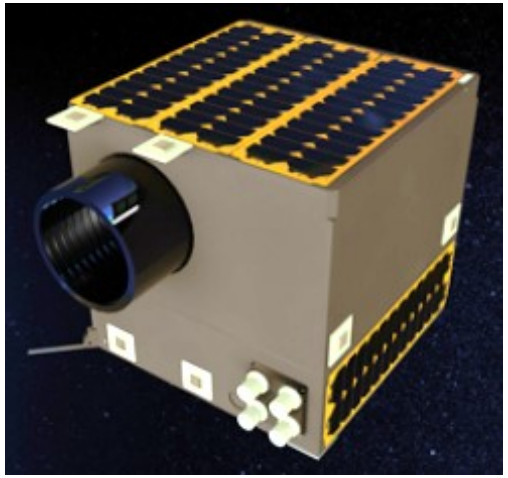
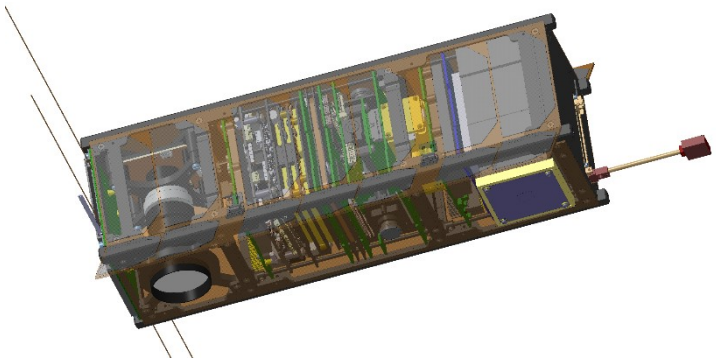
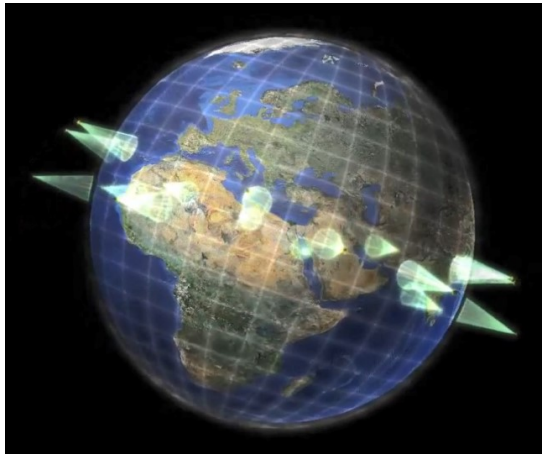
United Nations/Brazil Symposium on Basic Space Technology
"Creating Novel Opportunities with Small Satellite Space Missions
11-14.09.2018, NATAL, BRASIL

İTÜ-SSDTL Contributions to National and International Space Technology Development and Capacity Building with CubeSat and CanSat







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Space Systems Design and Test Laboratory

USTTL

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

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

Co-Author

- Mrs. Basak HASSOY

- Director, RF and Simulation Systems, STM Company

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**

Presentation Content

- *World Trends in Space Technologies, Small Satellites and CubeSat*
- *Small Satellite Projects by ITU-SSDTL*
- *PIRISAT Project*

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

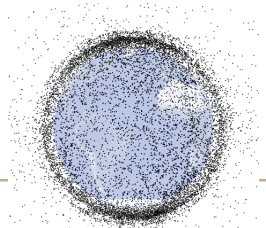
Major source of wealth and driving force for developed and developing countries

Increase human resources for space technologies

World Trends

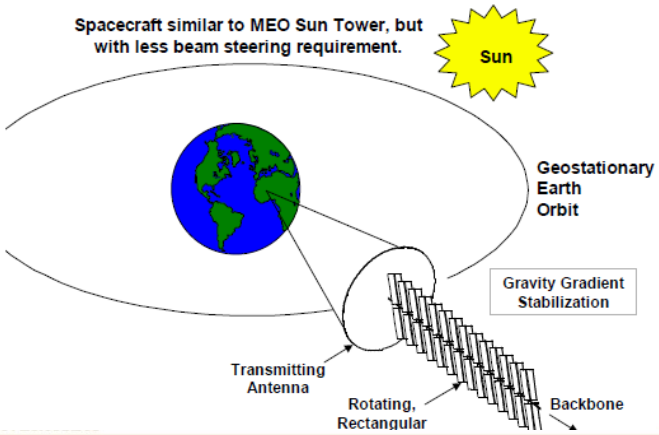
Economy!!!

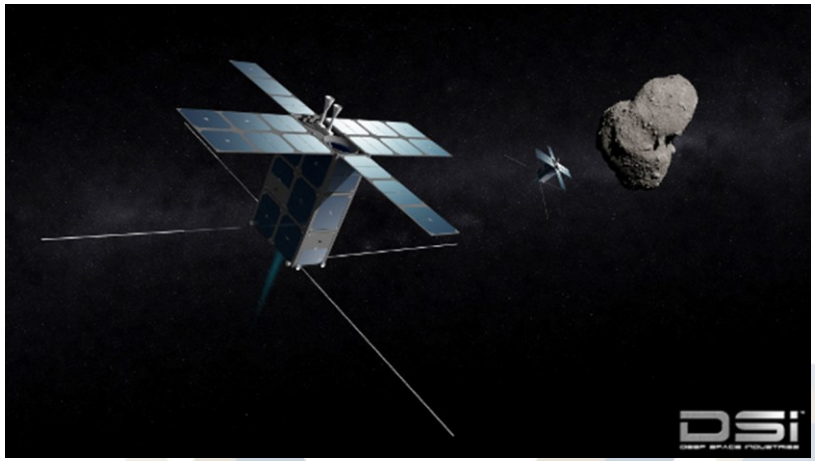
- Growing ComSats (increased coverage)
- Manned space exploration (space commerce, mining, colonization)
- Increased involvement of commercial companies (NEW SPACE)
- Increased importance of small sats (affordable and fast development of satellite constellations)
- Reusable launch vehicles (SpaceX, Blue Origin, SLS)
- Space debris



Next Century

- Space Fussion Plants established
- Electricity from space to earth
- Minining from moon and asteroids
- Colonies, Industrial centers at LEO
- Main goal: To be a civilization living in the Solar System: develop reliable, capable, affordable spacecraft and space access to space



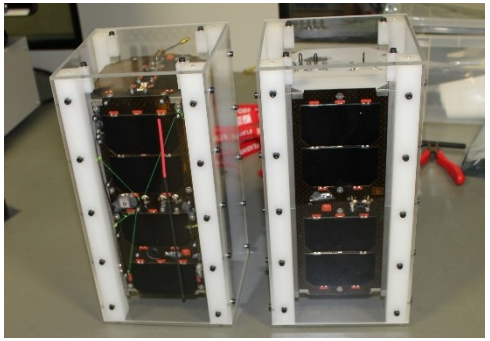


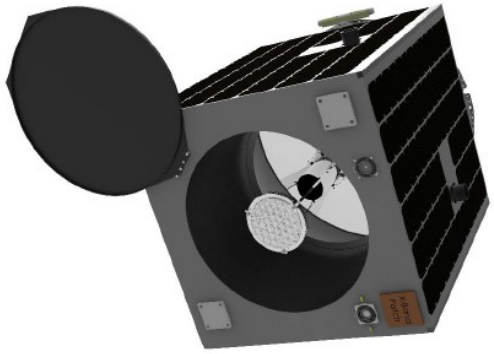
SMALL SATELLITES

- In recent years small spacecraft have become more attractive due to lower development costs and shorter lead times.
- There is a natural trade-off to be made between spacecraft size and functionality, but advances in both miniaturization and integration technologies have diminished the scope of that tradeoff:
  - MEMS: i.e. components with microscale (µm) features.
  - In addition to their small size, in some cases MEMS-based devices can provide higher accuracy and lower power consumption compared to conventional spacecraft systems.

Micro/Nano Satellite Developments

Satellite	MASS (kgs)	COST Millions	TIME (years)
LARGE	1000 kg+	$ 300 M+	10 +
MEDIUM	500-1000 kg	$ 100 M+	4-6
SMALL	100-500 kg	$ 10-100 M	3-5
Micro Sat	10-100 kg	$ 2-10 M	2-4
Nano Sat	1-10 kg	$ 0.1-2 M	<2-3
Pico Sat	< 1 kg	$ 100 k	<1-2

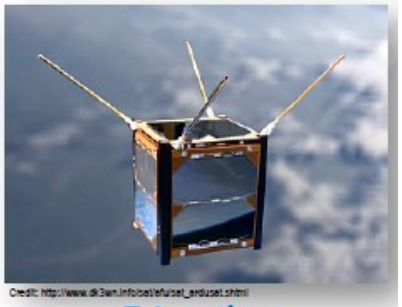




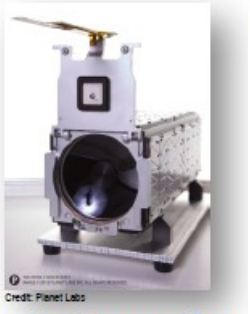
Micro-Nano Sat (Minosat: 1-50kg) new concept (IC Tecnology and MEMS)

MinoSat Application Areas

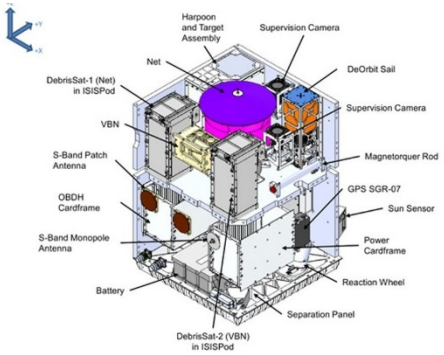
- Education
- Technology Demonstration
- Earth Observation
- Science
- Communication
- Data Collection
- In-orbit Inspection/Services
- Deep Space Exploration
- Military
- Debris Mitigation…



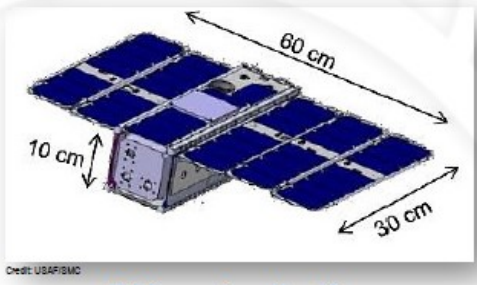
Education
ArduSat
Mass: 1 kg
Launched: 8/2013



Earth Observation
Dove 2
Mass: 5.5 kg
Launched: 4/2013

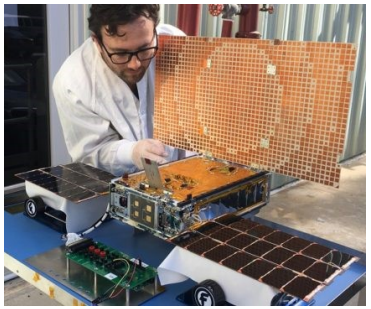


RemoveDebris
2018

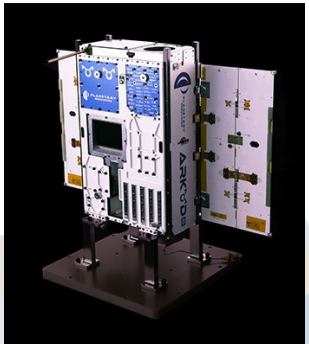


Military Application
SENSE-1
Mass: 5 kg
Launched: 11/2013

In-orbit Inspection
BX-1
Mass: 40kg
Launched: 09/2008



InSight: MARCO
2018

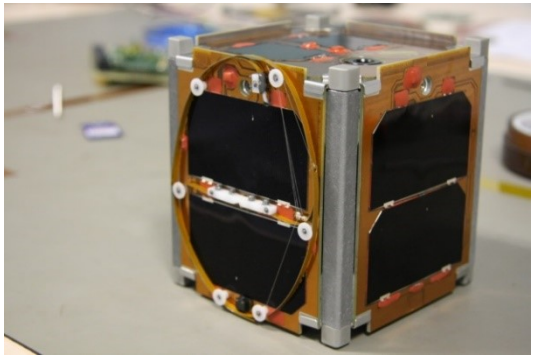


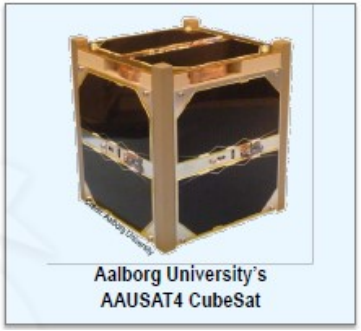
Arkyd-6 Water
Detection

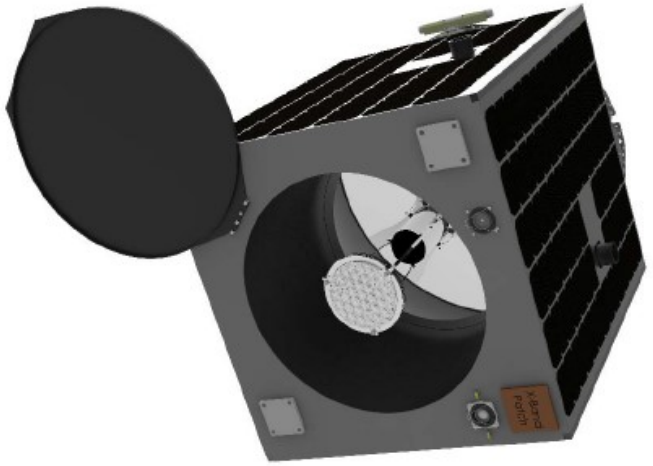
➔ 2014: CubeSats – one of the top 10 science breakthroughs in 2014 (Science mag)

CubeSat Definition

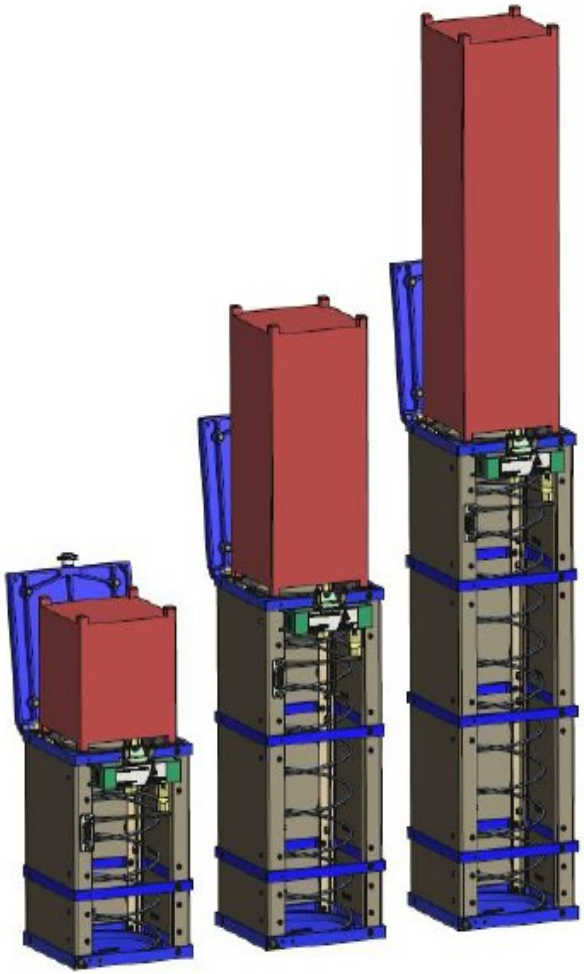
- Development based on the *CubeSat Standard*
  - 1st version 1999 CalPoly and Stanford,
  - CDS rev13 (2015), CDS 6U (2016)
- Multiple of 10*10*10cm units
- Each Unit (U) has a volume of 1 litre
- Each U has a max 1.33kg of mass (3U = 4kg)
- 6U,12 U up to 27U

