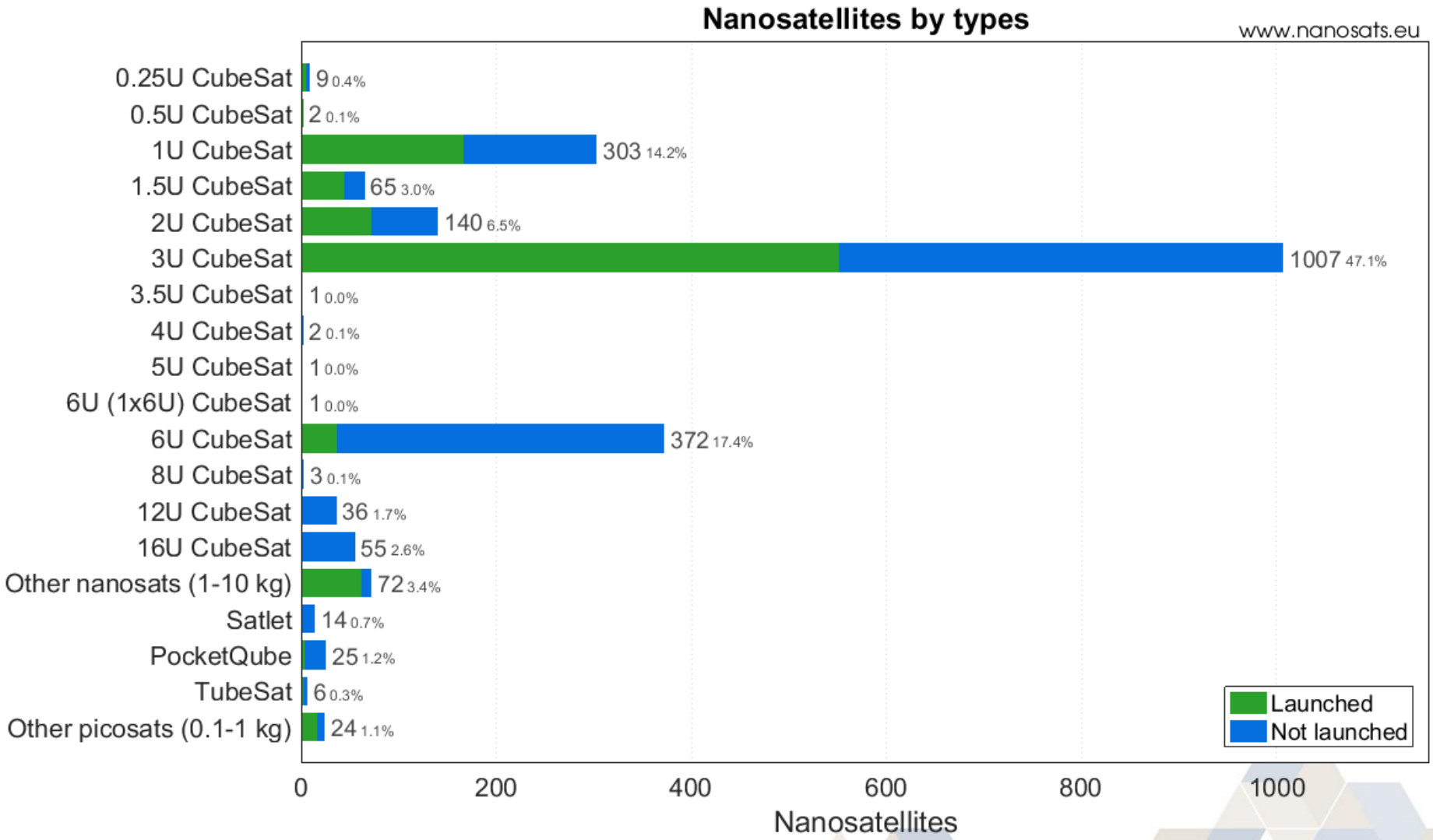
PIRI SAT TECHNICAL SPECS

Parameter	Targeted value
Mission lifetime	Min 1 year (expected: min 3 years)
PiriSat Mass	Nanosat, max. 10 kg
Volume (launch configuration	6U, 230mm*400mm*100mm
Payloads max mass	4 kg
Payload: Experimental AIS demonstration	• Receive AIS signals onboard • Record received signals • Downlink collected data to GS • Process and identify vessels
Launch	Secondary payload



