The 3rd UNISEC-GLOBAL MEETING
University of Tokyo, Tokyo, Japan
3-5 July 2015

Turkish UNISEC (UTEB) 2015 Activities

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İTÜ

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

JOINT UNDERTAKING of ACADEMIA Governement, Aerospace Co. and SMEs

- Istanbul Tecnical University
- Airforce Academy, Sabancı University
- AES Aero (SME)
- Ertek Ltd. (SME)
- Gumush Space(SME)
- HAVELSAN
- ASELSAN
- AMSAT-TR
- Turkish University Union of Space Education
- Turkish Aerospace Industries
- TURKSAT Co.
- Ministry of Transportation, Communications

UNISEC-TR History

- Started Nov 2011, by three Istanbul Universities (ITU, TurAFA, YTU)
- Over 20 participant universities
- Support of government, aerospace industry and research institutions
- 9 meetings so far hosted by starters and supporting institutions
- Working on establishing UTEB as a legal entity
- Define a joint project with governement and industry support based on national needs
- İnternational cooperation

MEETINGS

Meeting #	HOST, Location	Date	University Participation	Institutional Participation
1	İTÜ, Istanbul	2.11.2011	21	0
2	RAST 2013, Istanbul	13.06.2013	14	5
3	AIAC 2013, METU, Ankara	12.09.2013	11	8
4	TUBITAK SPACE, Ankara	06.12.2013	14	9
5	ISTANBUL TECHNOCITY, Gebze	04.03.2104	10	10
6	TurAFA/ASTIN, Istanbul	20.06.2014	13	4
7	Afyon Kocatepe, Afyon	20.01.2015	10	9
8	TAI, Ankara	29.04.2015	14	16
9	RAST 2015, Istanbul	17.06.2015	16	13

Turkish Space Program

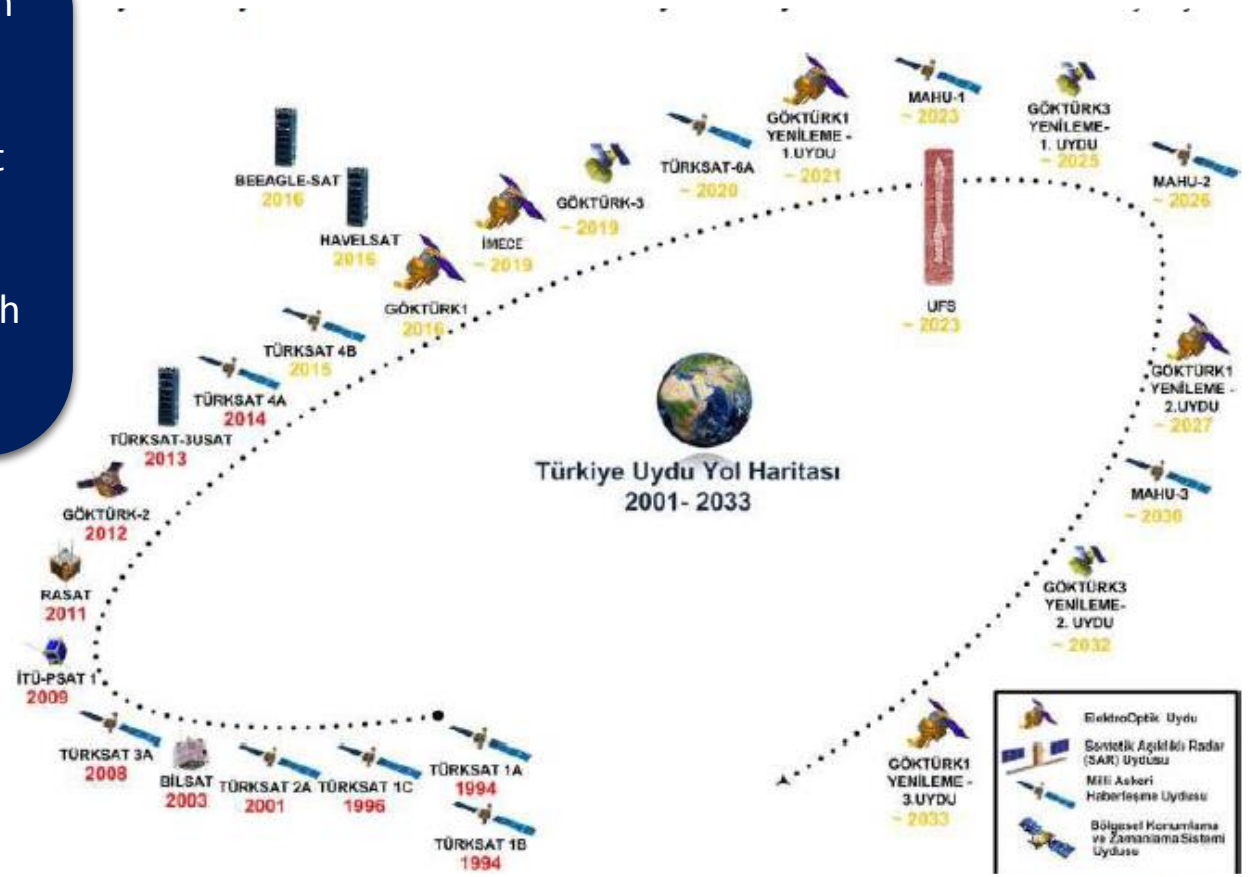
- Starting in 1989, Turkey ordered a number of **communication satellites** of which the first one were placed in orbit in August, 1994.
- New decisions have been made by the **government to support industry and research establishments including universities** to carry out research, design and development studies on space technology.
- One of such decisions was made in 2005 by the **National Higher Council of Science and Technology** that set specific goals and budgeted **space technology projects**.

- Development of qualified work force

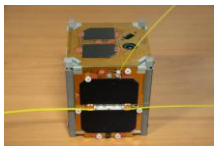
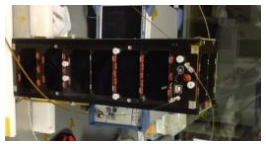
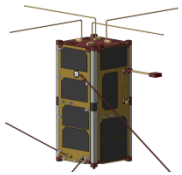
These efforts will be better coordinated with the establishment of the **National Space Agency**

Turkish Satellites

Road map of the space program that boasts several telecommunications spacecraft and two Earth-observation satellites, with plans to build more.



ITUpSAT1(2009) 3USAT-1(2013) 3US BeEagleSat-HAVELSAT(2016)