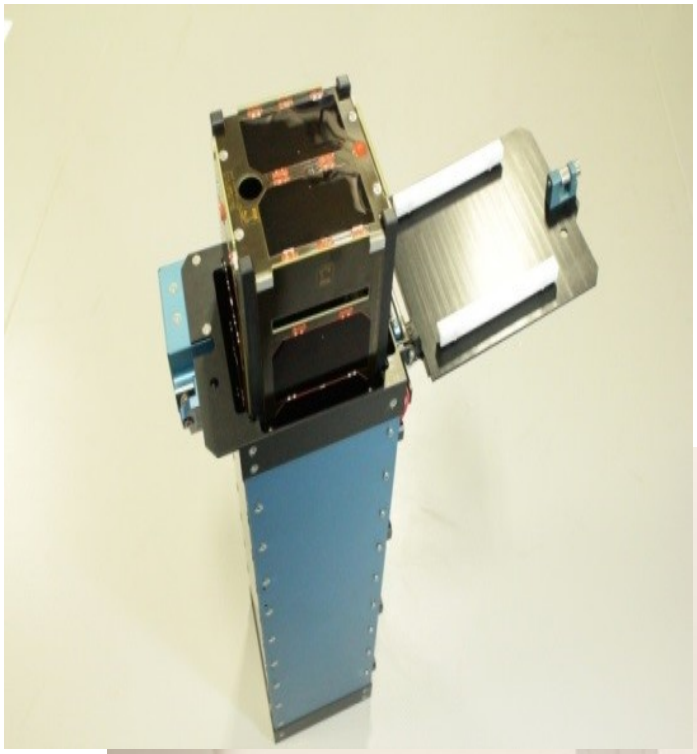


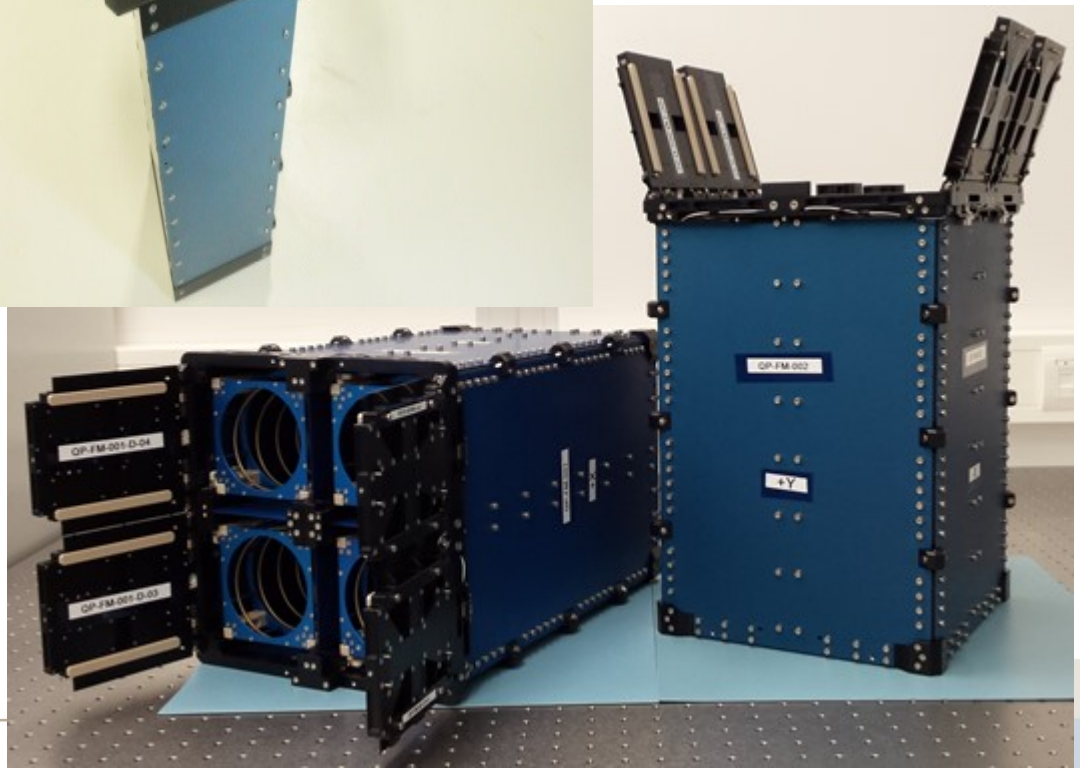


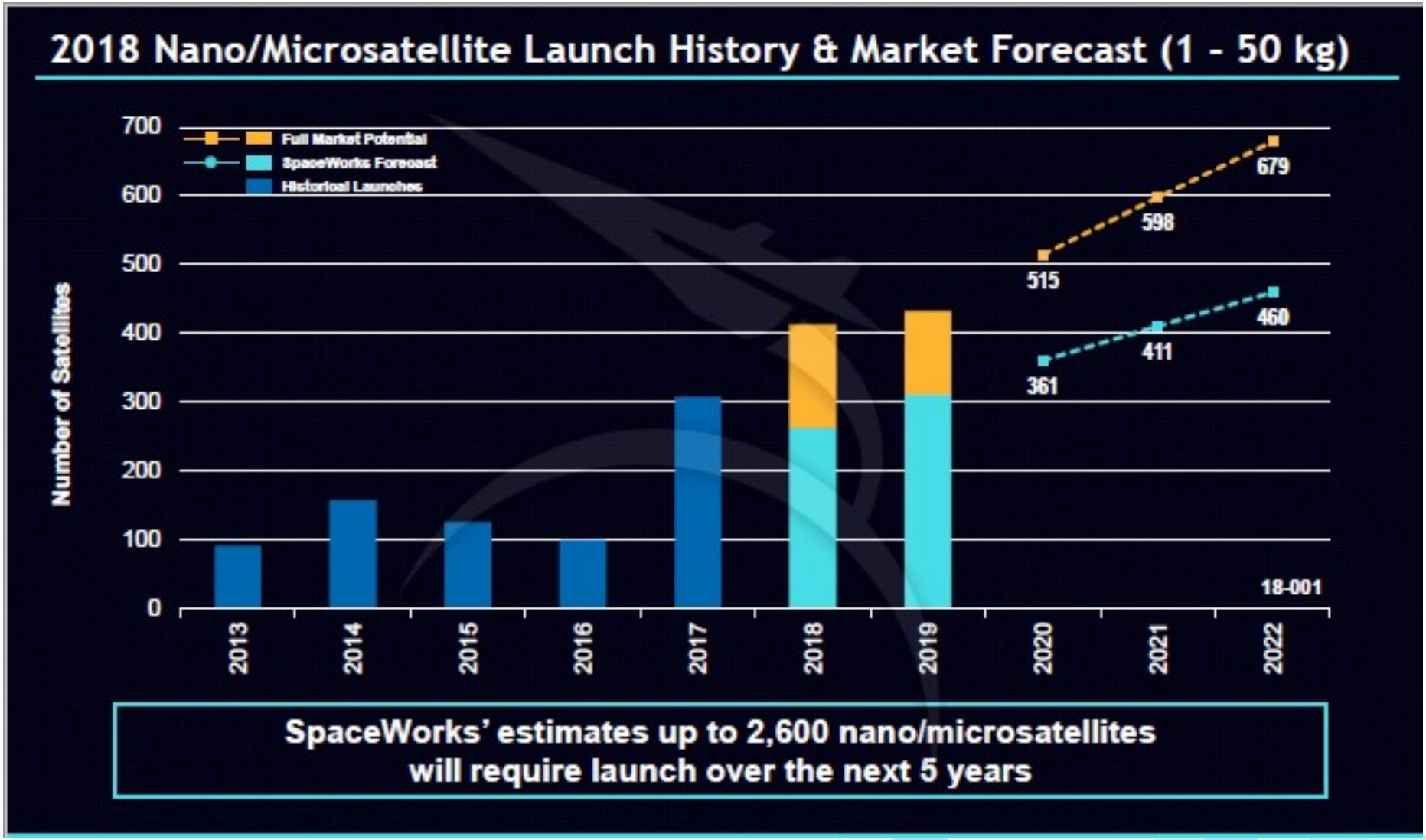


POD-CubeSat DEPLOYERS



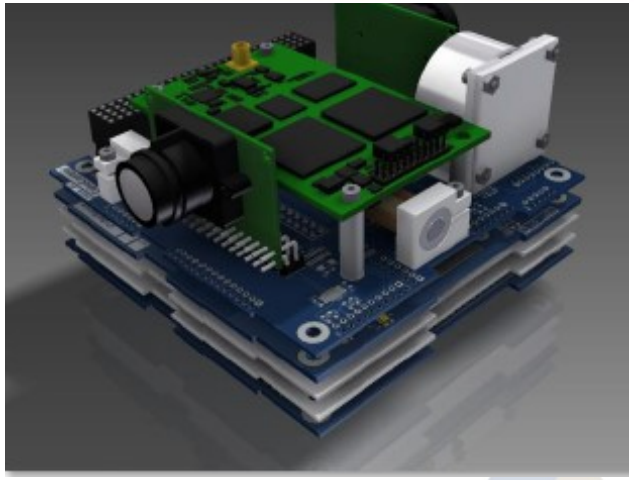





2018 Nano/Microsatellite Launch History & Market Forecast (1 - 50 kg)
Number of Satellites
700
600
500
400
300
200
100
0
Full Market Potential
SpaceWorks Forecast
Historical Launches
515
598
679
361
411
460
18-001
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
SpaceWorks' estimates up to 2,600 nano/microsatellites
will require launch over the next 5 years

KEY ISSUES

- Selection and Development of a micro propulsion system to aid formation flying of CubeSats
- Development of ADCS to keep desired CubeSats orientation and facilitate data transmission and communication within satellites and ground stations
- Development of continuous and autonomous high res image processing capabilities
- Selection and/or development of high rate communication for short video transmission



QB50 ADCS (www.qb50.eu)

EO Conclusions

- Scientific objectives for Earth observation programs have become more and more ambitious.
- The classical approach of using large satellites with multiple scientific instruments onboard has reached its limits in terms of costs, spatial and temporal resolution and coverage.
- Formation flying possesses the potential to enable order of magnitudes improvements compared with classical earth observation platforms.
- The concept of formation flying satellites involves two or more spacecrafts that use an active control scheme to maintain their relative positions and velocities.
- A large number of future planned space missions will be based on the use of highly coordinated micro- and nano-satellite formations to increase the overall efficiency and performance

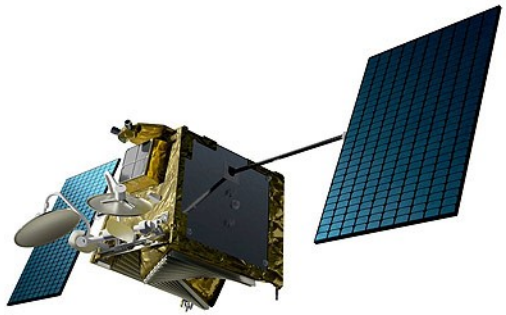
Ongoing Constellation Projects

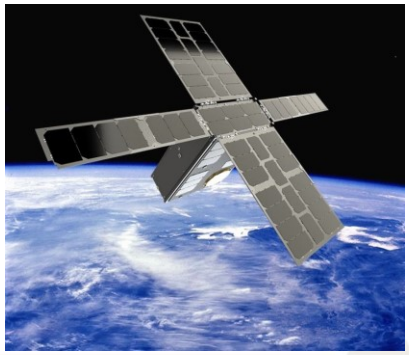
ONE WEB

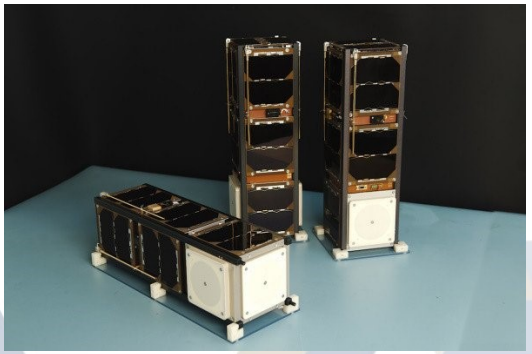
- 882 smallsat
- Total cost $2-3 billion
- First launch 9.08.2018 (Soyuz)
- Global wideband internet provision
- 2020: regional and 2022: global coverage

SKY and SPACE GLOBAL

- 200 nano sat
- Total cost $150-200 Million
- First launch 23.6.2017 (PSLV)
- Narrow band (voice call, text and picture)
- IOT, M2M, PTT, S&F, IM, Phone
- 2019 and2020 ready
- Upto date nanosat technology + custom software