- I- X Ray Detector
- Linear Transponder
- Langmuire Probe, Radiation Measurement
- RAD HARD nano/microsat OBDH

http://www.nanosats.eu

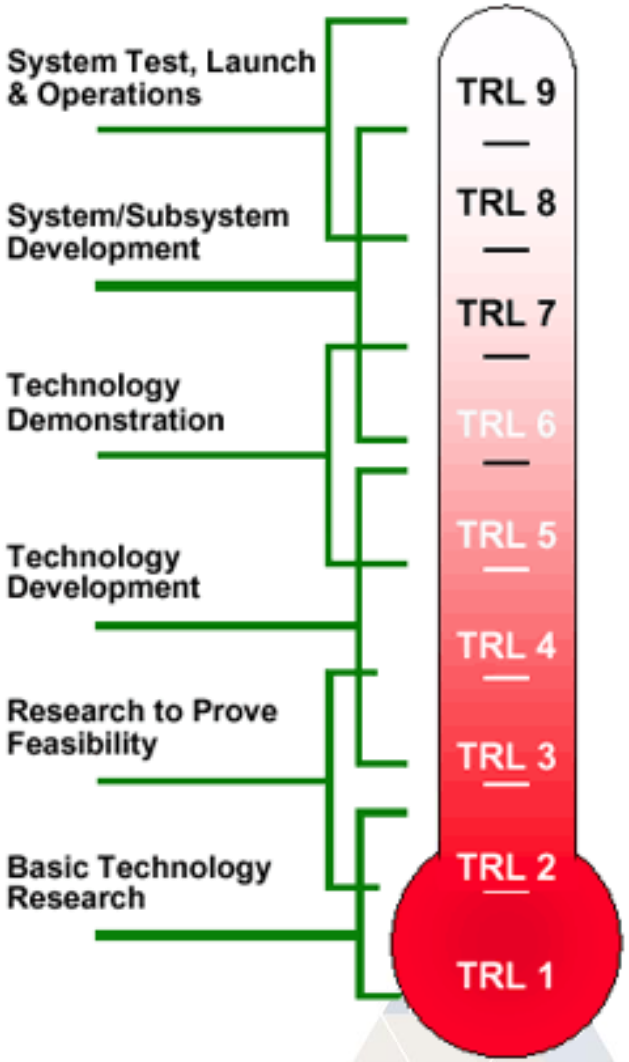


PROJECT TARGETS

- 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

TECHNOLOGY READINESS LEVELS

- NANOSAT will be comprised of different TRL equipment
  - TRL 9: Previously flown successful equipment
  - TRL 8: Equipment qualified in simulated relevant environment on Earth
  - TRL 2-3: Hosted payloads initial levels targeting TRL 8 before launch
  - TRL 7: Equipment's first testing in space fallowing launch