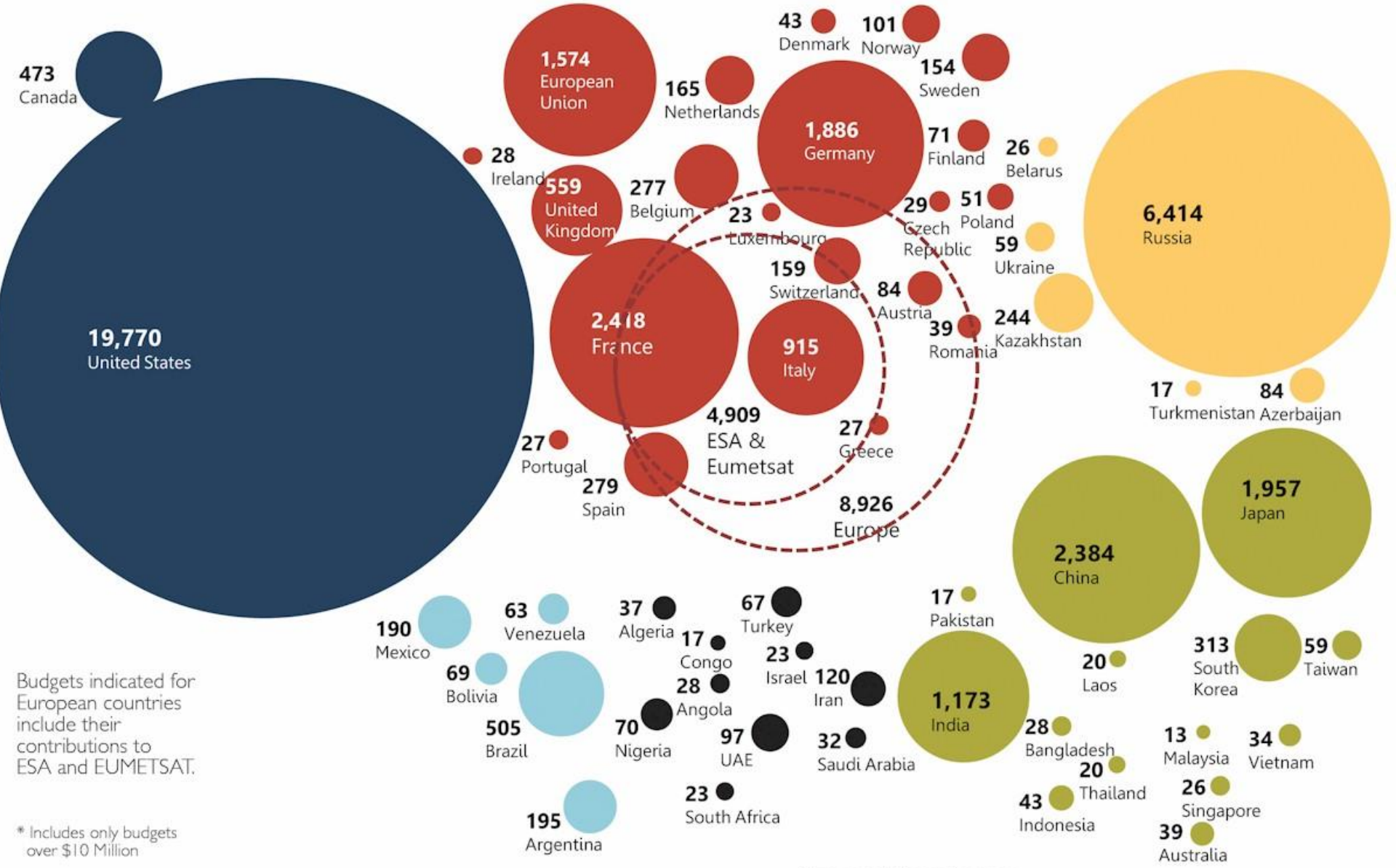
A total of **17 Turkish satellites** will come into orbit from **2012 to 2020**.

World Space Programs Today...

Many countries of the world have individual government-sponsored space programs... as well as there are group efforts that combine multi-national expertise...

Austria
Australia
Brazil
Canada
Chile
China
Czech Rep
Europe
France
Germany
Hungary
India
Indonesia
Iran
Iraq
Israel
Italy
Japan
Kazakhstan
Luxembourg
Malaysia
Mexico
Multi-national
North Korea
Norway
Pakistan
Philippines
Portugal
Russia
Saudi
Singapore
S. Korea
Spain
Sweden
Taiwan
Thailand
Turkey
UAE
UK
Ukraine
USA

WORLD GOVERNMENT EXPENDITURES FOR CIVIL SPACE PROGRAMS (2013)* TOTAL $43.7 BILLION



Budgets indicated for European countries include their contributions to ESA and EUMETSAT.

* Includes only budgets over $10 Million

Government Space Programs

2015 Summary

- 3 UTEB Meetings (total of 9 meetings)
- 10th meeting planned following CanSat-II
- H2020 applications with other UNISEC members
- 2nd Turkish CanSat Leader Training Course
- PreMIC4, ISTS30/NanoSat
- UN South Africa Symp on BSTI
- IAC2015
- Ongoing projects (QB50, UBAKUSAT, others)
- Efforts Towards an association, lawyer help
- Strong support of aerospace industry
- Efforts toward formulating a multi-institutional nanosat project. Funding ???

UNISEC-TR Meeting 7

New Aerospace department in AKU
Info on ongoing UNISEC GLOBAL activities (MIC, CLTP, NanoSat Symp)
International Meetings
Define a UTEB Space Project

UNISEC-TR Meeting 8

UTEB Project Proposal
How to undertake the Project
Visit of TAI Space Facilities
Space Medicine and Biological research
UTEB legal establishment


ACS

UNISEC-TR Meeting 9

Discussion topic:

The elements required for a succesful and useful space education: Project based applied education

Testing Tutorial

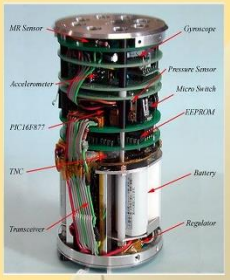

RAST 2015

MODEL UYDU TASARIMI ve İMALATI EĞİTİMİ

II. 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(2,5 litrelik kola şişesi) ve ağırlığı (1 kg) daha küçük olan ve bir araştırma roketi ile daha düşük irtifaya çıkarılan minyatür uydudur.



AMAÇ

Cansat eğitimi, uzay sistemleri alanında kendini geliştirmek isteyen farklı disiplinden öğrencilere uydu tasarımı ve uzay teknolojileri geliştirme konusunda ileride karşılaşabilecekleri sorunları önceden göstermek, onlarda 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 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
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 gerçekleştirilir,
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 veri analizi yapılır ve görev başarı durumu değerlendirilir.

Kimler Katılabilir?

Uzay alanında çalışmak isteyen Mühendislik, Temel Bilimler, Astronomi ve Uzay Bilimleri, Uzay Bilimleri ve Teknolojileri öğrencileri veya mezunları katılabilir.

TARİH
14-22 Ağustos 2015

YER
Çanakkale Onsekiz Mart Üniversitesi
Terzioğlu Yerleşkesi
Fen Edebiyat Fakültesi
Uzay Bilimleri ve Teknolojileri Bölümü
ÇANAKKALE

Eğitim Gideri: 1500 TL
Eğitim gideri, eğitim dökümanlarını, uygulamalı dersleri, uydu yapımında kullanılan malzemeleri ve fırlatmayı içermektedir. Konaklama ve günlük iaşe masraflarını içermez.