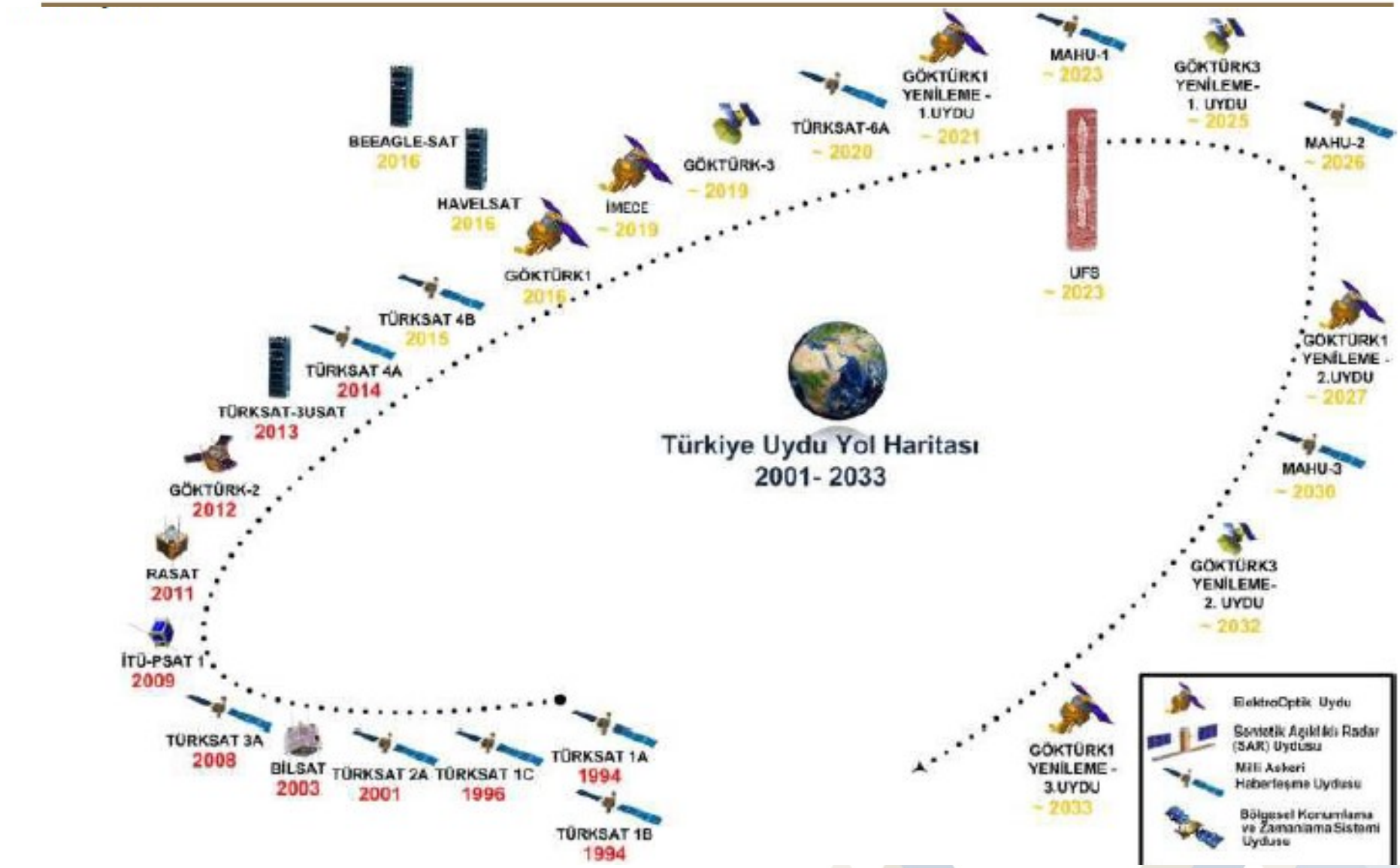






SMALL SATELLITE PROJECTS in TURKEY

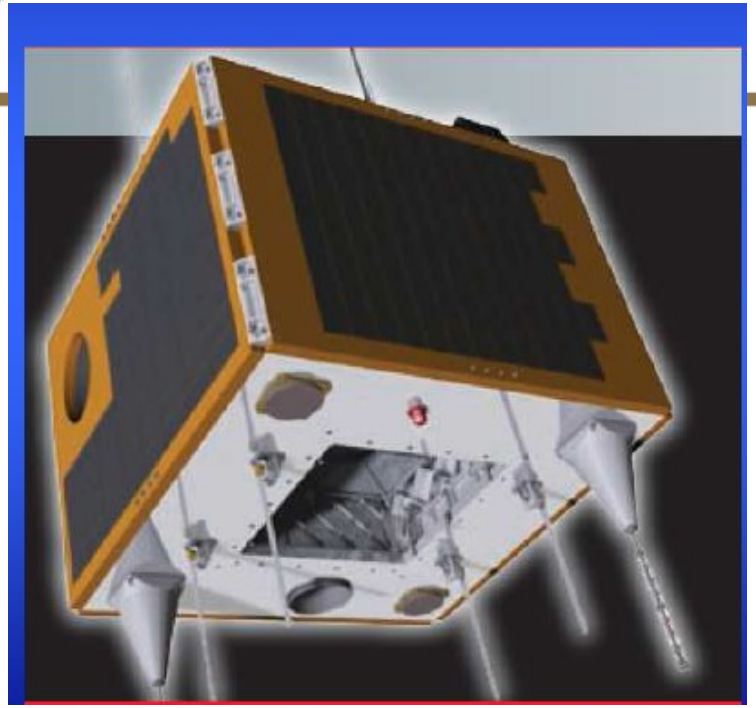
Turkish Satellite Road Map



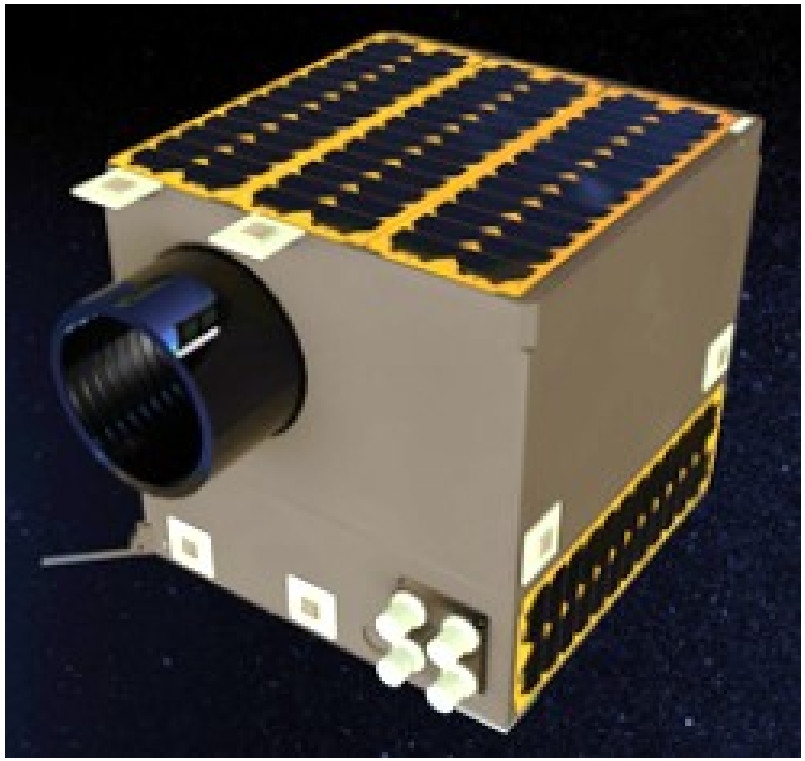
TURKISH SMALLSAT PROJECTS

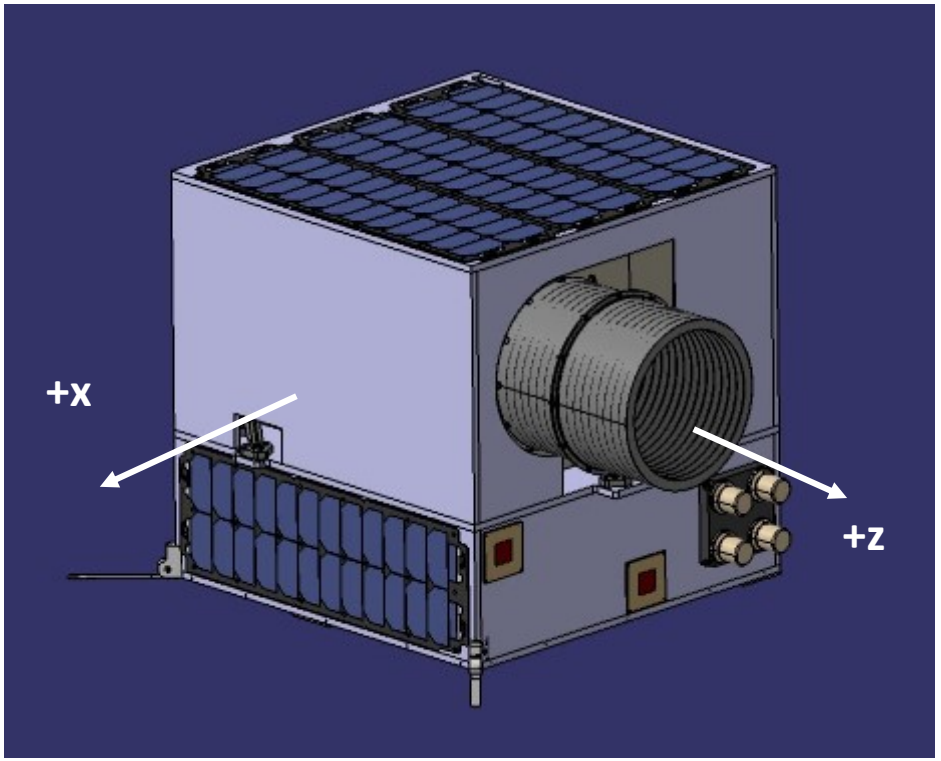
- BILSAT 27.09.2003 (SSTL, TT, 2 subsystems)
- ITUpSAT1 23.09.2009 (İTÜ)
- RASAT 17.08.2011 (TÜBİTAK UZAY)
- GÖKTÜRK II 18.12.2012 (T.UZAY and TAI)
- 3USAT 26.04.2013 (İTÜ/TAMSAT-TÜRKSAT)
- QB50 BEEAGLESAT/HAVELSAT, İTÜ,MAY 2017
- UBAKUSAT, 2018 (İTÜ, TAMSAT, MTMAC, JAXA)
- ASELSAT, 2019, İTÜ-ASELSAN
- LAGARİ, 2020, STM
- PİRİ SAT, 2020, STM
- Few others

RASAT/ GOKTURK 2



STM -- LAGARI



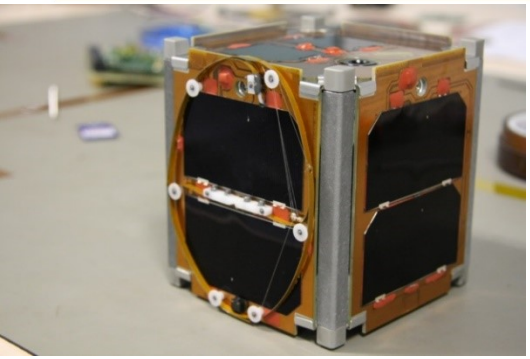


Hi Res EO, PAN <2m, MS<8m

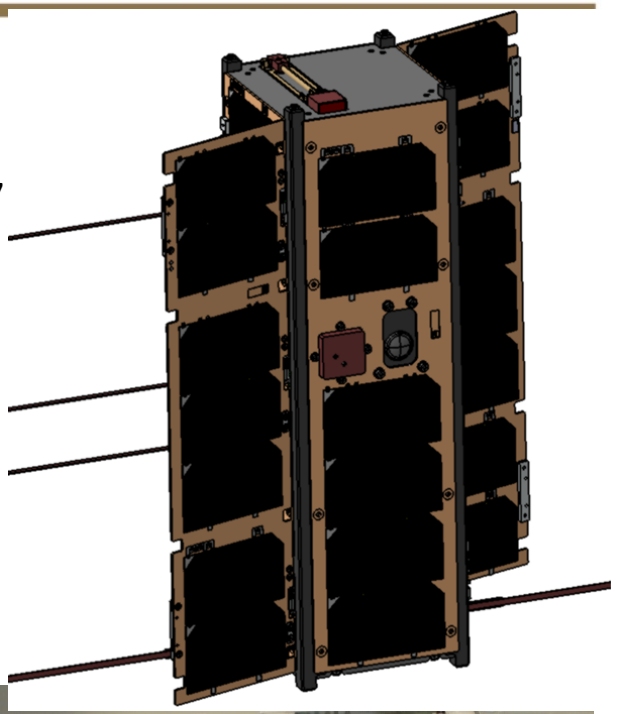
Micro Sat, <70kg, operational satellite

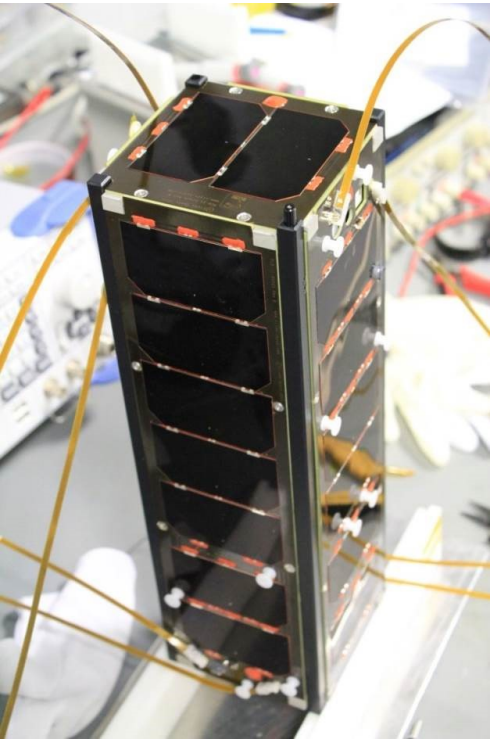
STM LAGARI HI RES MICRO SAT CONSTELLATION

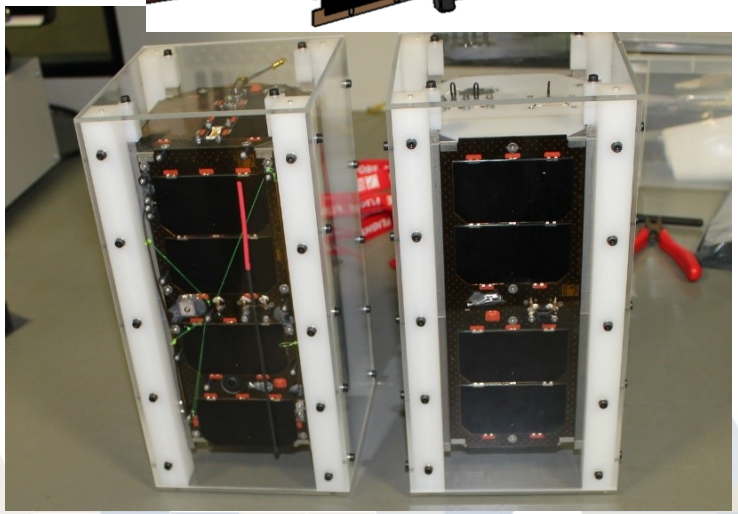
ITU SSDTL CUBESAT PROJECTS



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







Space Education at ITU

- ITU, as a modern research University, has a global vision in research and education.
- İTÜ provides Astronautical Engineering education since 1986.
- Applied studies include Development of CanSats, CubeSats and nano/micro satellites, de-orbiting systems, environmental tests of nano satellites and satellites subsystems, and rocketry with interdisciplinary team work.
- ITUpSAT1, the first Turkish CubeSat developed by İTÜ is in orbit for over seven years (Launch 23.09.2009).

SPACE in ITU

- ITU has started practical space studies in late 2005.
- The worldwide CubeSat projects and declared Turkish Space Program were both pivotal in deciding to go towards practical space projects.
- The CubeSats projects have attracted more and more students, first from the department and then from many other related departments, particularly, from electrical and electronics, computers, telecoms and mechanical.
- Space testing facilities were also established, to aid rapid and reliable development of spacecraft components.
- Large scale educational state projects were very helpful in establishing the testing infrastructure, providing the required large budgets for their procurement.

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

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)

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)

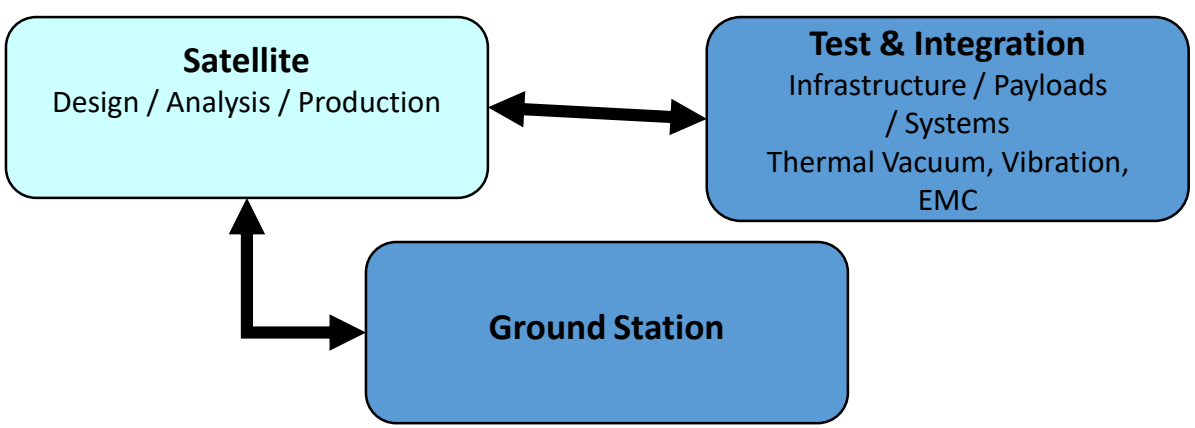
Research Methodology

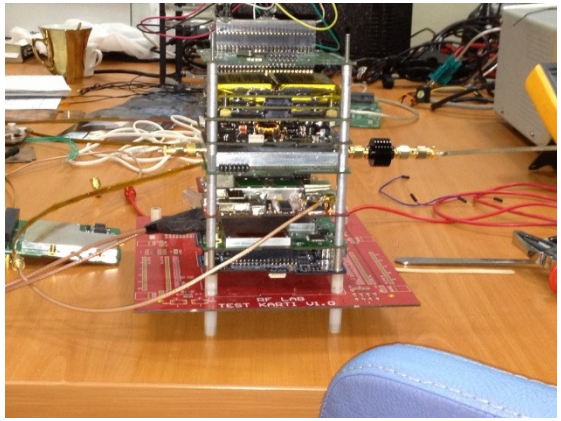
- General design methodology for nano and micro satellites
- Analysis,
- Development of subsystems
- Software developments,
- Component tests,
- Engineering models and ground tests,
- Flight models,
- Launch preparations

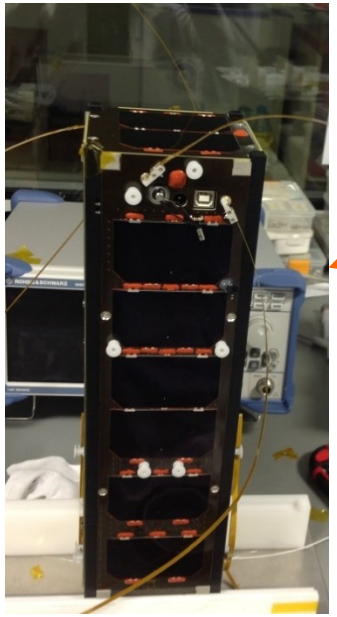
İ.T.Ü. NanoSat Group + AMSAT-TR + SMEs

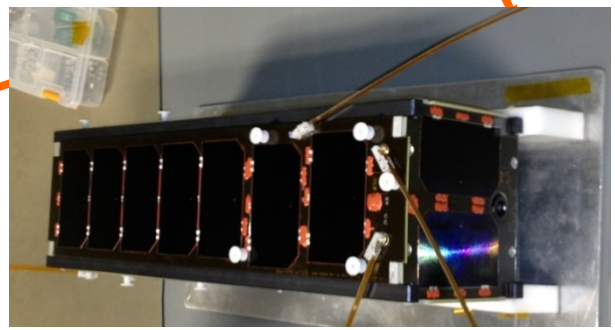
- Faculty, researcher and students from Astronautical, Aeronautical, Mechanical, Electrics and Electronics departments, with interdisciplinary team work.
- Joint work, design and manufacturing capabilities of SMEs and AMSAT-TR
- Competencies:
  - Design and development of nano/micro satellites, de-orbiting 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

İTÜ-SSDTL Development phases









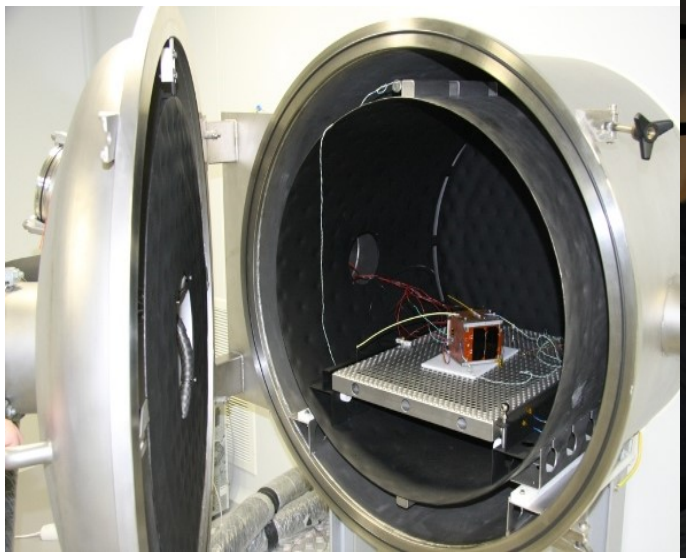
- Conceptual design
- Desktop model
- Engineering model
- Flight Model