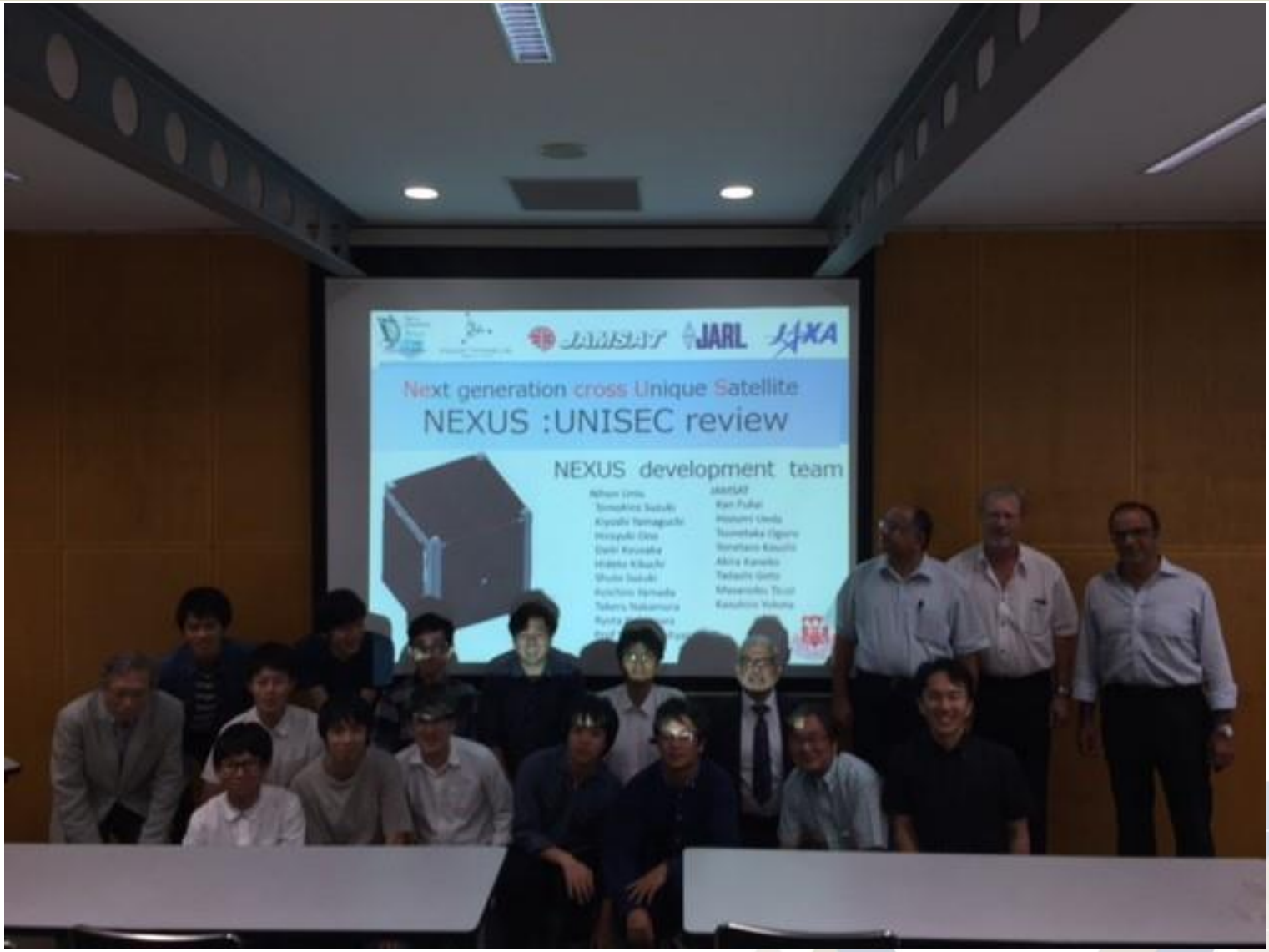
INTERNATIONAL COOPERATION

UNISEC GLOBAL
University Space Engineering Consortium

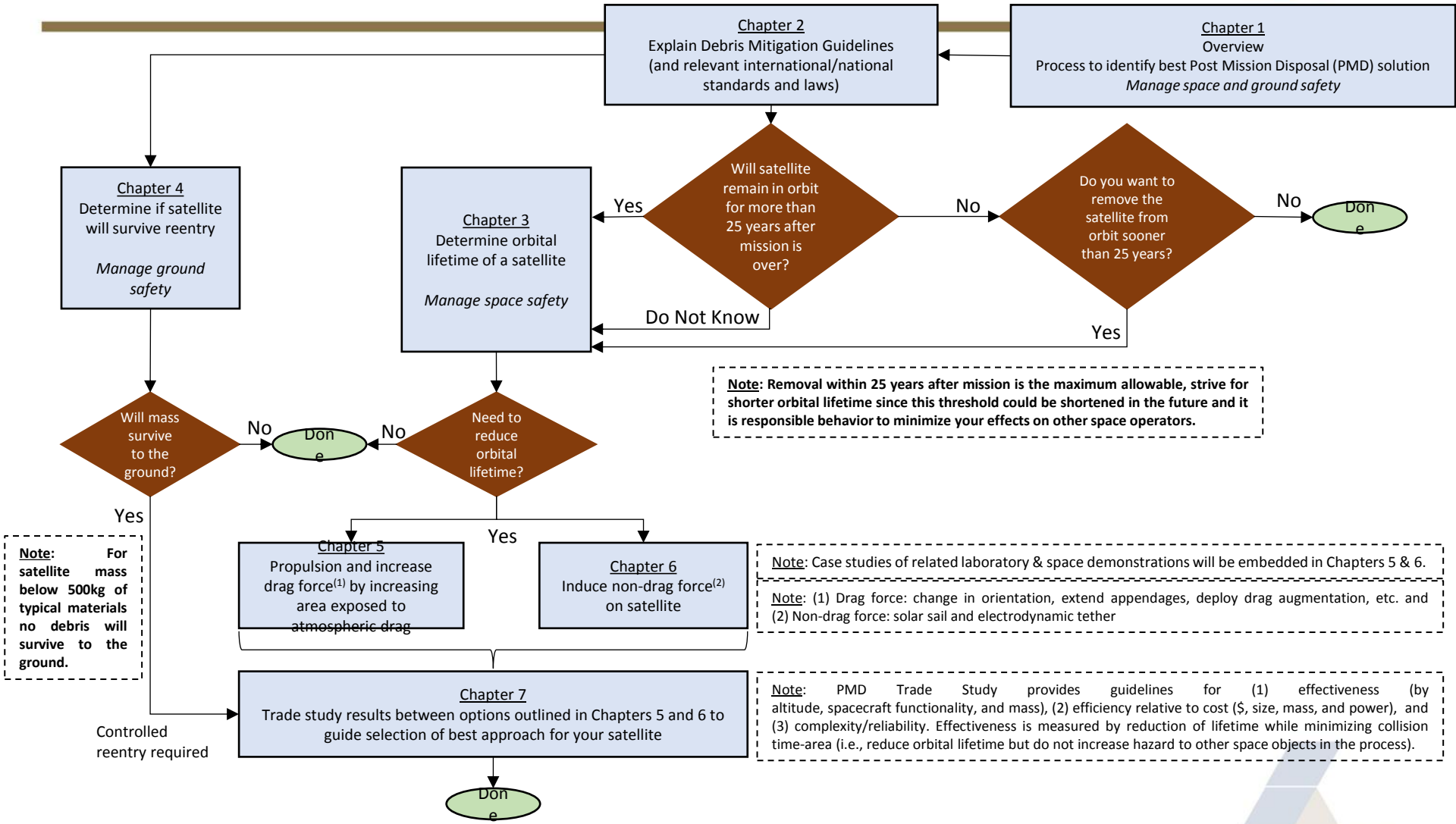
UNISEC TURKEY
University Space Engineering Consortium