İLETİŞİM : **burcu@comu.edu.tr, erkanyilan@comu.edu.tr**

SPONSORLAR

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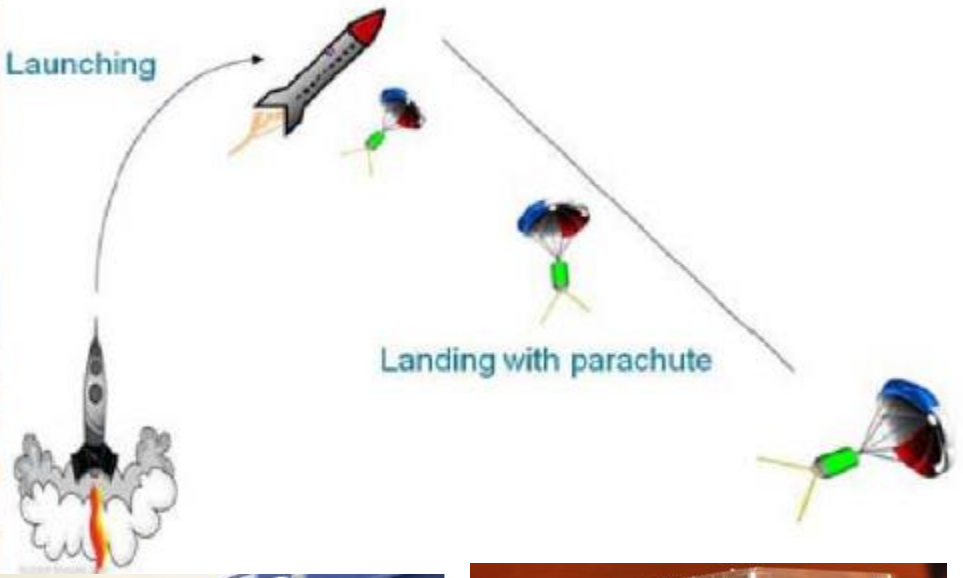
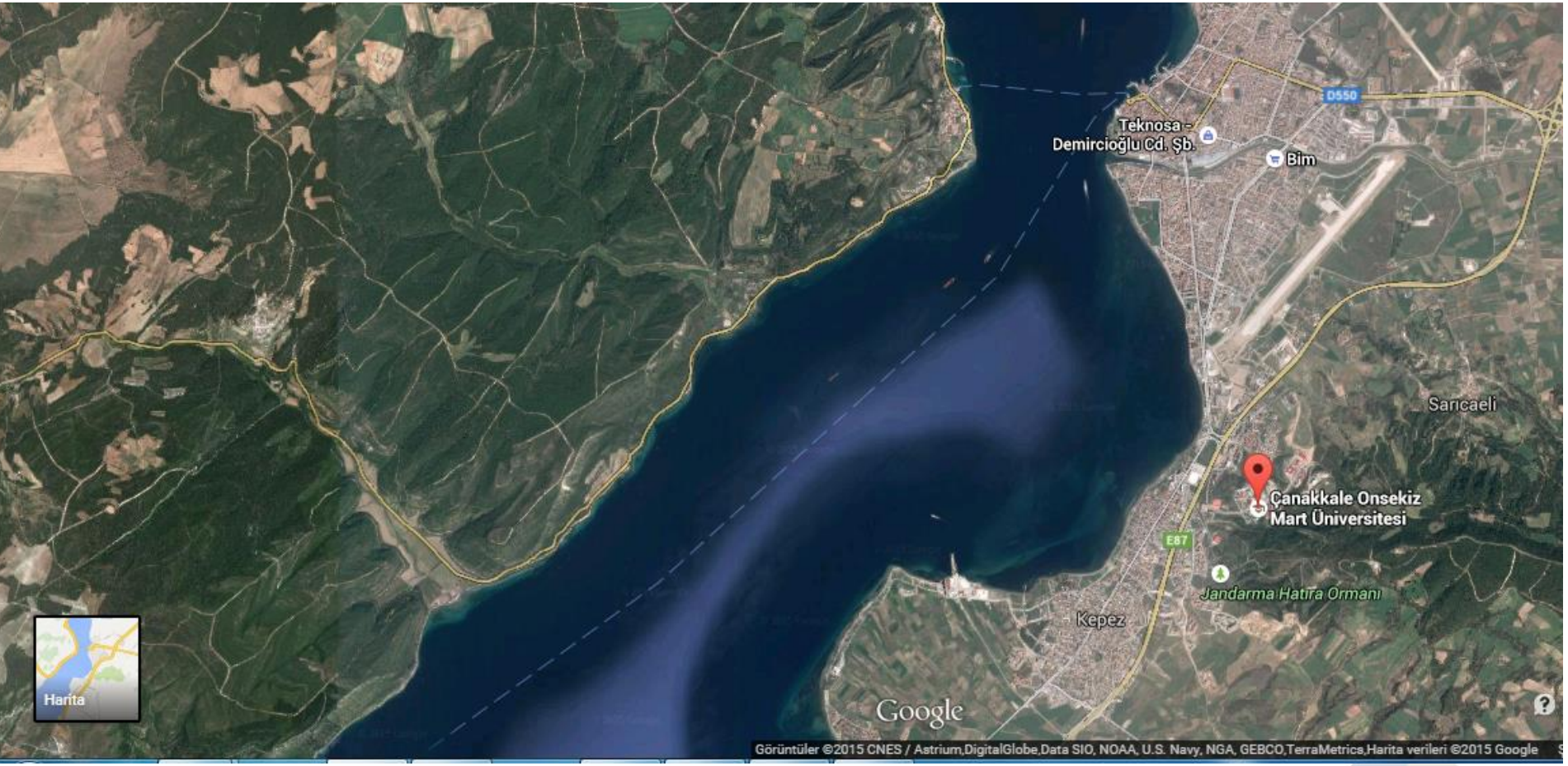
Asırlardır Çağdaş

UTEB CLTP-TR COURSE



CanSAT Launch

- 14-22 August 2015
- Çanakkale 18 Mart Univ. Facilities
- Applications accepted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D550
Bim
Sarıcaeli
Çanakkale Onsekiz Mart Üniversitesi
E87
Jandarma Hatıra Ormanı
Kepez
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2015 Projects

- TURKEY - TUNISIA joint Project
  - Development of intelligent control modules for nano satellites
- TURKEY – JAPAN
  - UBAKUSAT
- QB50
  - BeEagleSat
  - HavelSat
- Others

JAPAN-TURKEY MEETING FOR SPACE COOPERATION
UDX GALLERY, NEXT, TOKYO
2/04/2015

NANO-SATELLITE LAUNCH PROGRAM

UBAKUSAT

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Istanbul Technical University, Faculty of Aeronautics and Astronautics,
Istanbul, Turkey
aslanr@itu.edu.tr

OBJECTIVE

- Turkey – Japan Space co-operation between academic and government institutions

- Launch of a Turkish CubeSat from Japanese Launch facilities

Program Partners

TURKEY

- Ministry of Transport Maritime Affairs and Communications
- Istanbul Tecnical University
- Ertek Ltd. (SME)
- Gumush Space(SME)
- TAMSAT/AMSAT-TR
- TURKSAT INC
- Turkish Aerospace Industry
- UNISEC-TR

JAPAN

- Ministry of Education, Culture, Sports, Science and Technology(MEXT)
- Japan Aerospace Exploration Agency(JAXA)
- Kyushu Institute of Technology