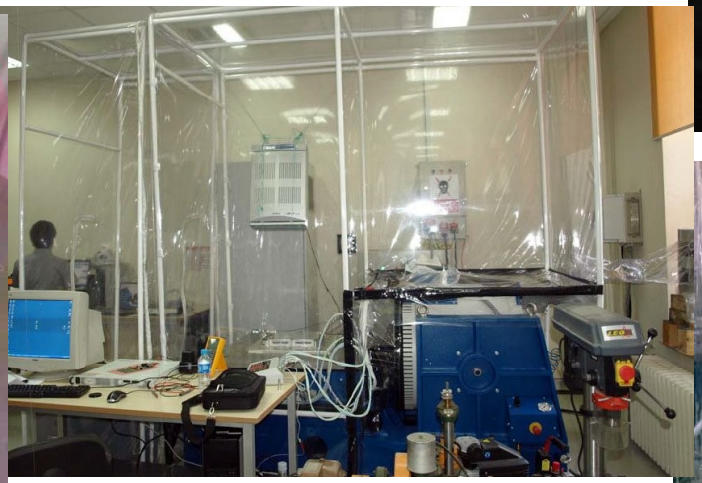
- Protoflight Model

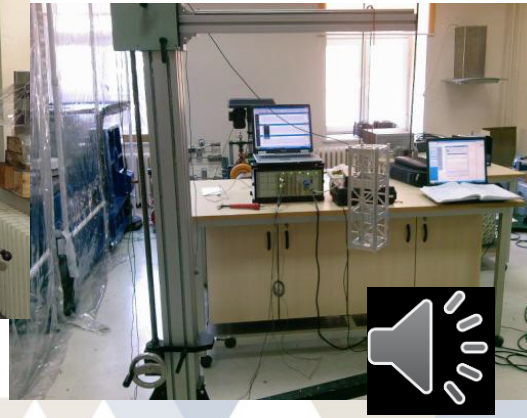
X BAND and VHF/UHF GROUND STATIONS at ITU

VHF/UHF GROUND STATION

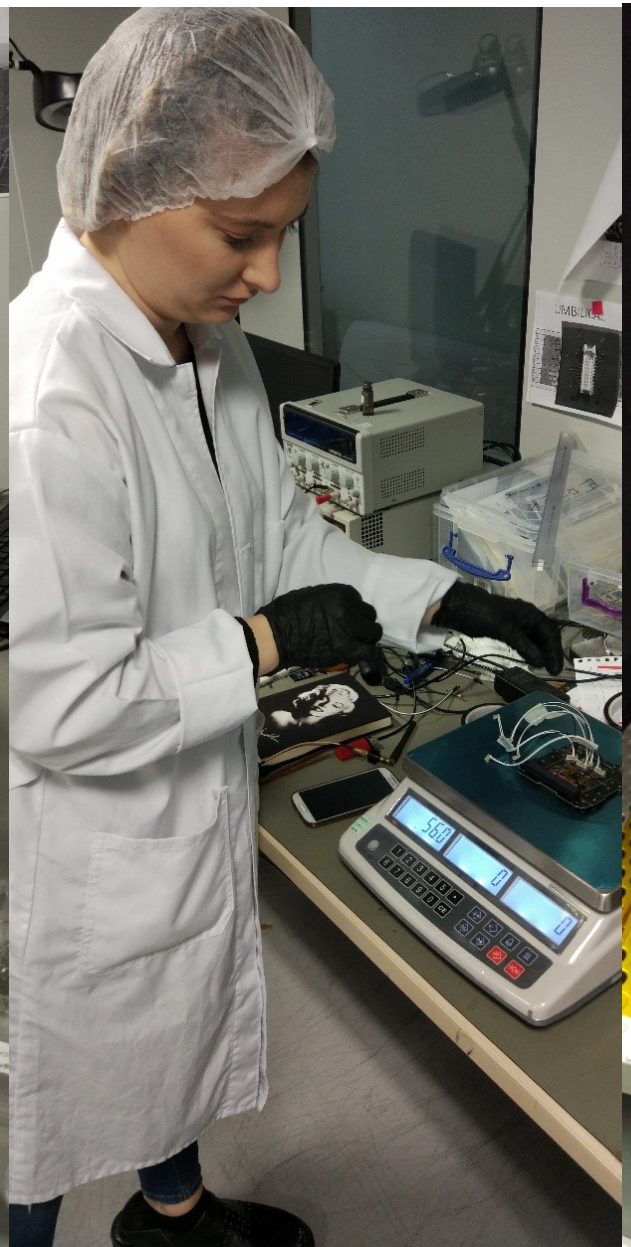
INTEGRATION and TEST at ITU

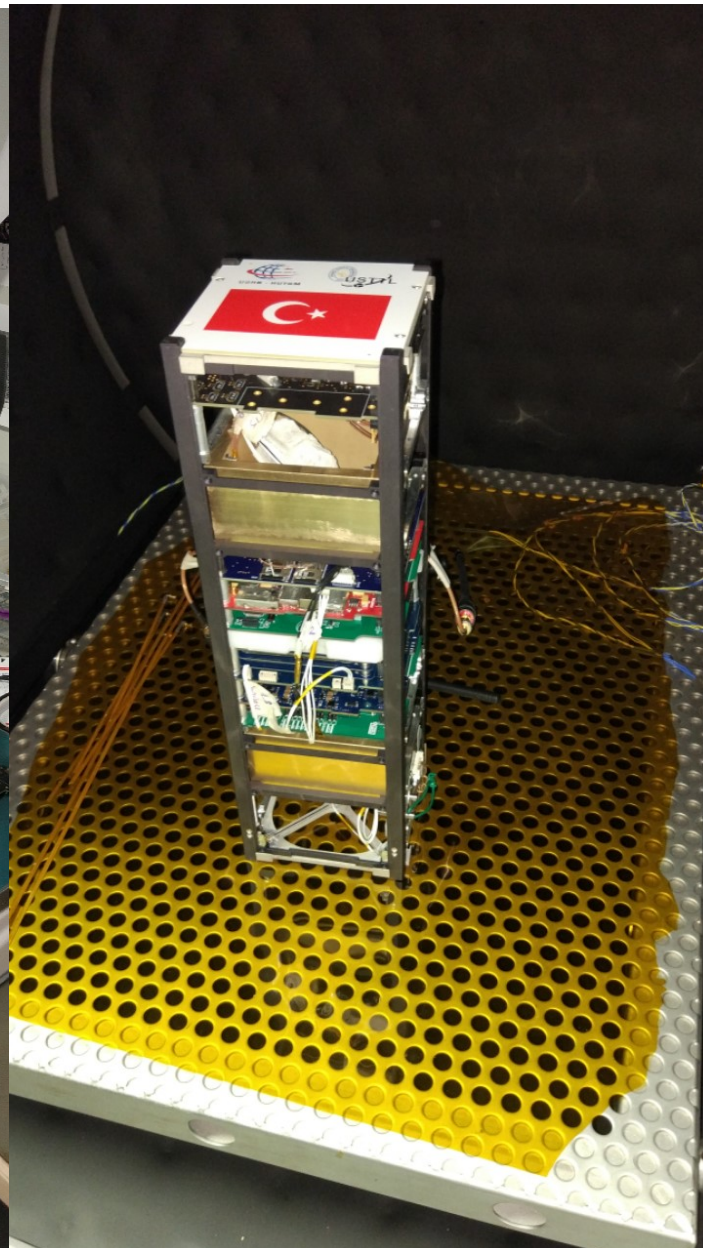






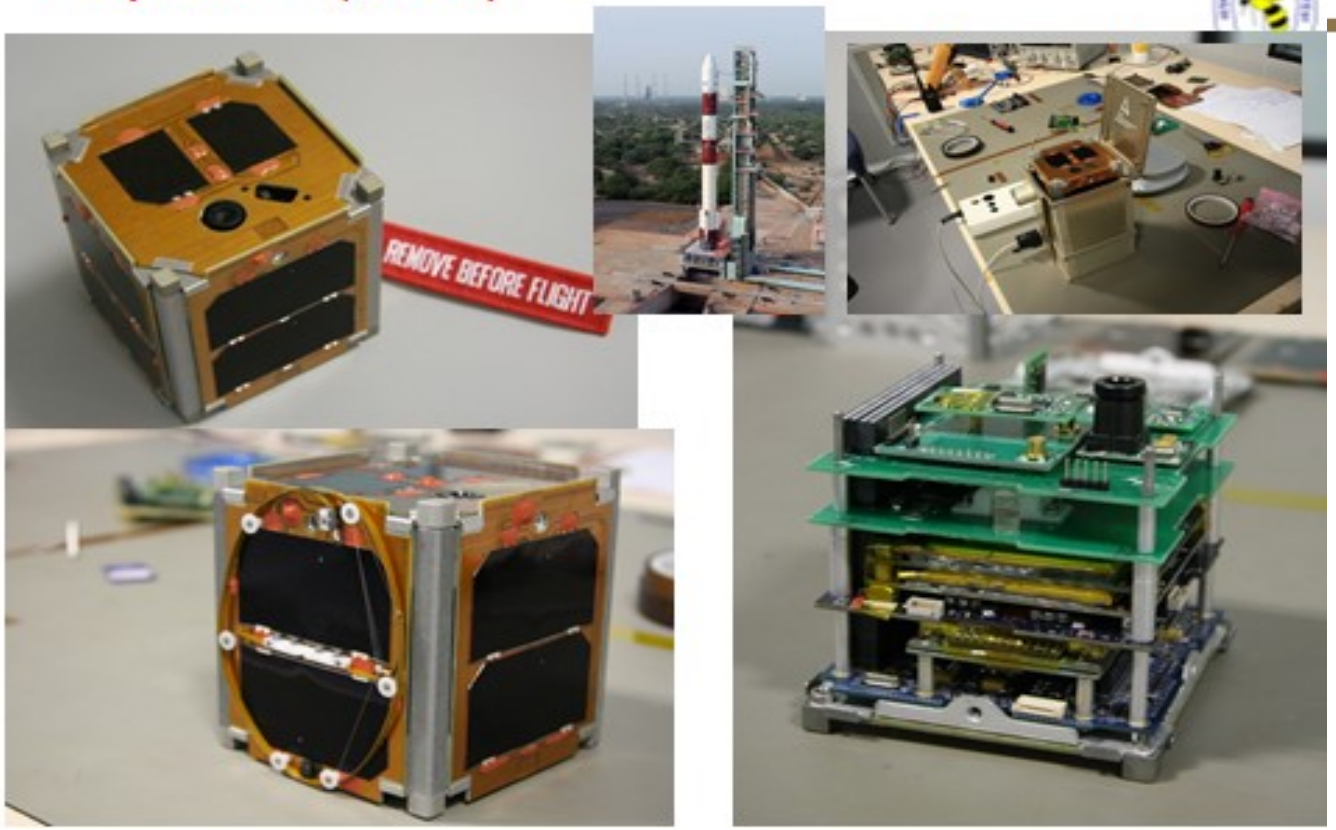
INTEGRATION and TEST at ITU





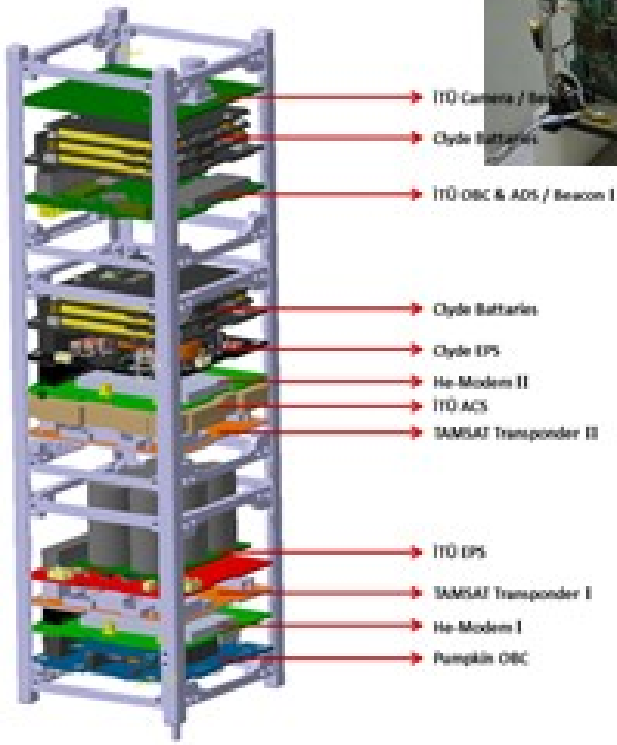
İTÜpSAT1 (2009)

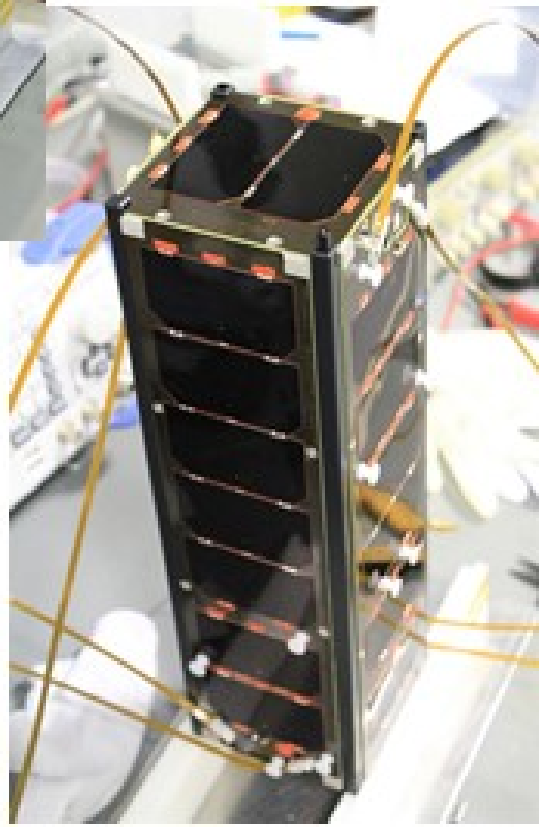
Launched with swisscube, BeeSat and UWE-2



ITUpSAT1, ITU Space Eng. first practical space project. Launced on 23.09.2009, still operational. The project was a major step in increasing space awarness among students. TÜBİTAK 1001, 106M082

3USAT (2013)

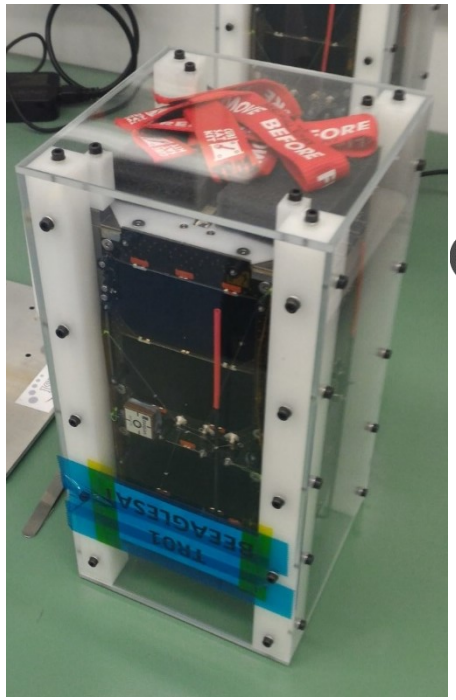




TURKSAT-3USAT, fully industry supported 3 unit communication CubeSat project. Launched on 26.04.2013.