UNISEC EUROPE
University Space Engineering Consortium

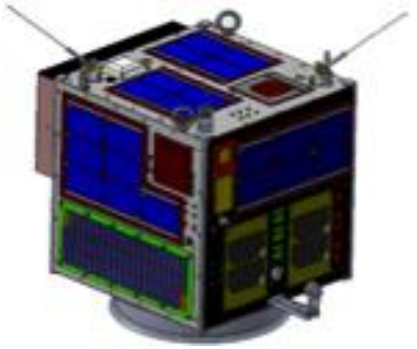
UNISEC REVIEWs



IAA SG4.23 DEBRIS MITIGATION GUIDELINES for SMALLSATS



GLOBAL ANTENNA SHARING PROJECT for achieving Sustainable Development Goals



Prof.Dr. Alim Rustem Aslan
UNISEC-GLOBAL Steering Com.Member
Manager, Space Systems Design and Test Laboratory
Istanbul Technical University, Faculty of Aeronautics and Astronautics,
Istanbul, Turkey
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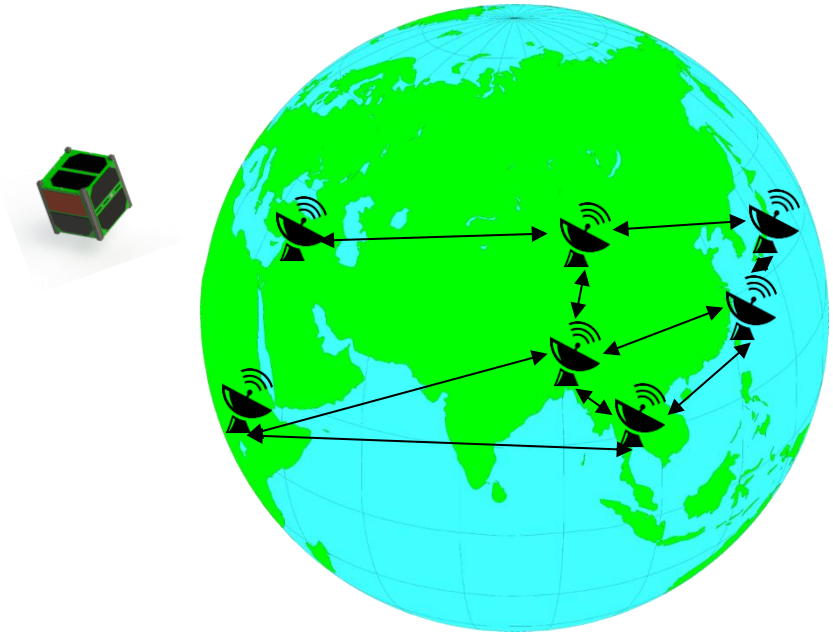
VIENNA PRESENTATION

Antenna Sharing

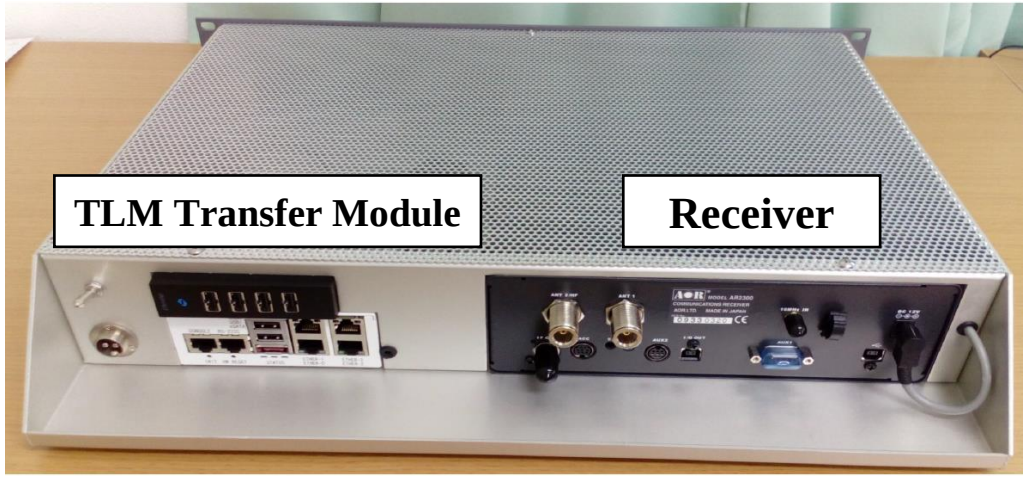
- Increase the number of tracking antennas



By connecting more antenna
Time Resolution Increases!

GSN Device

Front Panel



Rear Panel

- Receiver
  - Satellite downlink signal reception
  - Output in IQ data (raw data)
  - Centralized demodulation and decoding are done by software defined radio (SDR) at Central Server.
- TLM transfer
  - Transfer IQ data or processed data to Central Server
- Transmitter (optional)
  - Satellite uplink signal transmission
  - Encoded and modulated IQ data from Centralized SDR at Central server and transmits uplink signal to satellite.

TUNISIA PROJECT

- CANSAT Design and development WORKSHOPS in

- UAE, January 2018
- Jordan, April 2018
- Lebanon, September 2018
- Efforts towards 2030 goal

YALOVA ÜNİVERSİTESİ

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 tanımlamasıdır. Model uydu modern uyduların temeli oluşturan 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.