Duties

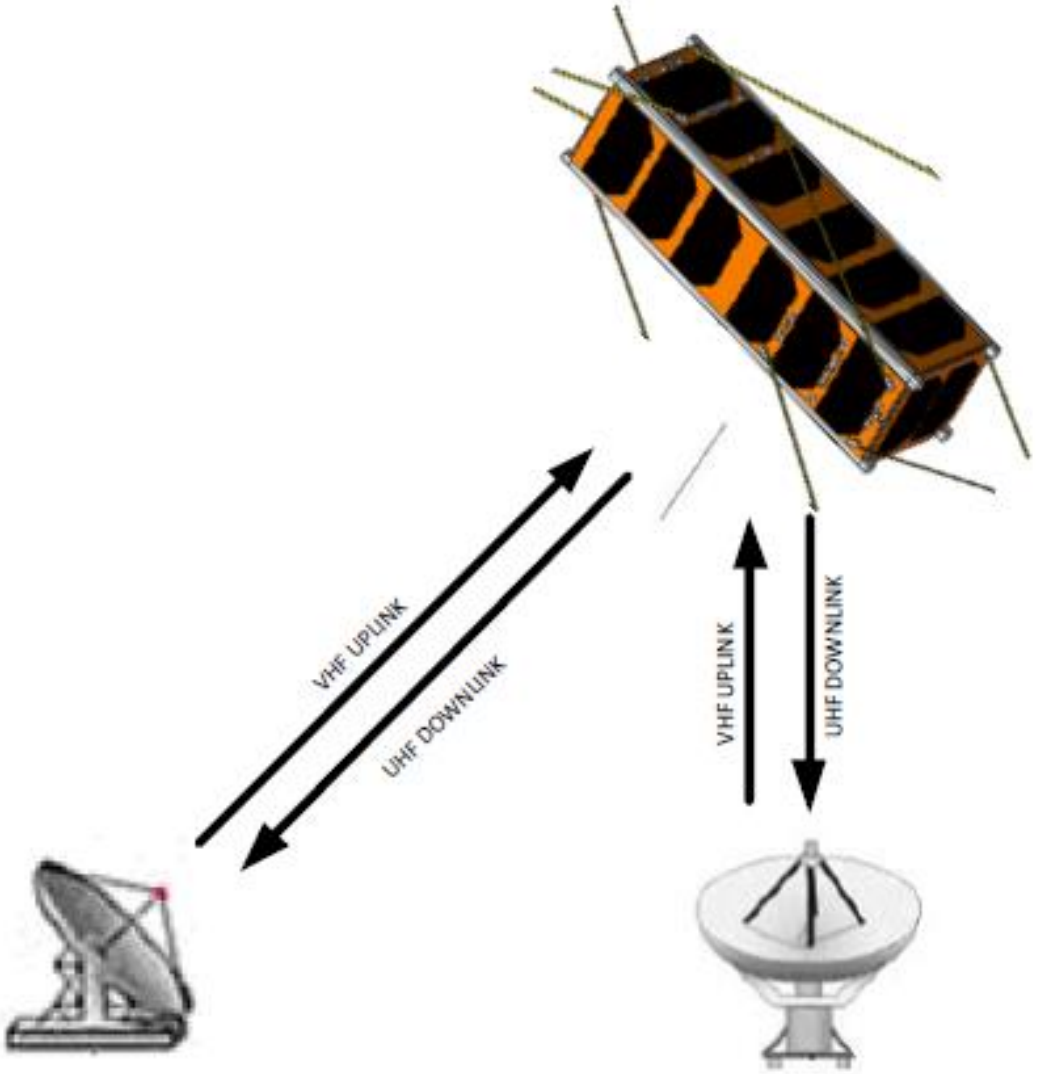
TURKEY

- Develop and test 3U CubeSat, UBAKUSAT
- Compliance with JEM Payload Accommodation Handbook
- Transport to KIT/Japan

JAPAN

- Further Testing of UBAKUSAT
- Assist in document preparation for Launch
- Launch

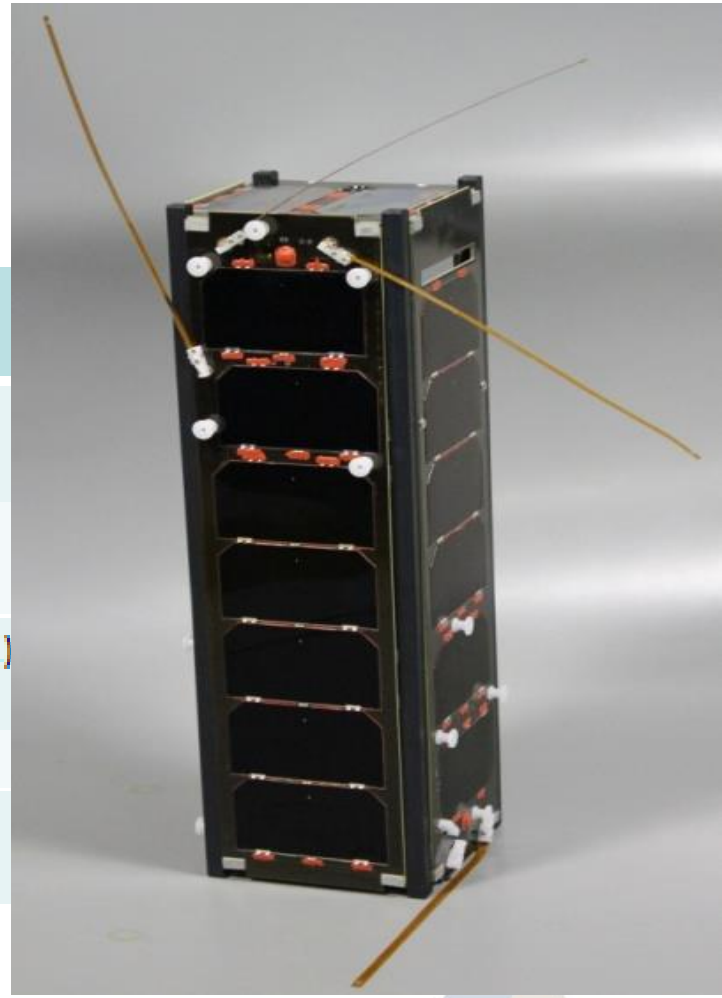
UBAKSAT, MISSION



UBAKSAT, Details

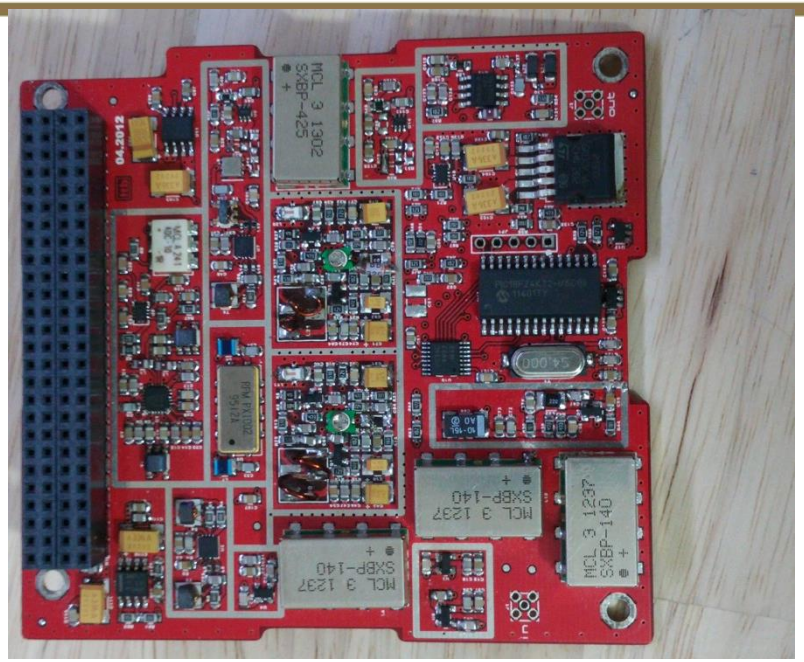
- Size standard 3U CubeSat, 10*10*34cm
- Mass approximately 2 kg, max 3kg
- Main payload a VHF/UHF Transponder

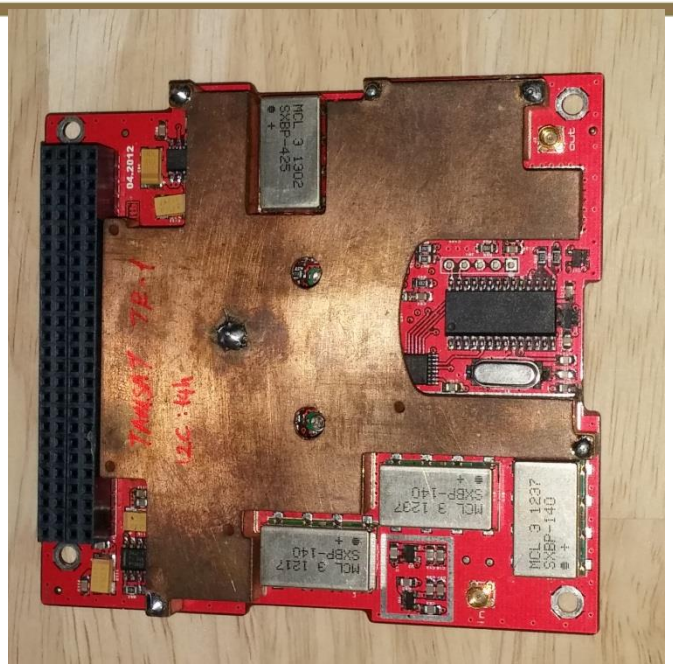
Input Frequency	145.940 – 145.990 MHz
Output Frequency	435.200 – 435.250 MHz
Transponder Type	Inverting – Linear
Modulation	All Mode (AM, FM, SSB, CW, FSK,etc.)
Bandwidth	50 KHz
RF Power (max)	1 Watt - 30 dB