BeEagleSAT and HavelSat

- BeEagleSAT: İTÜ, HHO, SU, Kobiler, Havelsan (UTEB Project).
- QB50 deki 2 of 32 2U in QB50
- HavelSat: ITU and Havelsan



İSTANBUL TEKNİK ÜNİVERSİTESİ 1773

HAVA HARP OKULU 1961

GUMUSH

Sabancı Üniversitesi

Ertek

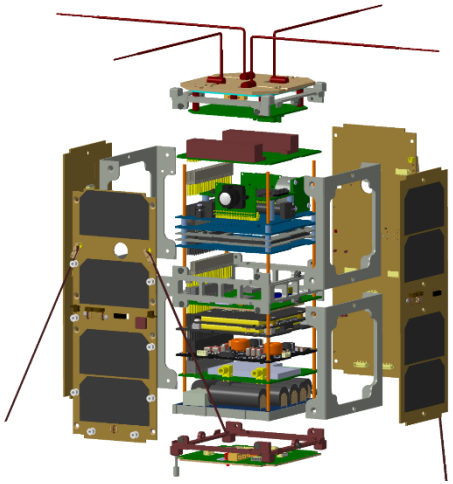
QB50

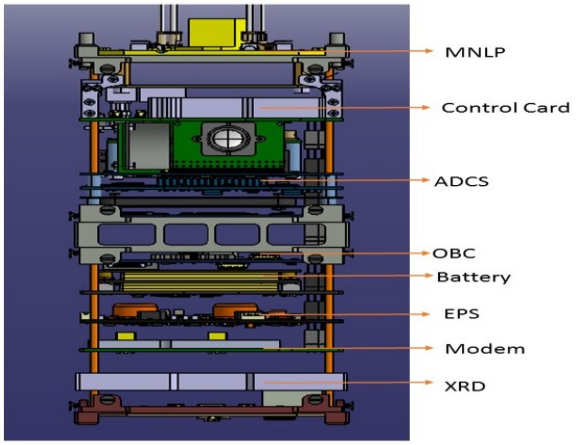
HAVELSAN

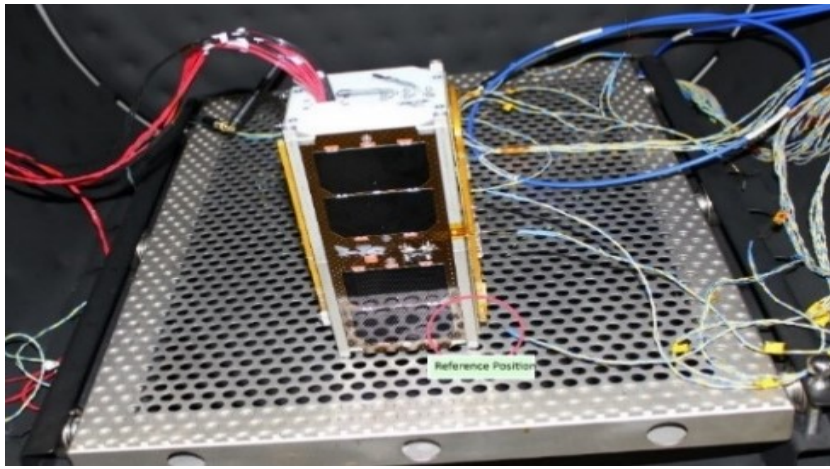
SEVENTH FRAMEWORK PROGRAMME

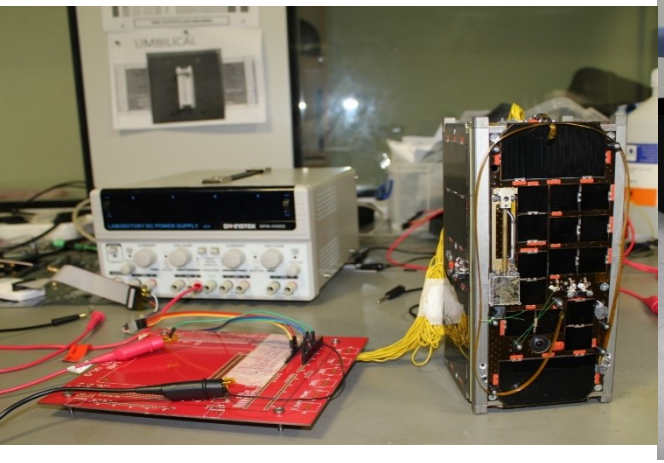
Asırlardır Çağdaş

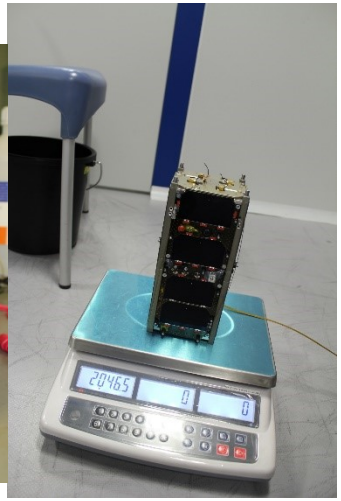
BEEAGLESAT

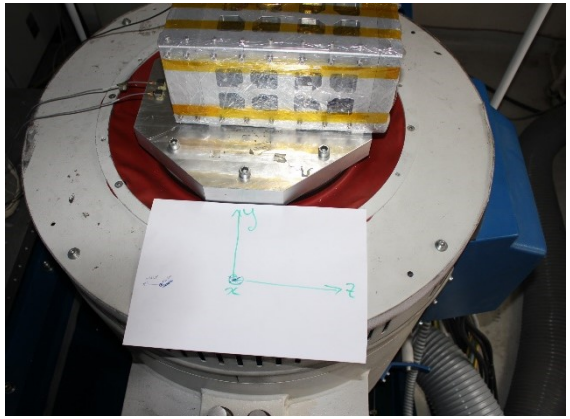



MNLP
Control Card
ADCS
OBC
Battery
EPS
Modem
XRD


Reference Position




20465



Laying foundations of scientific space payloads in Turkey!

Why CubeSat?

Game changer for space research worldwide, opportunity for developing countries:
build experience+skilled personel

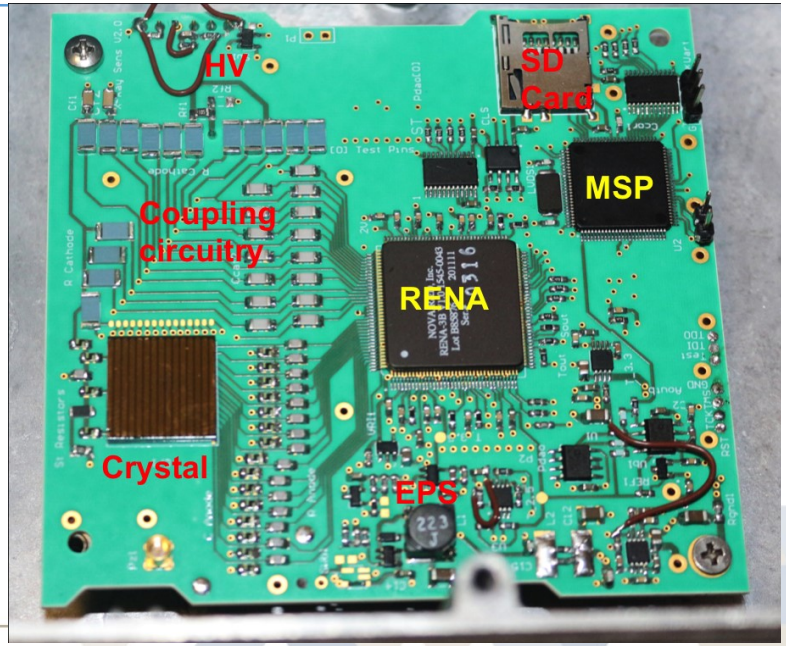
- Modest budget
- Short development time
- COTS components

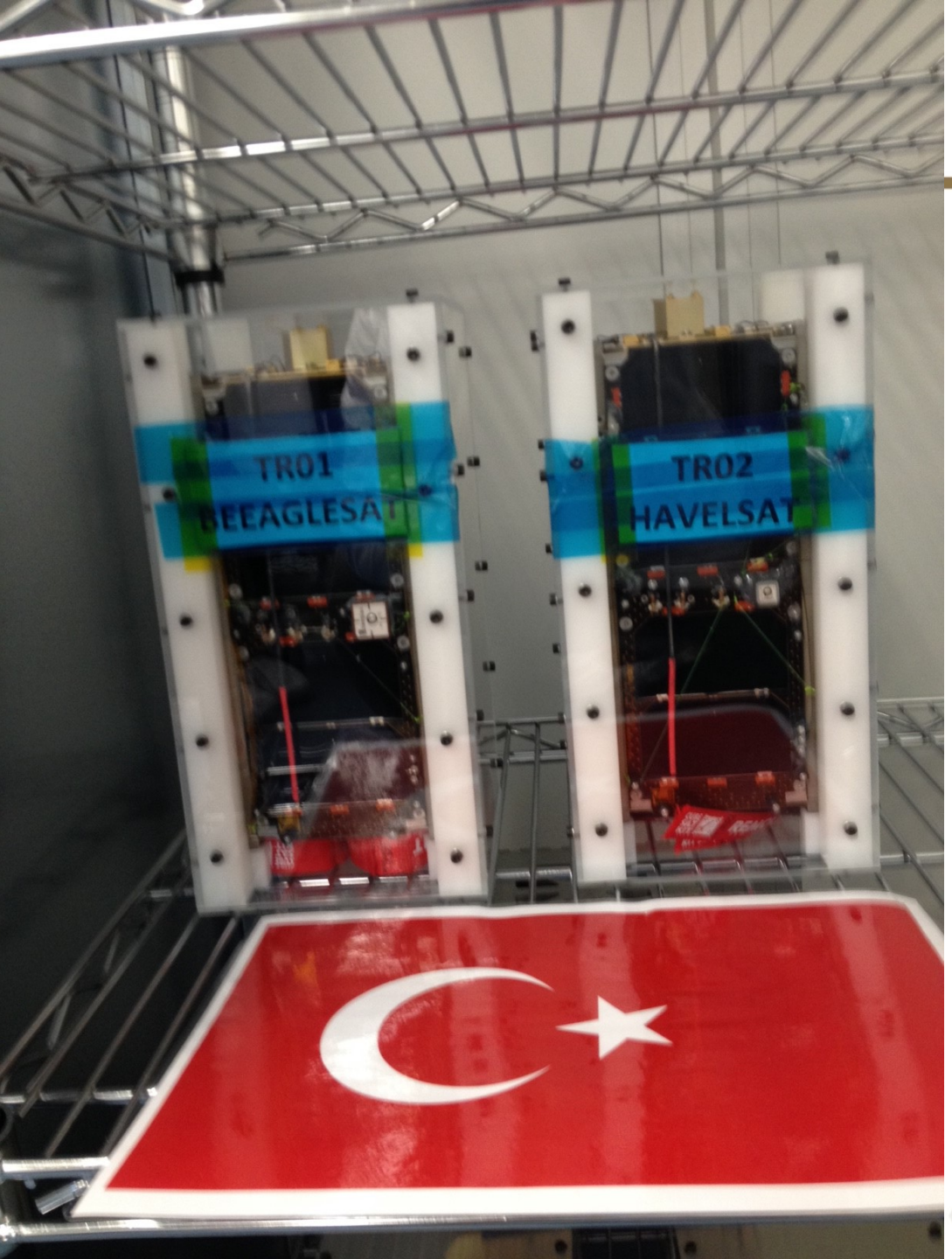
Why QB50?

- Science with CubeSats
- Freedom for secondary payload
- Launch!

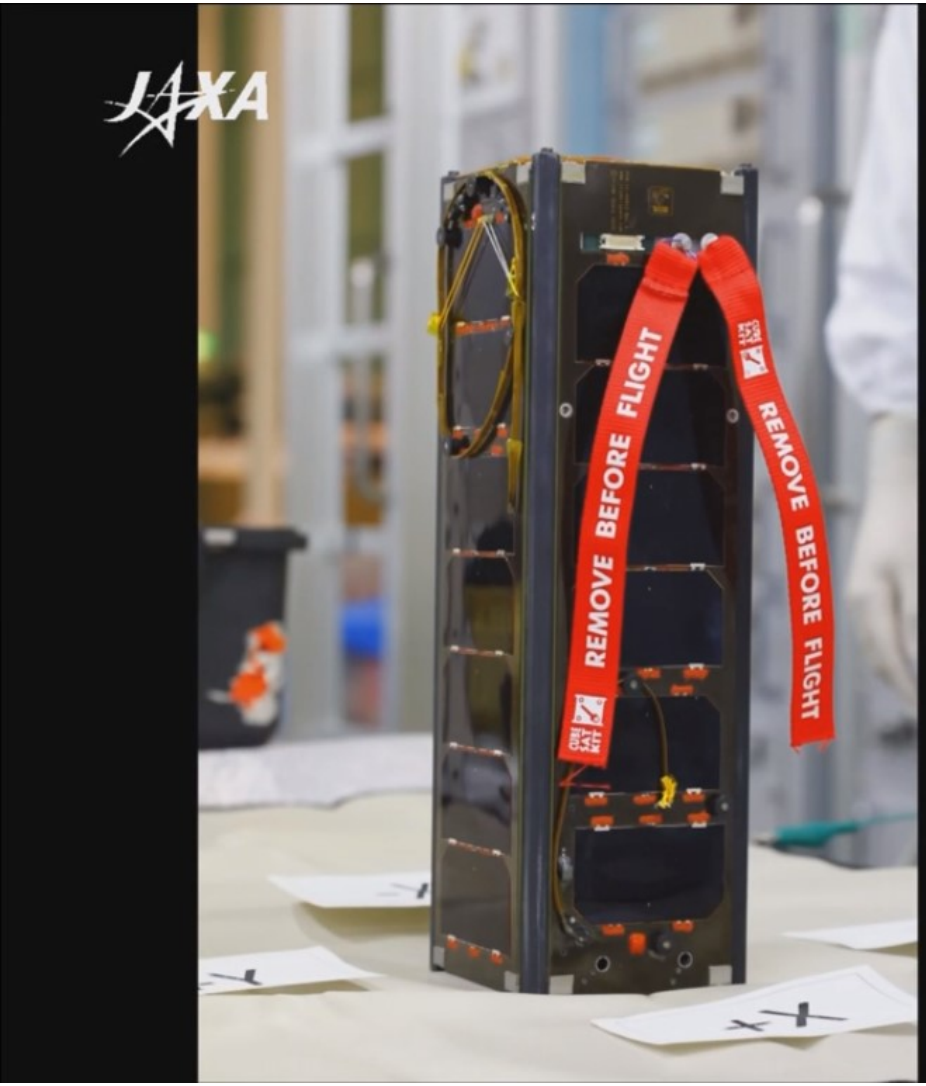
Why X-Ray Detector?

- Small, Affordable, All COTS
- CZT detector crystal space heritage
- Measure X-ray background spectrum at low Earth orbit.
- Detect GRBs, large magnetar bursts (if extremely lucky)