AMAÇ
CanSAT eğitimi, uzay sistemleri alanında kendini geliştirmek isteyen farklı disiplinden öğrencilere uydu tasarımı ve uydu teknolojileri geliştirme konusunda ileride karşılaşabilecekleri sorunları önceden göstermek, onlara çözüme yaklaştırıcı bir zihin yapısı ve tecrübe kazandırmayı amaçlayan uygulamalı bir model uydu tasarım ve üretim yöntemidir.
Böylece, uzay teknolojileri ve uygulamalı uzay mühendisliği alanında en etkili eğitim verme biçimidir. Katılımcılara ekip çalışması yapma fırsatı ve disiplinler arası sistem mühendisliği ile kendi uydularını tasarlama, imal etme ve fırlatma fırsatı sunmaktadır.

CanSAT Temelli Uzay Eğitiminin Hedefi
Uzay mühendisliği ve bilimleri alanında yetişmiş insan gücünü artırmak amacıyla CanSAT tasarımı ve imalatını bir eğitim aracı olarak kullanmaktır.
Türkiye' de CanSAT projeleri gerçekleştirebilecek ve uluslararası CanSAT yarışmalarına katılabilecek kişi sayısını artırmak amacıyla katılımcıları CanSAT tasarım ve imalatı konusunda uygulamalı olarak eğitmektir. Bu eğitime katılan kişilerin üniversite ve kurumlarına döndükten sonar 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
Telemetri Sistemi Entegrasyonu
Alçalma ve İniş Sistemleri Tasarımı
Mekanik Tasarım
Yer İstasyonu Geliştirme
Test ve Fırlatma
Görev Sonrası Veri Analizi

CanSAT Temelli Uzay 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 isteyen HERKES, özellikle savunma sanayii firma yönetici 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

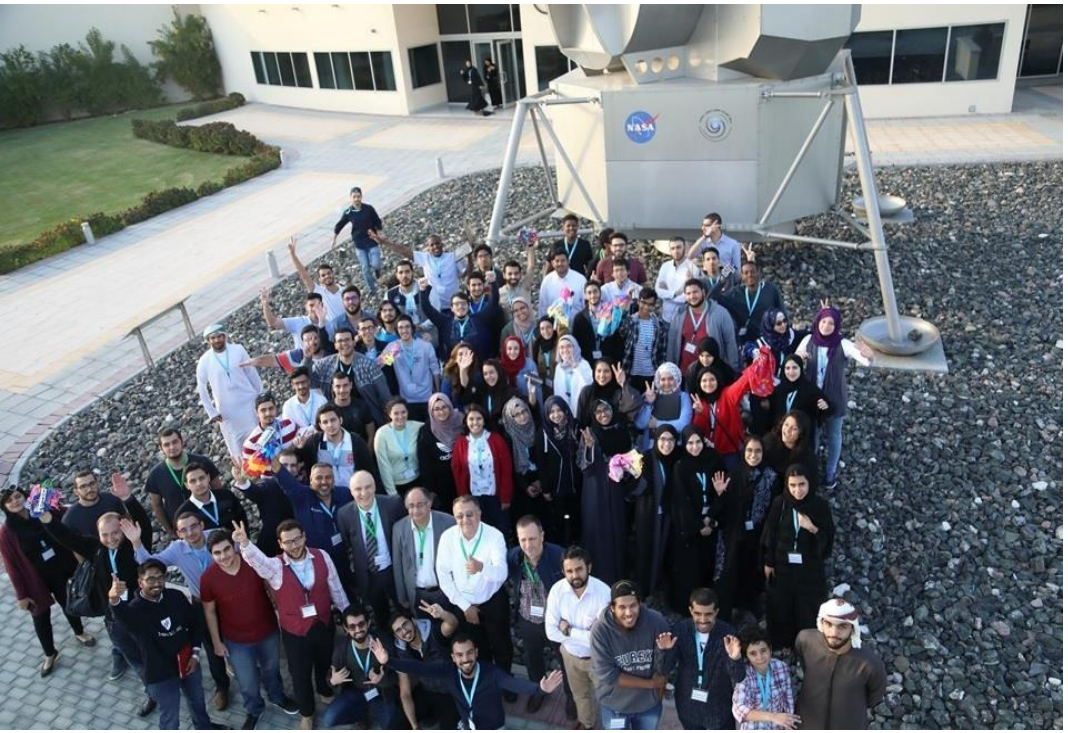
Kurs Ücreti: 1500 TL
Kurs ücreti, kurs dokümanlarını, uygulamalı dersleri, uydu yapımında kullanılan malzemeleri ve fırlatmayı içermektedir. Konaklama masraflarını içermez.