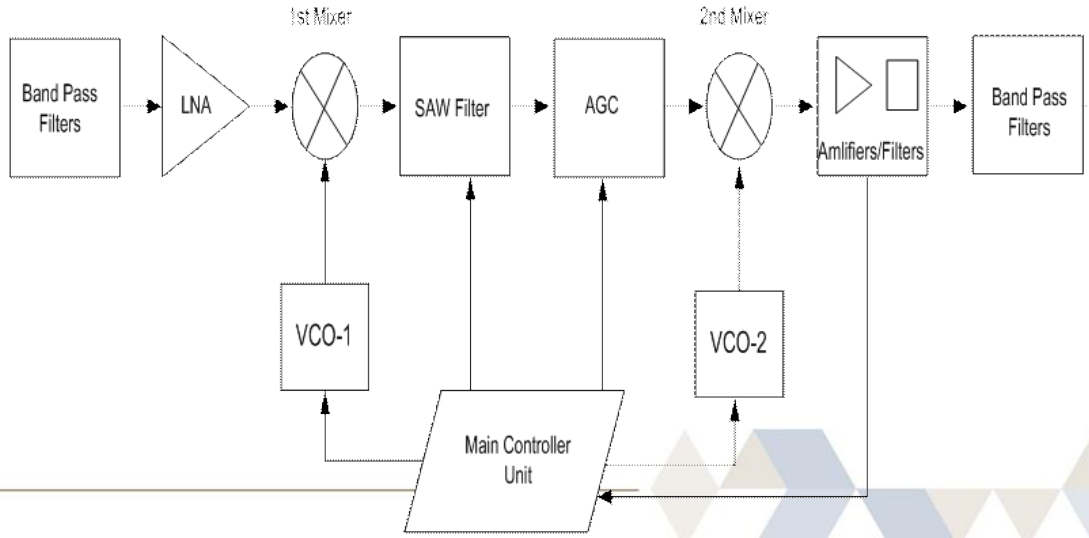


- Battery 30Whr
- Passive Magnetic Stabilization system

TRANSPONDER - OBC







Transponder:

Uplink 145,940 – 145,990 MHz

Downlink 435,200 – 435,250 MHz

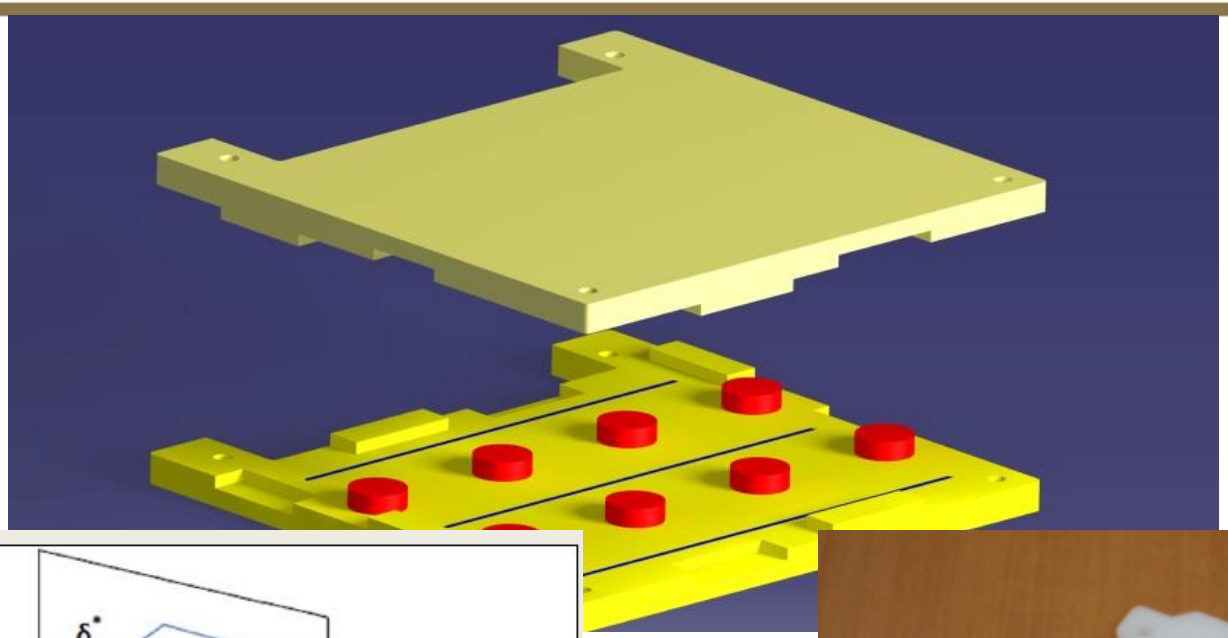
Beacon: Downlink 437,225 MHz

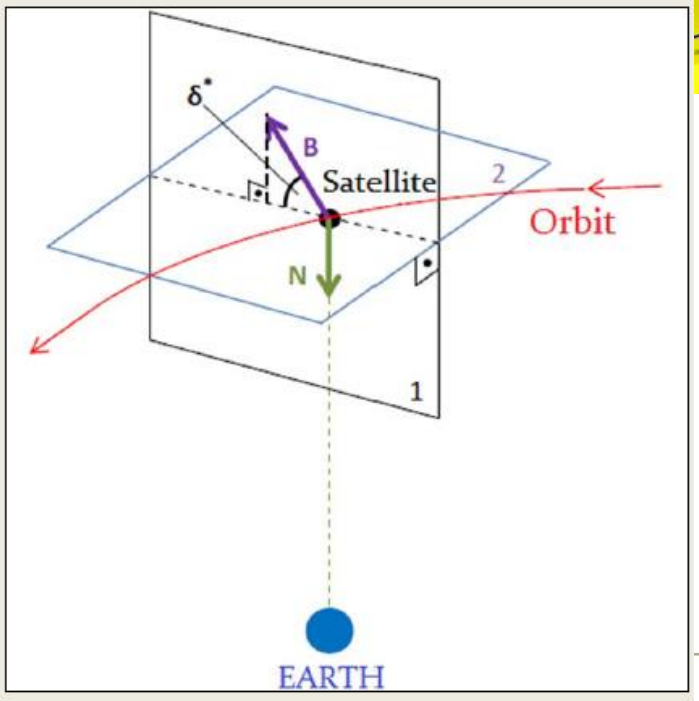
Modem central frequencies:

Uplink (m) 144,675 MHz

Downlink (m) 437,225 MHz

PMACS



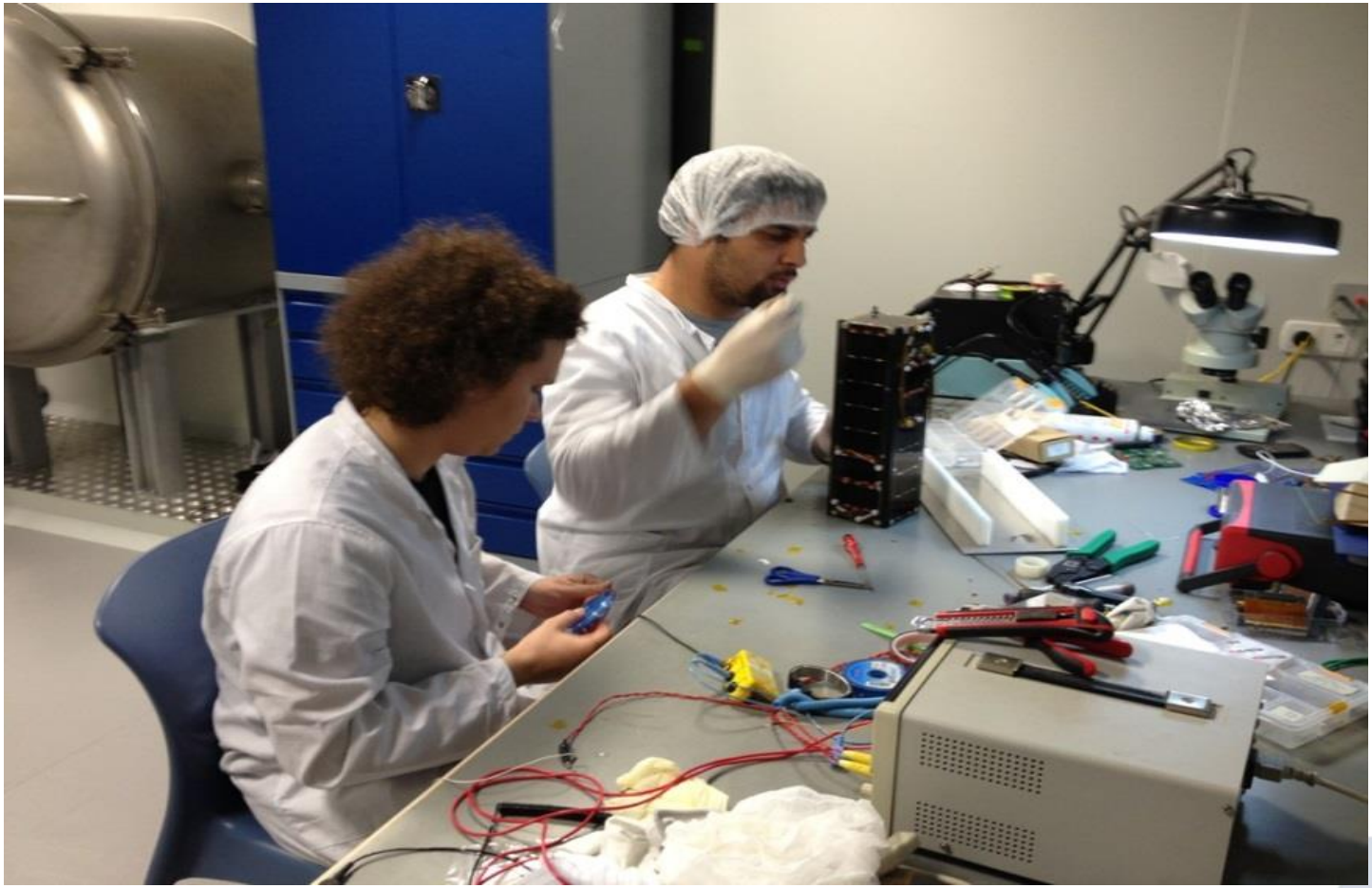


POWER SYSTEM, CLYDE SPACE

OTHER SUBSYSTEMS

- 3U Structure, Kill switch, RBF,
- Umbilical
- Antenna release and Beacon card
- TAMSAT SIMPLESAT: an independent satellite with all subsystems and radiation measurement sensor

3USAT Assembly in Clean Room

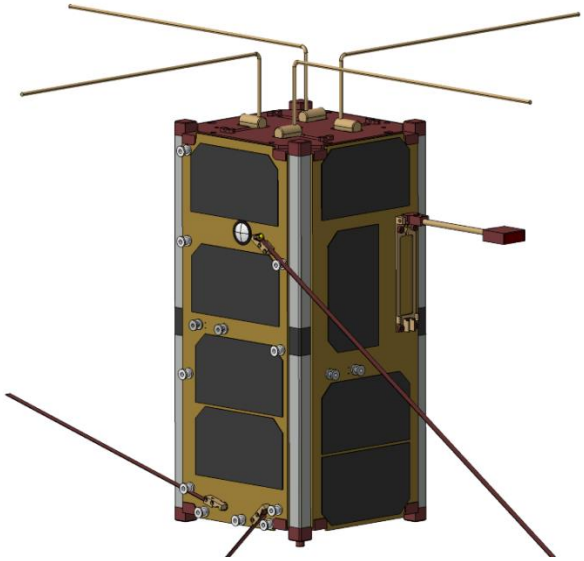


TIME FRAME

- HAND UBAKUSAT From ITU to KIT in January 2016
- HAND UBAKUSAT From KIT to JAXA in late March 2016
- Launch in 2016

BeEagleSAT and HavelSat

- BeEagleSAT is a joint project of Istanbul Technical University, Turkish Air Force Academy, and Sabanci University along with SMEs and Industry (UTEB MEMBERS).
- One of 2U CubeSats of the QB50 Network
- HavelSat is developed by ITU and Havelsan Co



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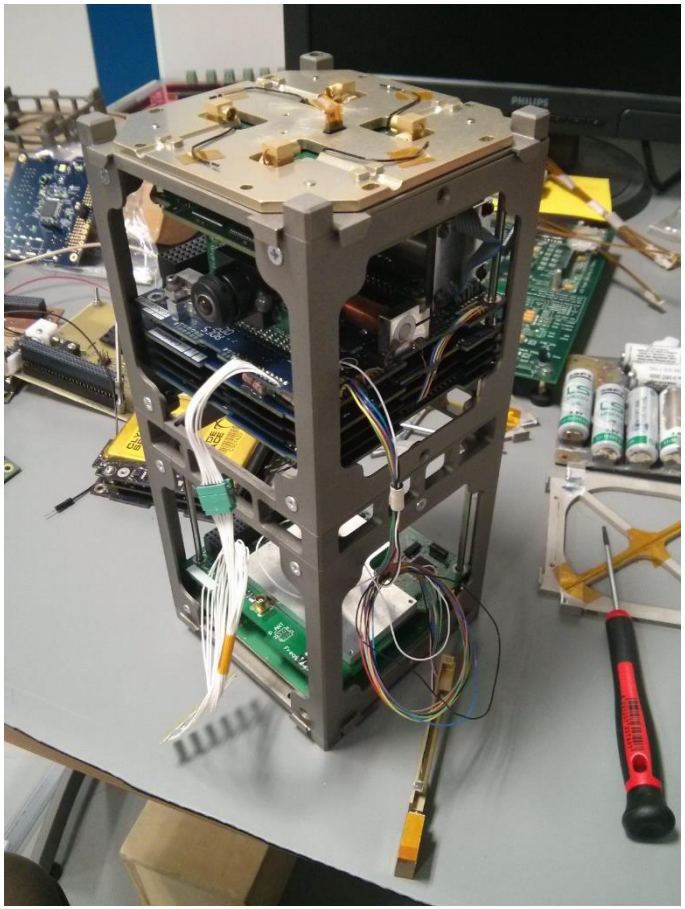
HAVA HARP OKULU