TR01
BEEAGLESAT
TR02
HAVELSAT

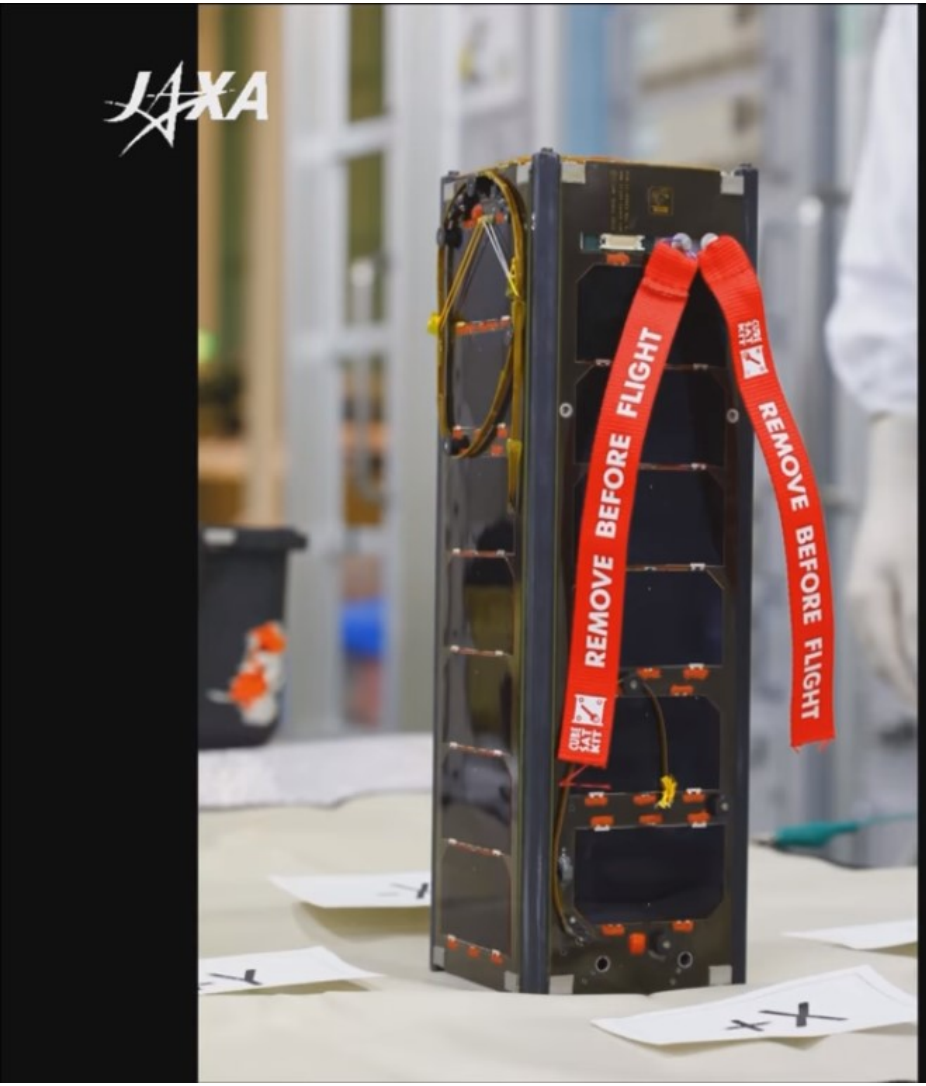

TR02
HAVELSAT
TR01
BEEAGLESAT



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）

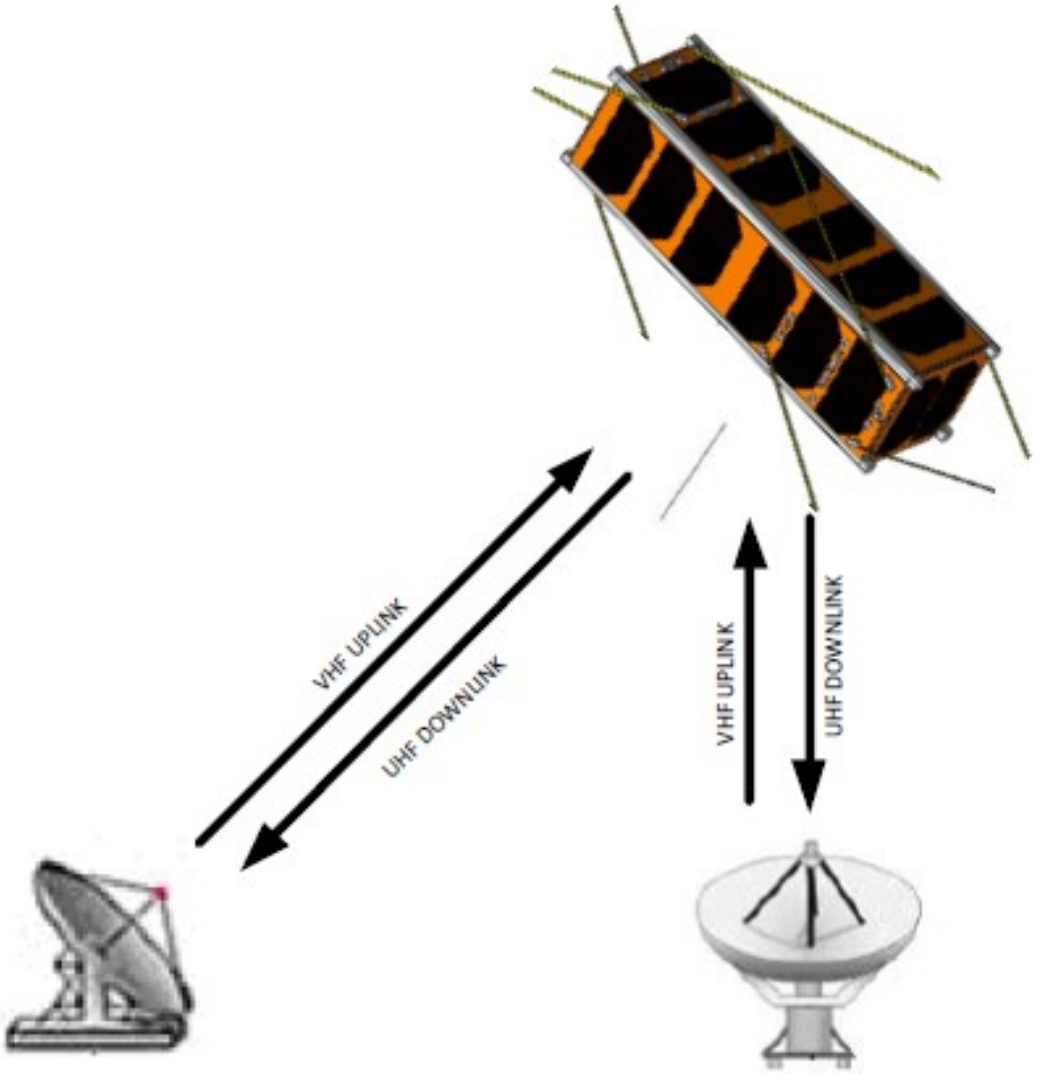


Cooperation in the field of space and aeronautics
（宇宙・航空分野に関する協力）

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



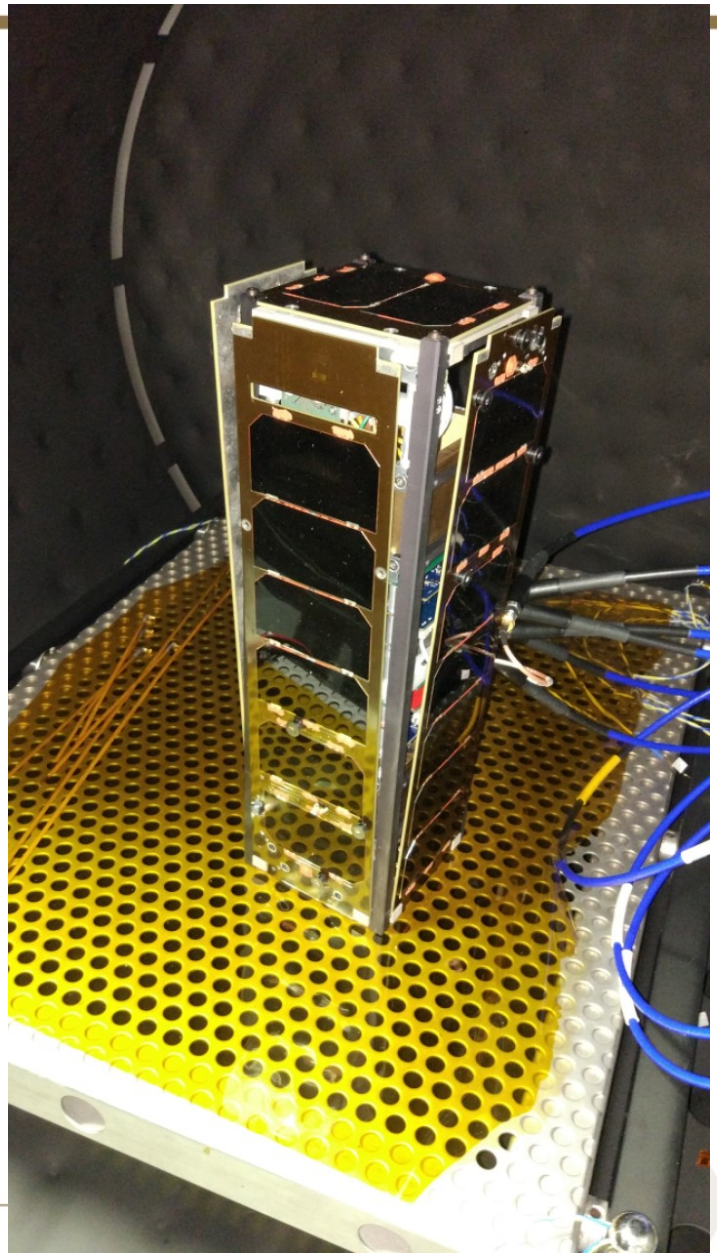
UBAKUSAT, Details

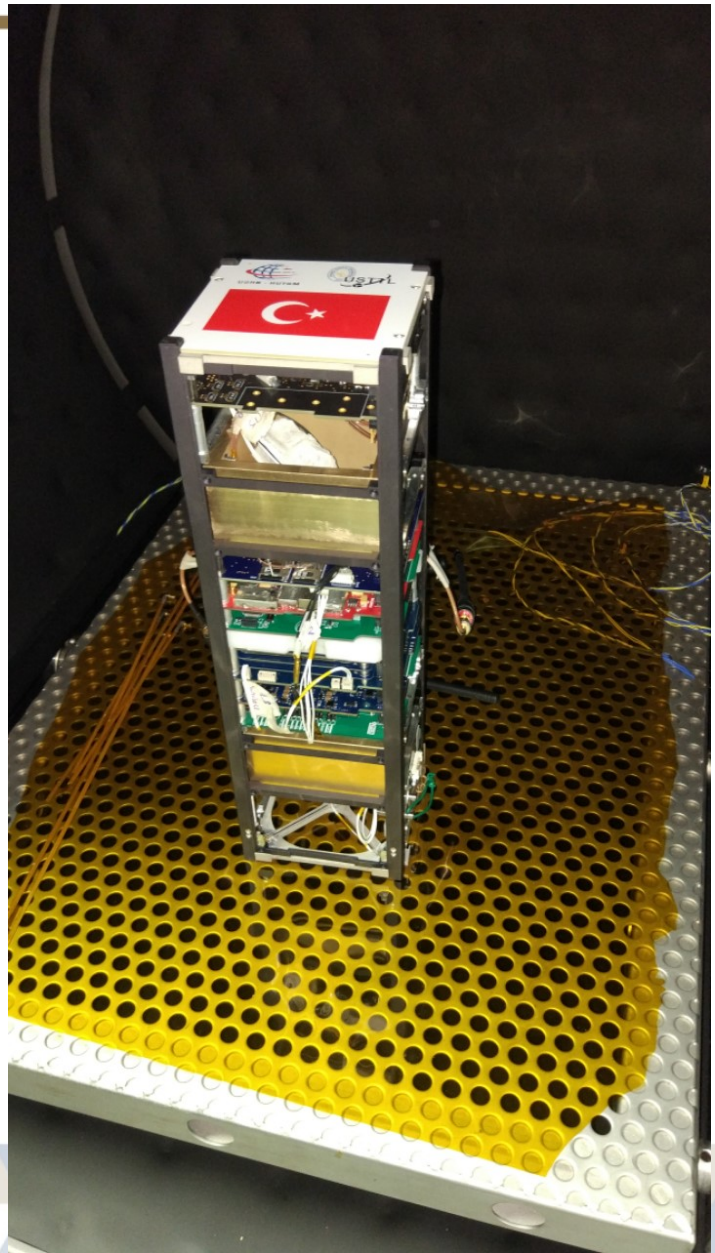
Mass 3.2 kg
10*10*34cm, 3U CubeSat

- 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