Sponsorlar:

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

University of Sharjah CanSat Course

- 8-10 January 2018
- 15 CanSat teams

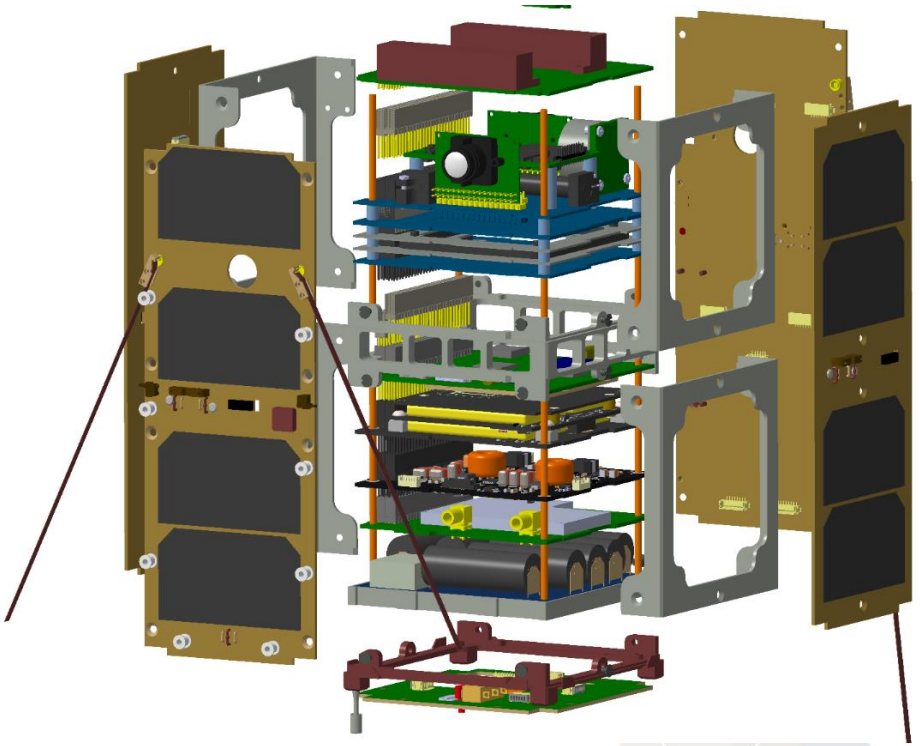


Lebanese International University CanSat Course

- 24-29 September 2018, 15 CanSat teams

SHARJAH-SAT-1

- Hands on CubeSat training, November 2018
- 3U CubeSat, XRD, Camera, Launch 2021



USA CANSAT COMPETITION

CanSat Competition

Home Mission Teams **Winners** Photo

Sponsors

U.S. NAVAL RESEARCH LABORATORY

NASA

NASA Goddard

TARLETON STATE UNIVERSITY
Member of The Texas A&M University System

Asırlardır Çağdaş

2018 Winners

First Place
University of Manchester, UK
Manchester CanSat Project

Second Place
Bulent Ecevit University, Turkey
grizu-263

Third Place
Istanbul Technical University, Turkey
APIS AR-GE

Fourth Place
Hacettepe University, Turkey
Team CERVOS

Fifth Place
Arizona State University, USA
Team BUTTER (Ballistic Universal Times Trajectory Egg Recovery)