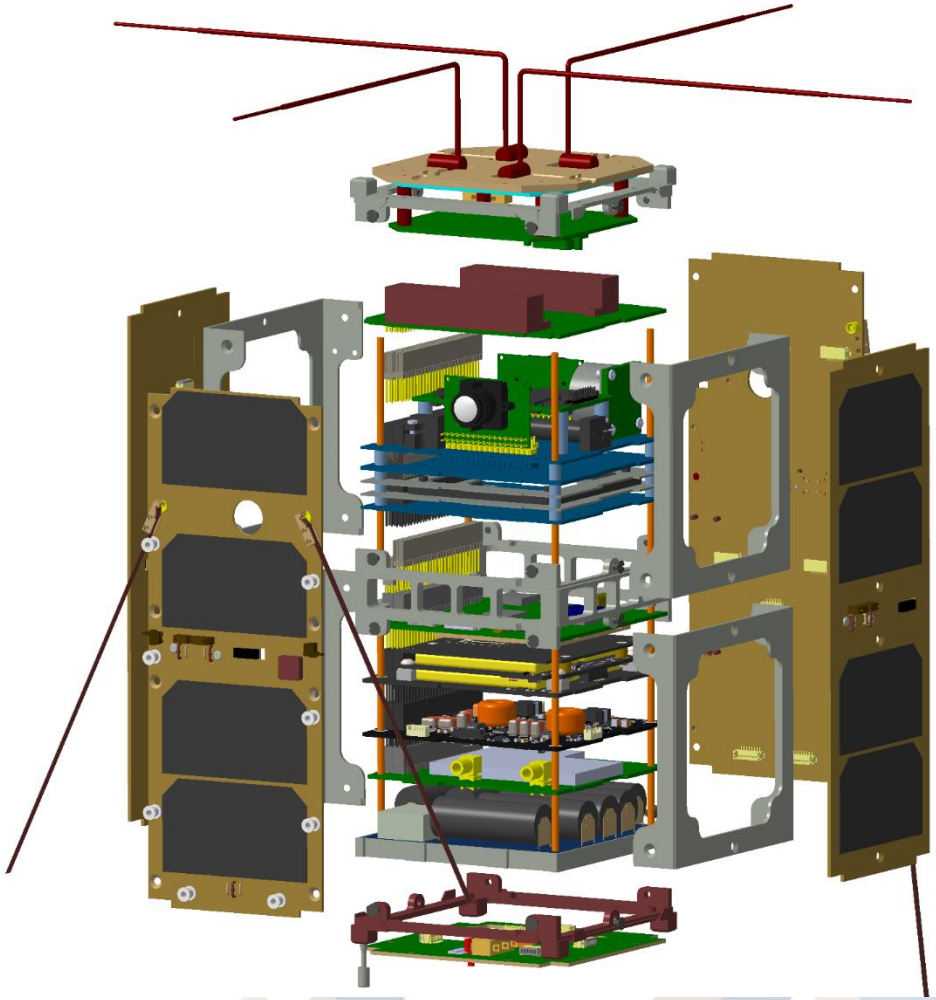
Sabancı Üniversitesi

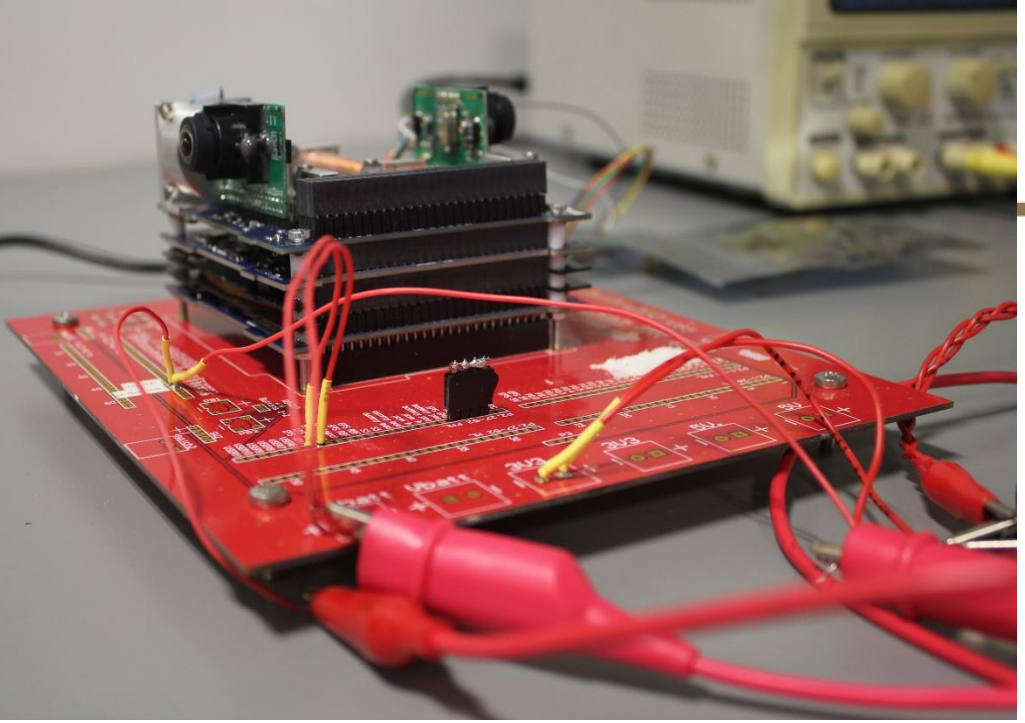
QB50

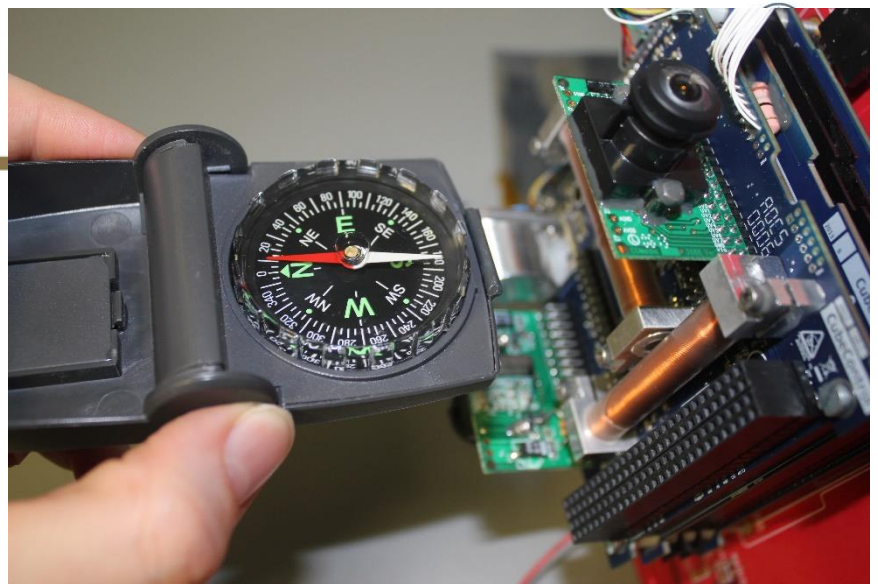
HAVELSAN

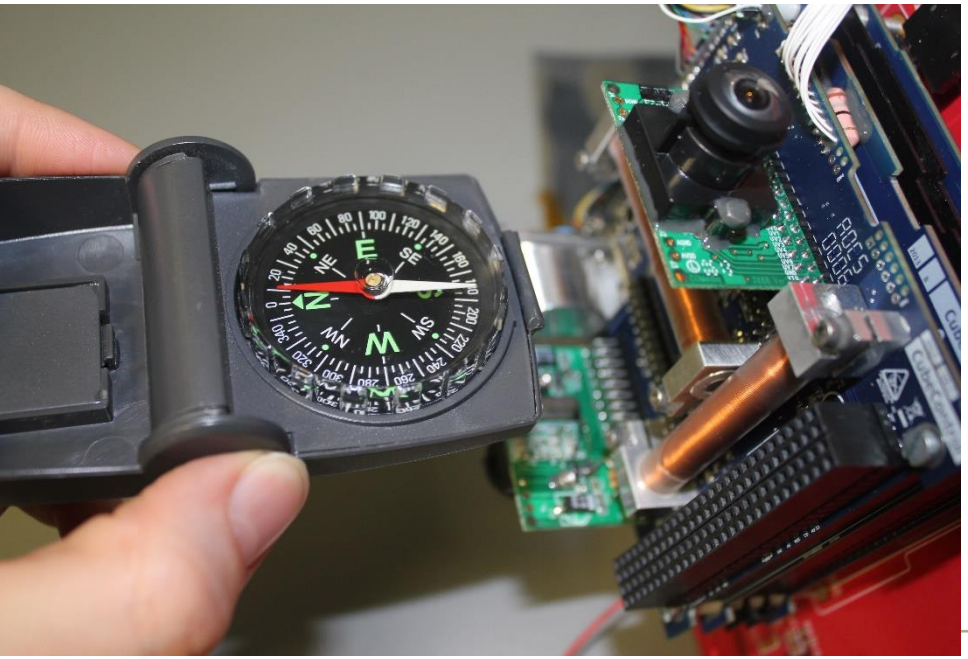
SEVENTH FRAMEWORK PROGRAMME

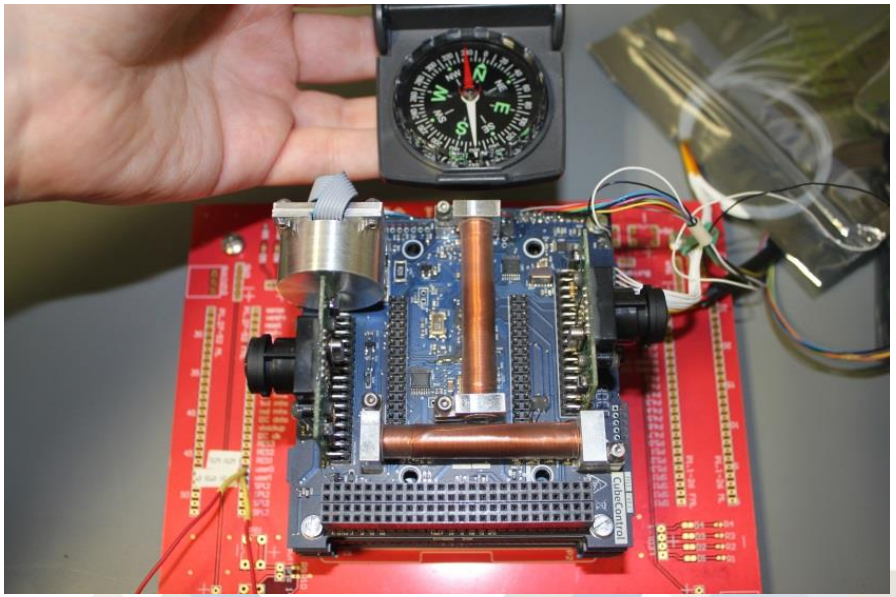






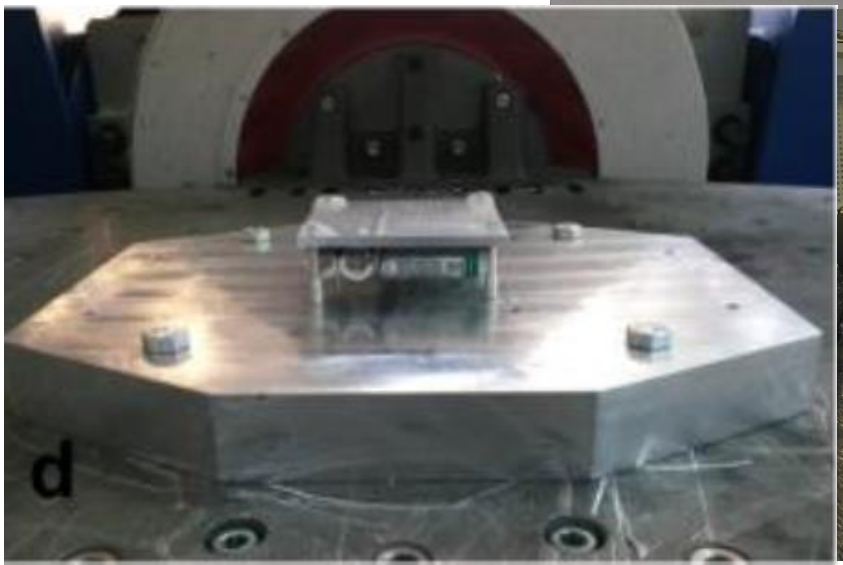


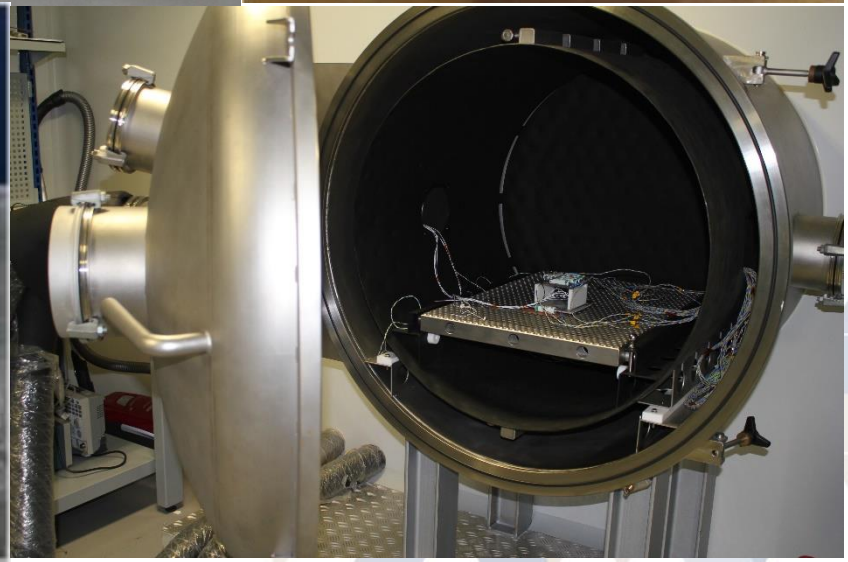




XRD of BeEagleSat

Lay foundations of producing scientific space payloads in Turkey!

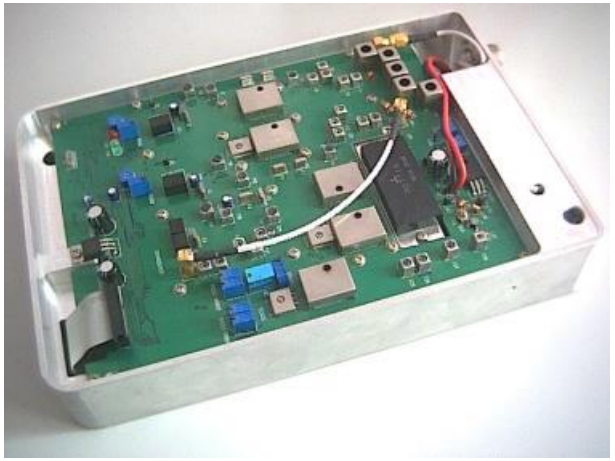


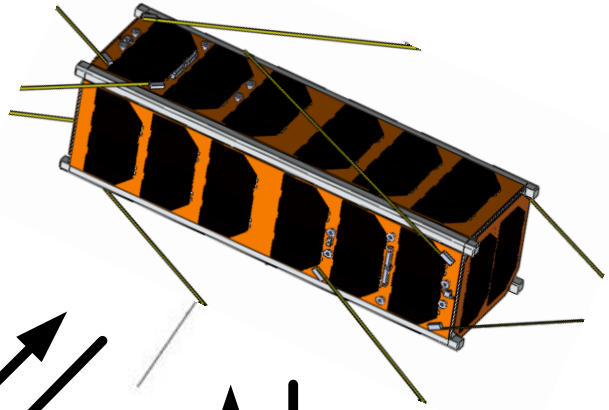


QB50 Project Benefits

- A good example of multi institution international collaboration
- Mix of budgets: from QB50 and local budget
- Local budget from UTEB members, aerospace industry, ITU spinoff mikroSMES
- One/Two QB50 WS meetings per year
- Detailed very valuable documentation
- A good school for enhancing spacecraft design, management and ground station operation skills
- Carrier possibilities for students, young engineers

X-Band Comm on a CubeSat





Satellite

VHF UPLINK

UHF DOWNLINK

Ku Band UPLINK

X-Band DOWNLINK

GS-1
TM/TC

GS-2
Transponder

PARS ROCKET TEAM

- Hybrid rocket development

OUTREACH at High Schools

2015-2016

- Further UTEB Meetings (10th...)
- 7th NanoSat + 4th MIC and UG Meetings in Istanbul
- Ongoing projects (QB50, 3USAT etc)
- Efforts Towards forming an association
- Efforts toward formulating a multi-institutional nanosat project. Look for funding
- WAY FORWARD
- A legal association with individual members OR
- An advisory and facilitator umbrella institution
  - Leagal issues and funding to be handled by universities

We Look Forward To a Fruitful Cooperation

Towards being a civilization living in the Solar System

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Department of Space Engineering
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usl.itu.edu.tr

BENEFITS

- **CanSats and Nano Satellites are a very useful tool for starting space work by everybody.**
- Students, through hands-on work, developing the necessary skills and experience to succeed in the space industry.
- Overall, nanosat projects provide an outstanding intercultural experience and a global network of students and engineers with the possibility of exchange and cooperation programs.
- UTEB/UNISEC like bodies may facilitate project development and funding

- NANOSATs may be the answer to very large budgeted, long time taken government space programs.
- Improving capability NanoSat in mission VS very capable largeSat in development.

- 2 book chapters on nanosats
- H Steyn visit
- Design courses
- 2nd CanSat
- PARS rocket team
- UBAKUSAT with KIT and JAXA and J governement
- RAST2015
- NATO AVT group (contribution to zaragoza)
- Papers for ISTS, QB50 WS, IAC, UN-BSTI, AVT