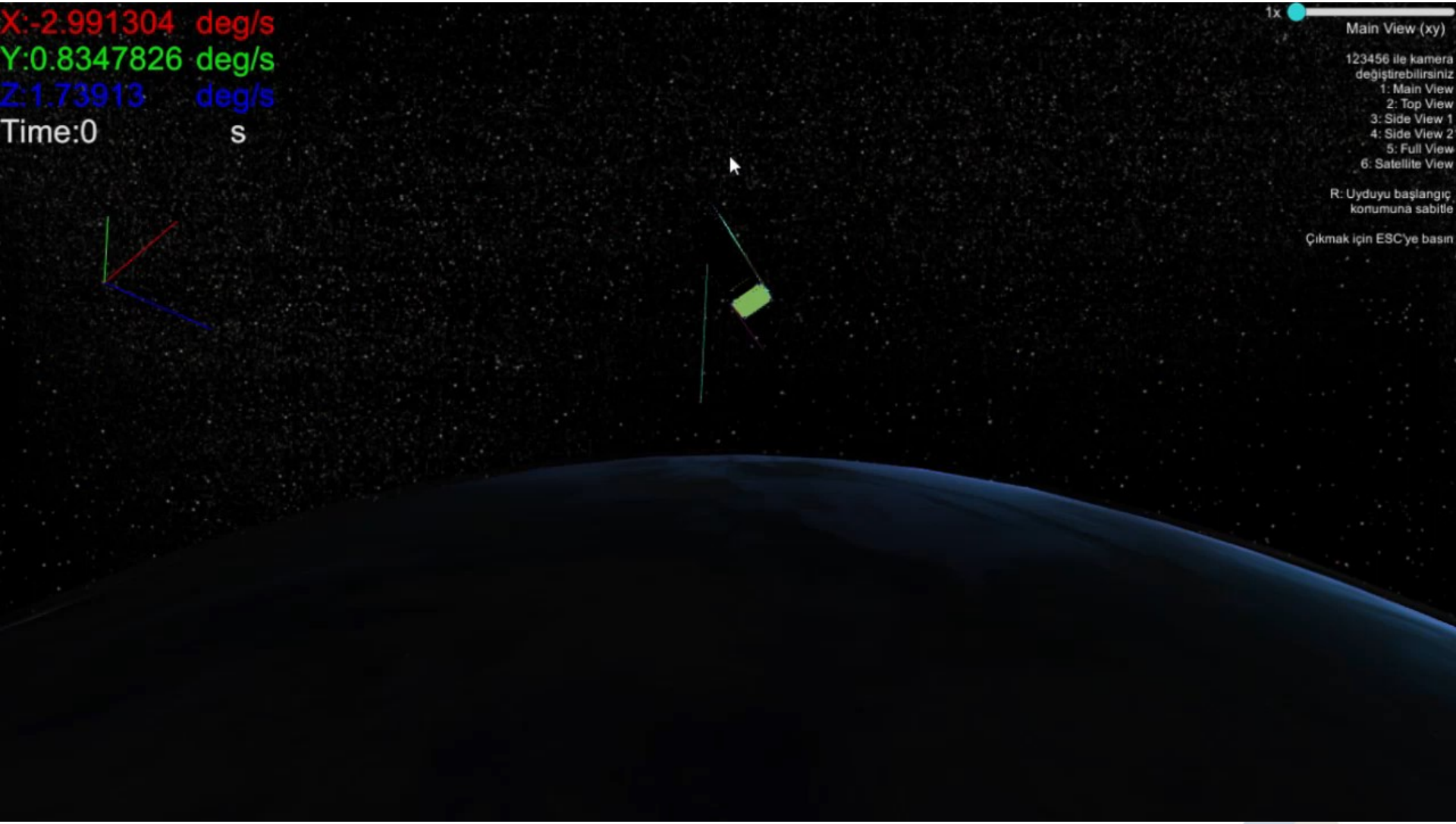


CLEAN ROOM, GETTING READY FOR LAUNCH, JAXA, TSUKUBA

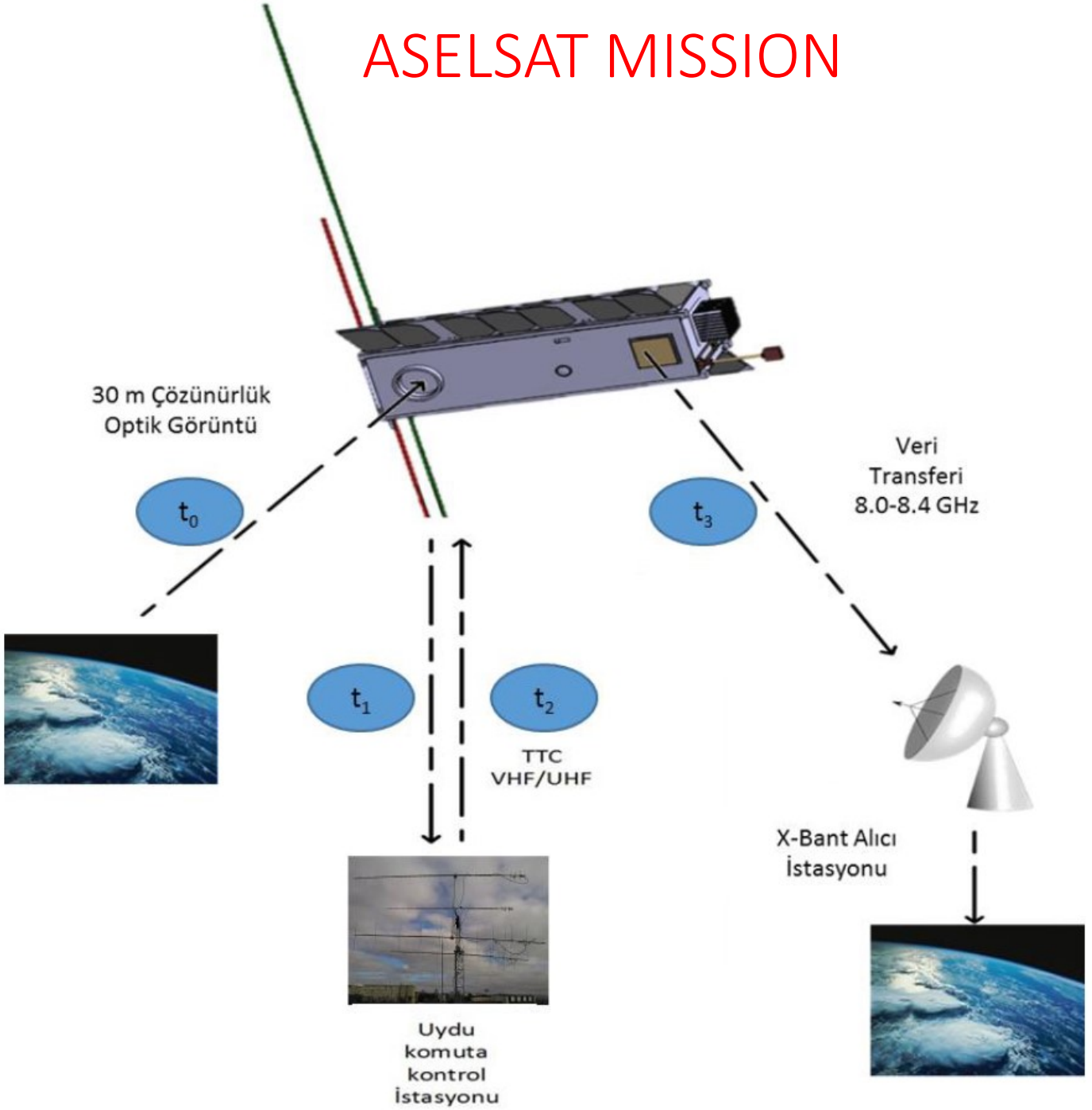
Photo Courtesy of JAXA, TSUKUBA


JAXA
JAXA
JAXA Astronaut
Norishige Kanai

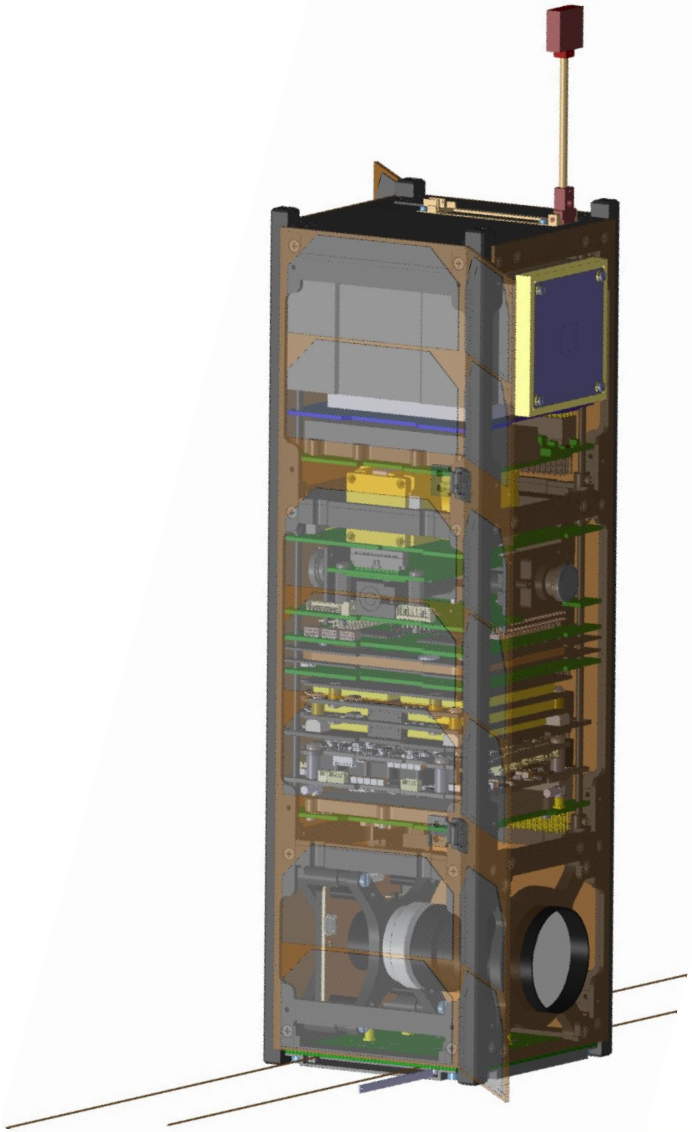

Kibo"
「きぼう」日本実験棟
JAXA


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



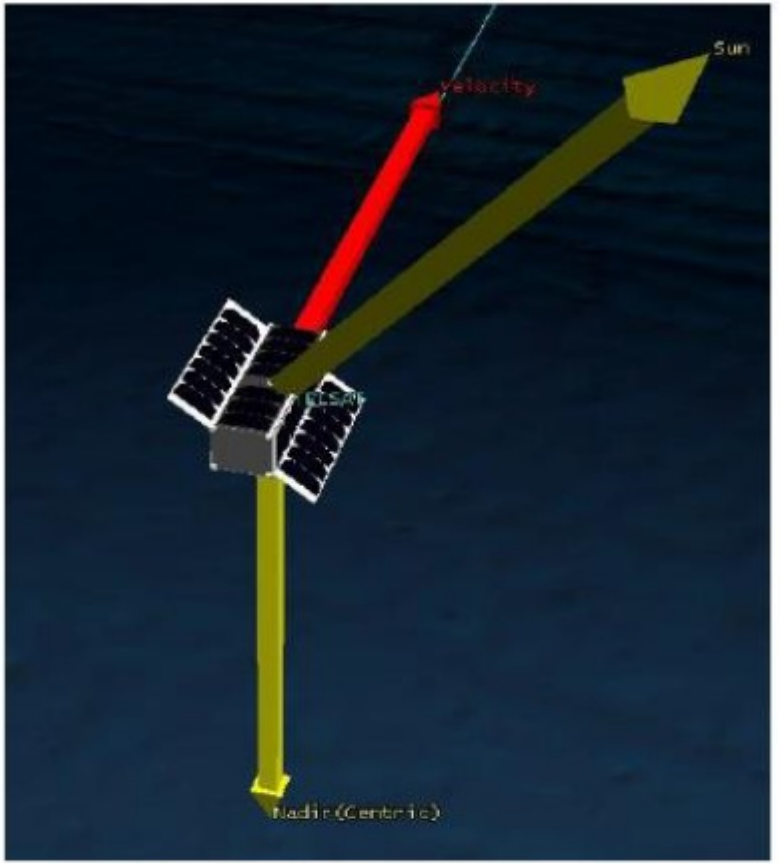
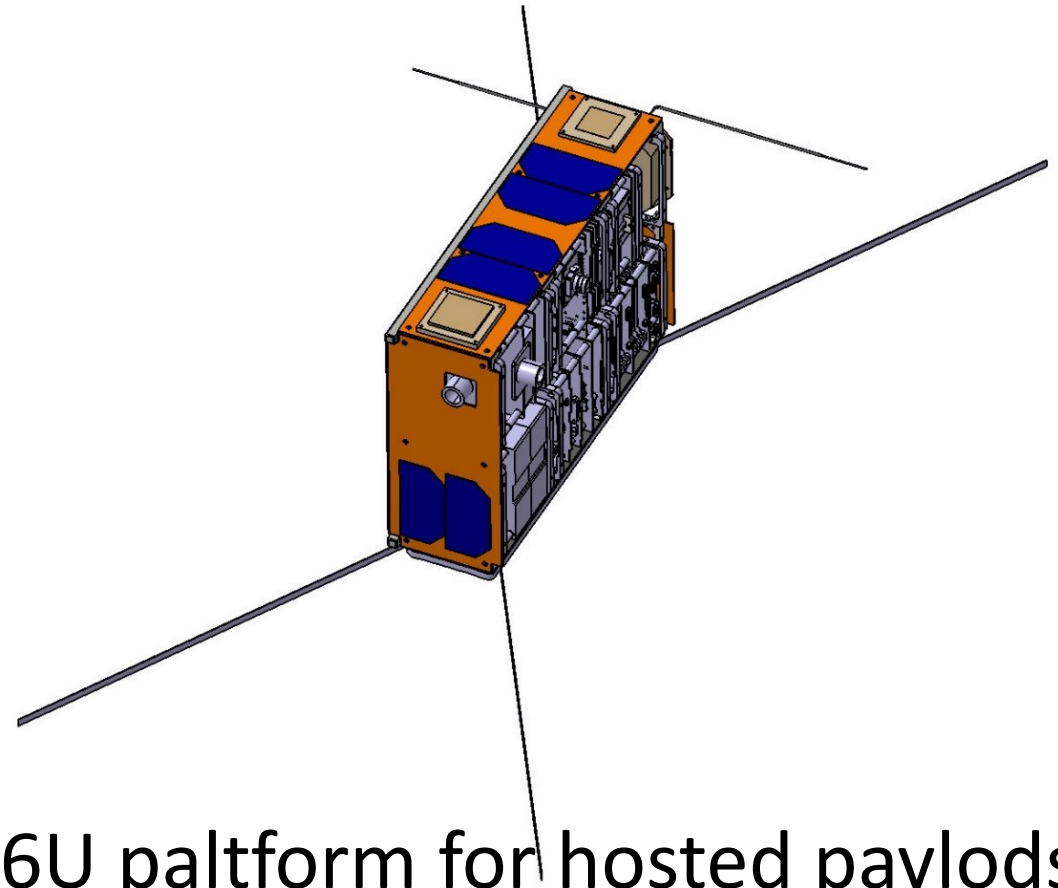


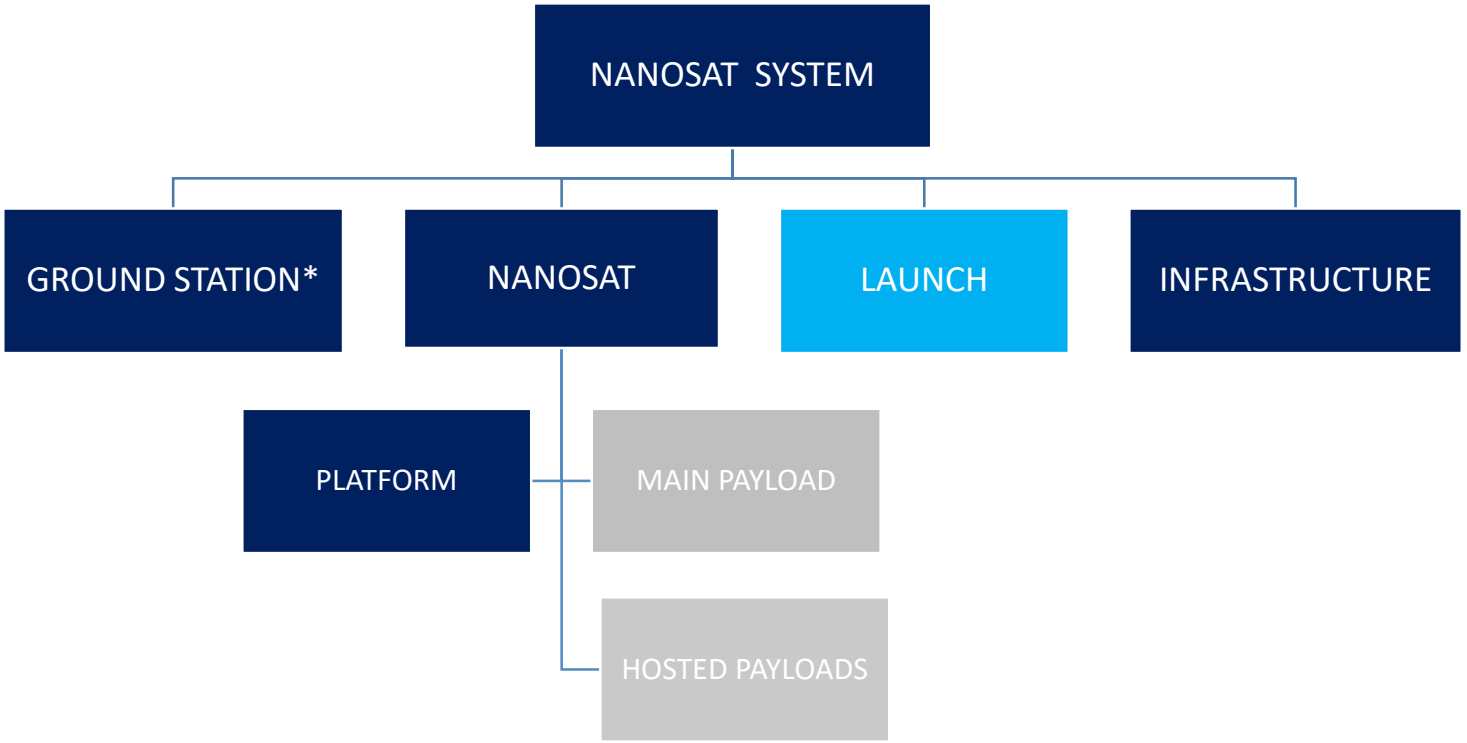
Figure 7. ASELSAT's attitude for life time analysis