3rd TURKSAT CANSAT CONTEST
20-22 September 2018

İTÜ PARS ROCKETRY TEAM

- Hybrid rocket


II. ASTEROİT MADENCİLİĞİ VE METEOR BİLİMİ ÇALIŞTAYI
15-16 ŞUBAT 2018 EGE ÜNİVERSİTESİ FEN FAKÜLTESİ KONFERANS SALONU
15 Şubat 2018 Perşembe, 09:00 – 17:00
Dr. Michael E. ZOLENSKY (NASA-Johnson Space Center, Houston, A.B.D.)
Water in meteorites and regolith process on the surface of asteroids: Hayabusa and Osiris-Rex missions (Göktaşlarındaki su ve asteroit yüzeylerinin oluşum süreçleri: (HAYABUSA ve OSIRIS-REX Görevleri)
Doç. Dr. Lokman KUZU (TÜBİTAK-Uzay Teknolojileri Araştırma Enstitüsü Müdürü, Ankara)
TÜBİTAK UZAY ve uzay madenciliği vizyonu
Doç. Dr. Ozan ÜNSALAN (Ege Üniversitesi, İzmir)
Türkiye'deki meteor bilimi çalışmaları ve ülkemizdeki göktaşları (M.Ö. 465 – M.S. 2018)
Dr. Sadık Murat YÜKSEL (TÜBİTAK-Uzay Teknolojileri Araştırma Enstitüsü, Ankara)
Dünyada ve Türkiye'de uzay madenciliği'nin geleceği ve teknolojik altyapısı
Prof. Dr. Alim Rüstem ASLAN (İstanbul Teknik Üniversitesi, İstanbul)
Küçük uydular ve uzay madenciliği
Yrd. Doç. Dr. Mehmet YEŞİLTAŞ (Kırklareli Üniversitesi, Kırklareli)
Asteroidal aqueous alteration inferred from the Sutter's Mills meteorite
Prof. Dr. Mehmet Emin ÖZEL (FSMV Üniversitesi, İstanbul)
Yıldızlararası asteroitler – OUMUAMUA (1I/2017 U1)
Prof. Dr. Fuat İNCE (NUTEK Enerji Danışmanlık, Ankara)
Asteroit çarpması, muhtemel tehlike ve önlemler
Dr. Umut YILDIZ (NASA-JPL-Jet İtki Laboratuvarı, Kaliforniya, A.B.D.)
Derin uzay görevleri ve bilimsel hedefleri (Online Bağlantı)
Arkeolog Altay BAYATLI (Trakya Üniversitesi, Edirne)
Osmanlı Arşivlerinde Meteor Vak'aları
Prof. Dr. Osman DEMİRCAN (Onsekiz Mart Üniversitesi, Çanakkale)
Kutup araştırmaları bilim programında meteoritler ve mikrometeoritler
Fatih ALTAYLI (HABERTÜRK, Gazeteci, Sunucu, Köşe Yazarı, İstanbul)
Oturum: Asteroit Madenciliğinin Farklı Yönlerine Hukukun Verdiği Cevaplar
Av. Nazlı CAN (İstanbul Barosu, İstanbul)