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

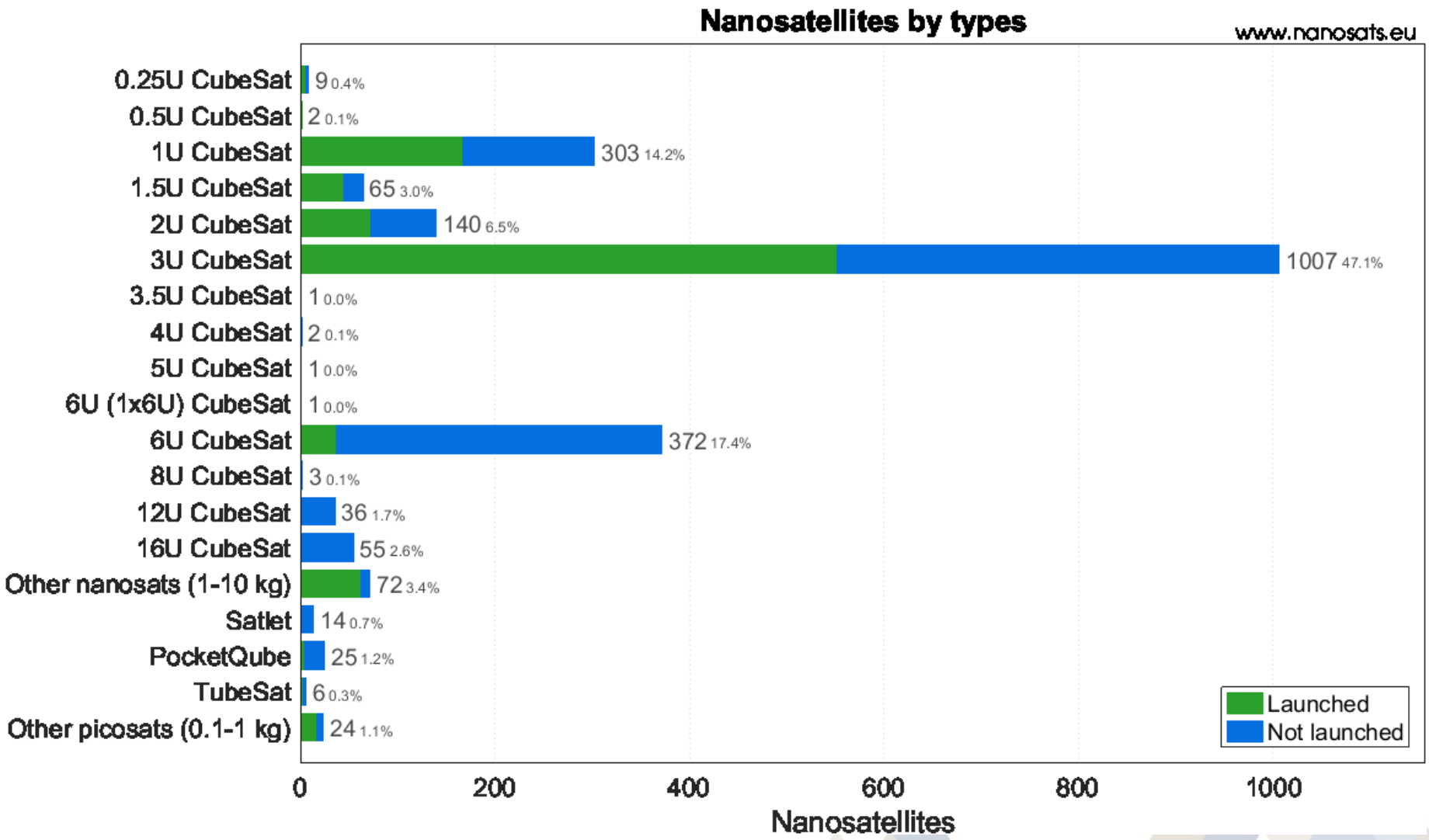


PIRI SAT TECHNICAL SPECS

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

http://www.nanosats.eu

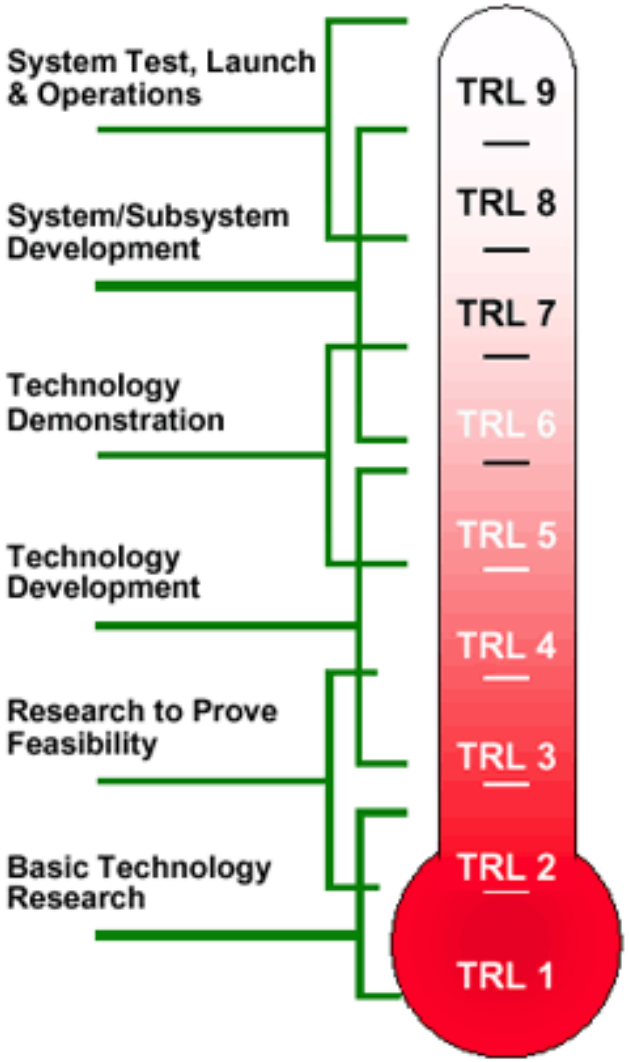


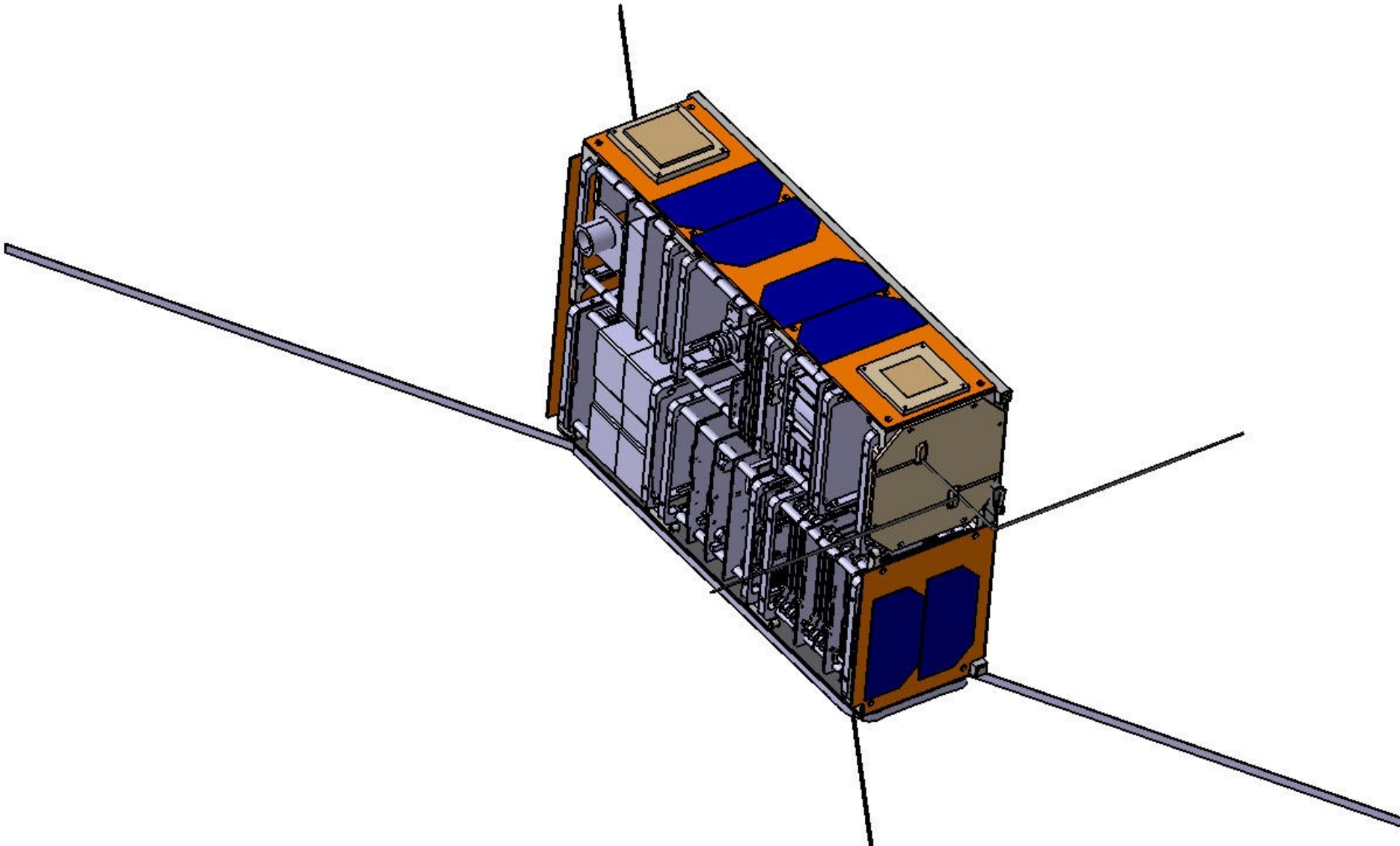
PROJECT TARGETS

- 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





TAMSAT AMateur SAtellite Technologies Organization (2010)

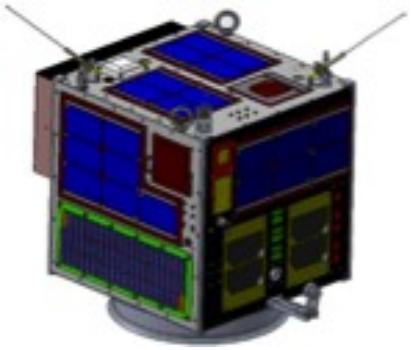
INTERNATIONAL COOPERATION

UNISEC GLOBAL
University Space Engineering Consortium

UNISEC TURKEY
University Space Engineering Consortium

UNISEC EUROPE
University Space Engineering Consortium

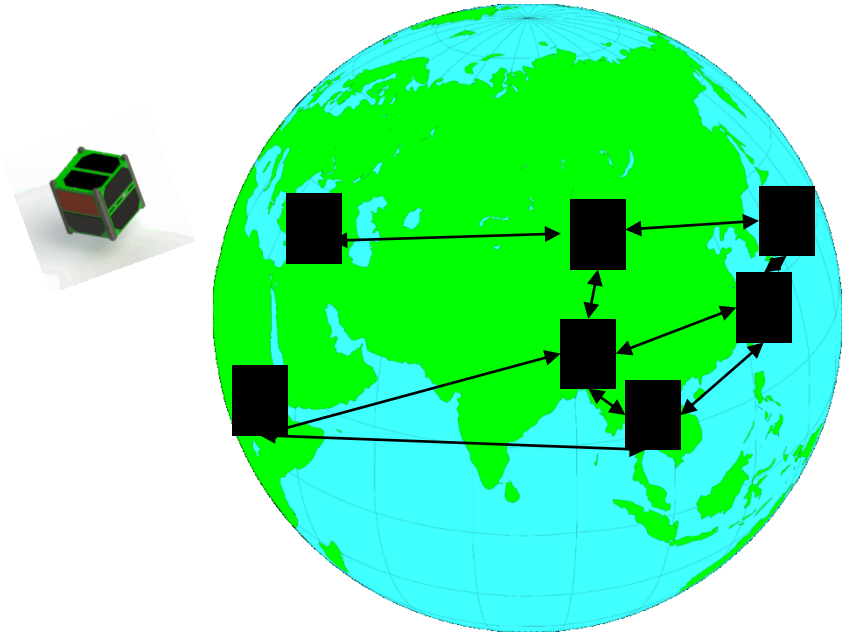
GLOBAL ANTENNA SHARING PROJECT for achieving Sustainable Development Goals



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
aslanr@itu.edu.tr

Antenna Sharing

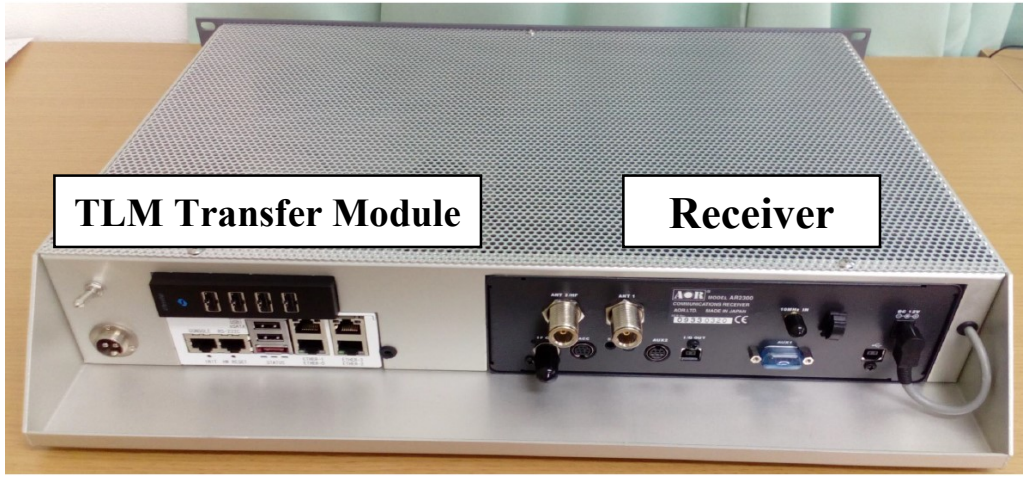
- Increase the number of tracking antennas



By connecting more antenna
Time Resolution Increases!

GSN Device

Front Panel



Rear Panel

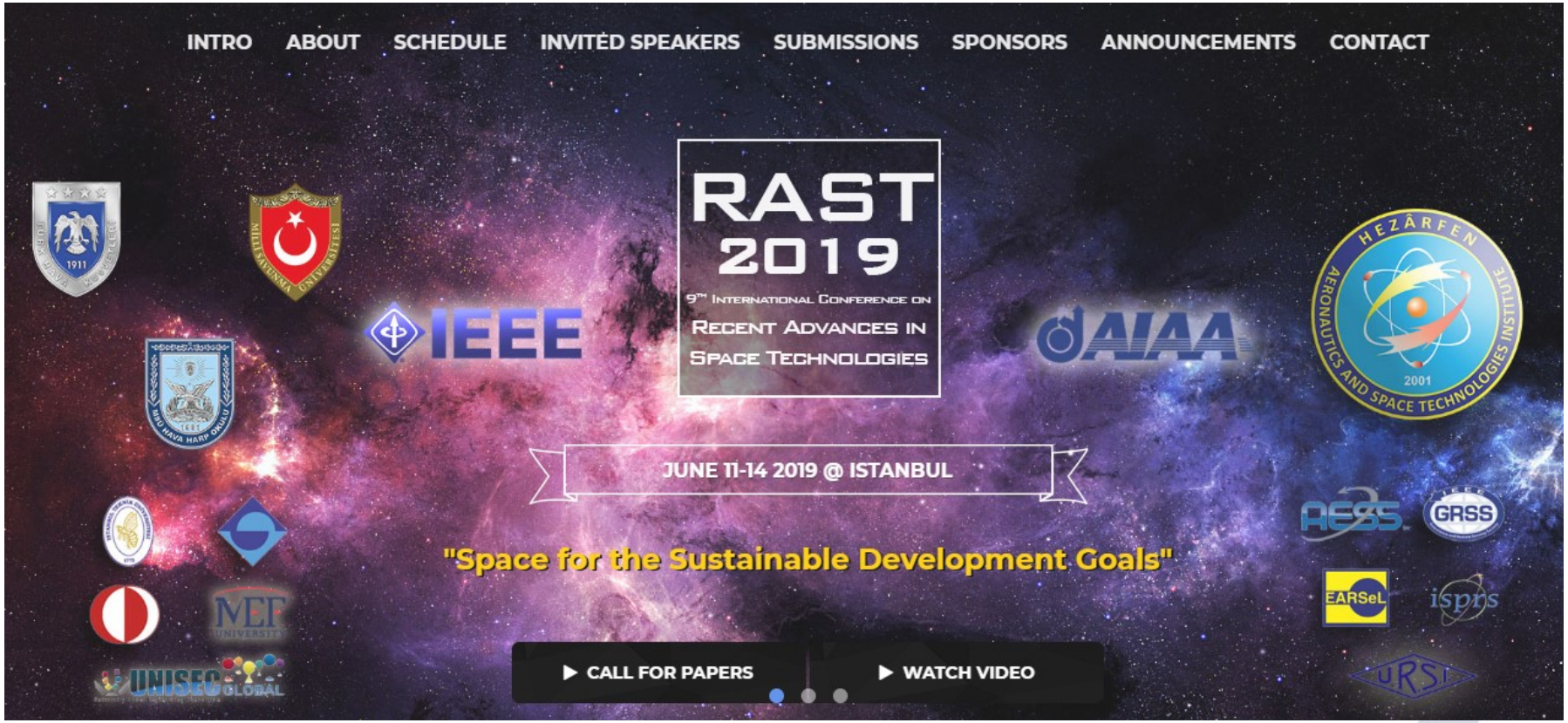
- Receiver
  - Satellite downlink signal reception
  - Output in IQ data (raw data)
  - Centralized demodulation and decoding are done by software defined radio (SDR) at Central Server.
- TLM transfer
  - Transfer IQ data or processed data to Central Server
- Transmitter (optional)
  - Satellite uplink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

how we can help SDGs…?

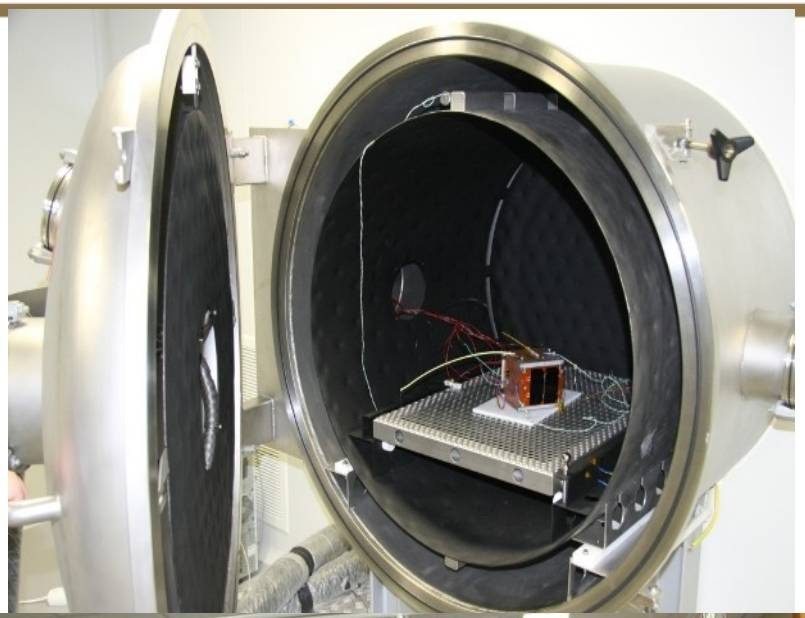
https://sustainabledevelopment.un.org/sdgs

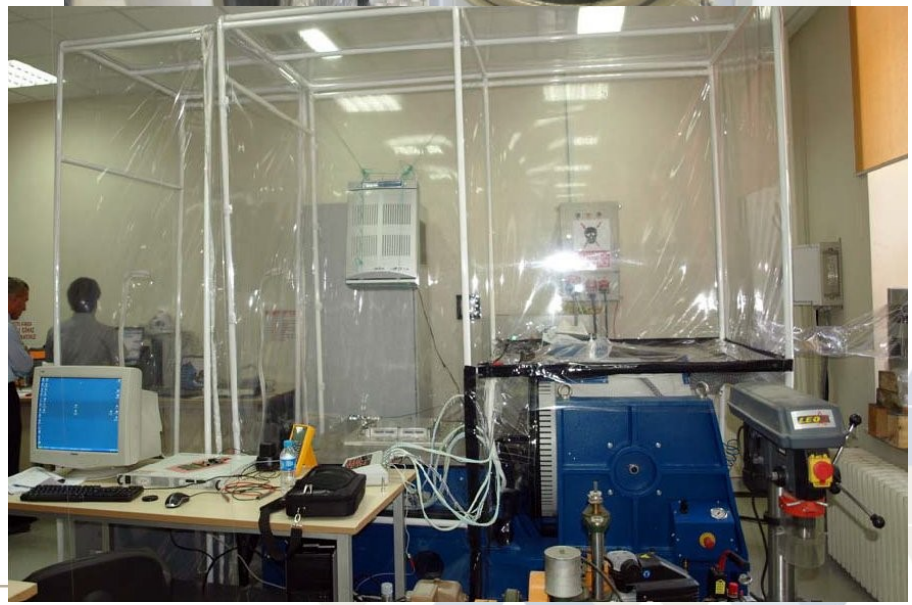
RAST 2019, 11-14 JUNE 2019

SPACE for SUSTAINABLE DEVELOPMENT GOALS



RAST 2019 TESTING TUTORIAL at ITU





- CANSAT Design and development WORKSHOPS in

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

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.

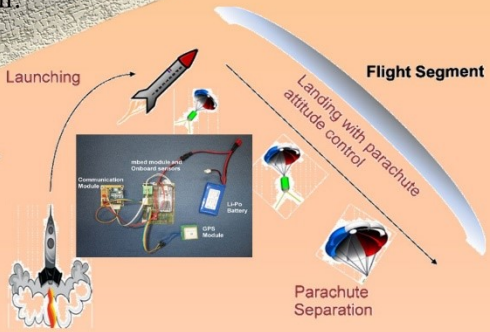
CanSAT Eğitim Adımları
Görev Analizi ve Sistem Geliştirme
Donanım Entegrasyonu
Yazılım Geliştirme
Mikrodenetleyici Programlama
GPS Entegrasyonu
Güneş Paneli Entegrasyonu ve Güç Sistemi
Telemetri Sistemi Entegrasyonu
Alçalma ve İniş Sistemleri Tasarımı
Mekanik Tasarım
Yer İstasyonu Geliştirme
Test ve 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:

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İTÜ PARS ROCKETRY TEAM

- Hybrid rocket

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).
- Together with a strong national space partner the Turkish STM Company, İTÜ-SSDTL proposes to develop/provide a modular satellite platform to house various payload/subsystem to be prepared by national and international developing institutions without the high cost burden of platform and launch.

We Look Forward To a Fruitful Cooperation

Towards being a civilization living in the Solar System

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