Ay'da uzay madenciliği ile ilgili hukuki düzenlemeler ve farklı ülke politikaları
Doç. Dr. Leyla ATEŞ (Altınbaş Üniversitesi, İstanbul)
Lüksemburg ve asteroit madenciliği: Teşvik liderliğinin arkasındaki gerçekler
Dr. Merve ERDEM (Ankara Üniversitesi, Ankara)
Uzay madenciliğinin hukuken düzenlenmesinde farklı yaklaşımlar
Konular
Asteroit Madenciliği
Meteor Bilimi
Asteroit Madenciliğinin Vergisel Teşviki
Uzay Hukukunda Asteroit Madenciliğinin Yeri
Uzay Madenciliği ve Uydu Teknolojileri
16 Şubat 2018 Cuma, 09:00 – 12:00
GENİŞ KATILIMLI PANEL (SORU-CEVAP)
Dr. Michael ZOLENSKY (NASA-JSC),
Sn. Fatih ALTAYLI (Habertürk), Doç. Dr. Ozan ÜNSALAN,
Prof. Dr. Mehmet Emin ÖZEL, Prof. Dr. Fuat İNCE,
Prof. Dr. Alim Rüstem ASLAN, Yrd. Doç. Dr. Mehmet YEŞİLTAŞ,
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Analitik ve Araştırma Cihazları SAN. ve TİC. LTD. ŞTİ.
Türkiye'nin Astronomi Kaynağı
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www.uzay.tubitak.gov.tr
TUMÇAG
Türkiye Uzay Madenciliği Çalışma Grubu
turk-met.com/tumcag
3DÖRTGEN
www.3dortgen.com
AMoMoSDer
Akdeniz Moleküler Modelleme ve Spektroskopi Derneği
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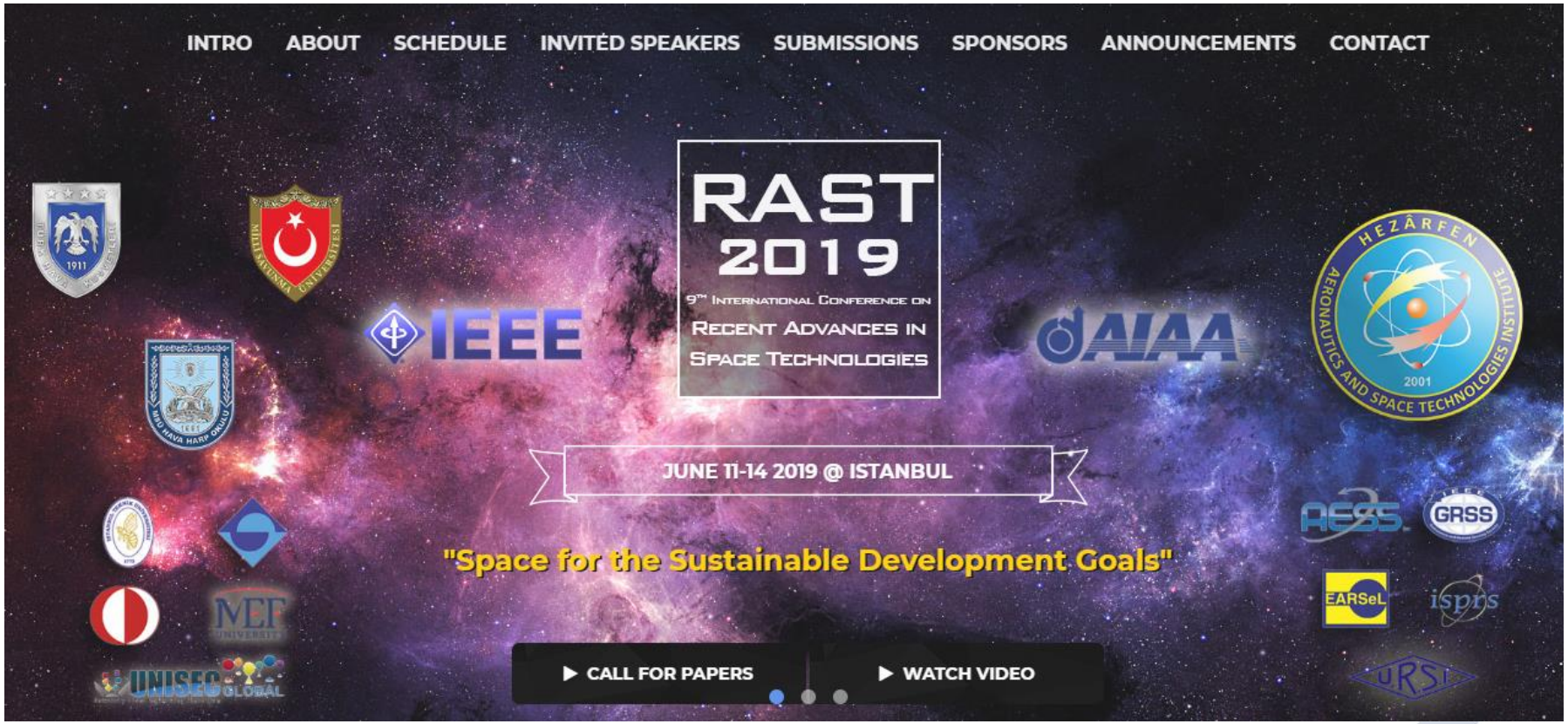
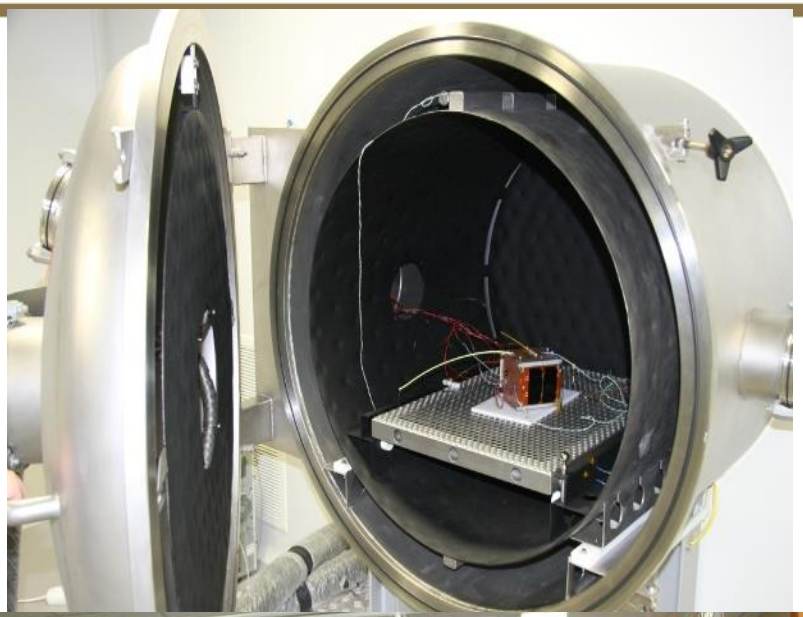
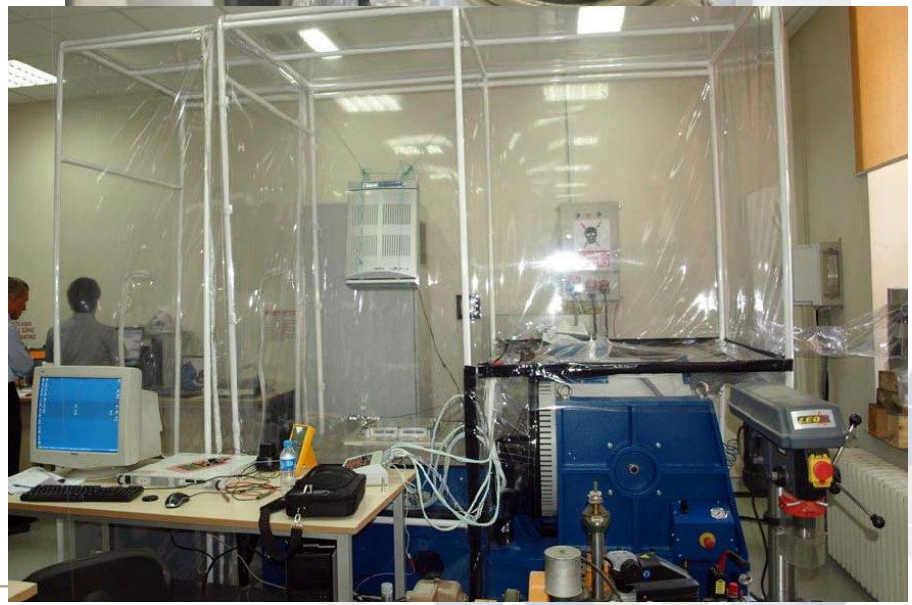
RAST 2019, 11-14 JUNE 2019

SPACE for SUSTAINABLE DEVELOPMENT GOALS



RAST 2019 TESTING TUTORIAL at ITU





TAMSAT AMateur SAtellite Technologies Organization (2010)

CONCLUSIONS

- Based on its past experiences and achievements, its member international organizations (UNISEC-Global, UNISEC-Europe, UNISEC-Turkey, AMSAT-TR) and available space systems design and testing infrastructure along with ongoing projects, İTÜ-SSDTL is ready to further contribute to international space technology development for a more equal World UN SDG 2030).

We Look Forward To a Fruitful Cooperation

Towards being a civilization living in the Solar System

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