

7th Nano-Satellite Symposium

ASELSAT: High Resolution High Speed CubeSat

Sibel Türkođlu

turkoglusi@itu.edu.tr

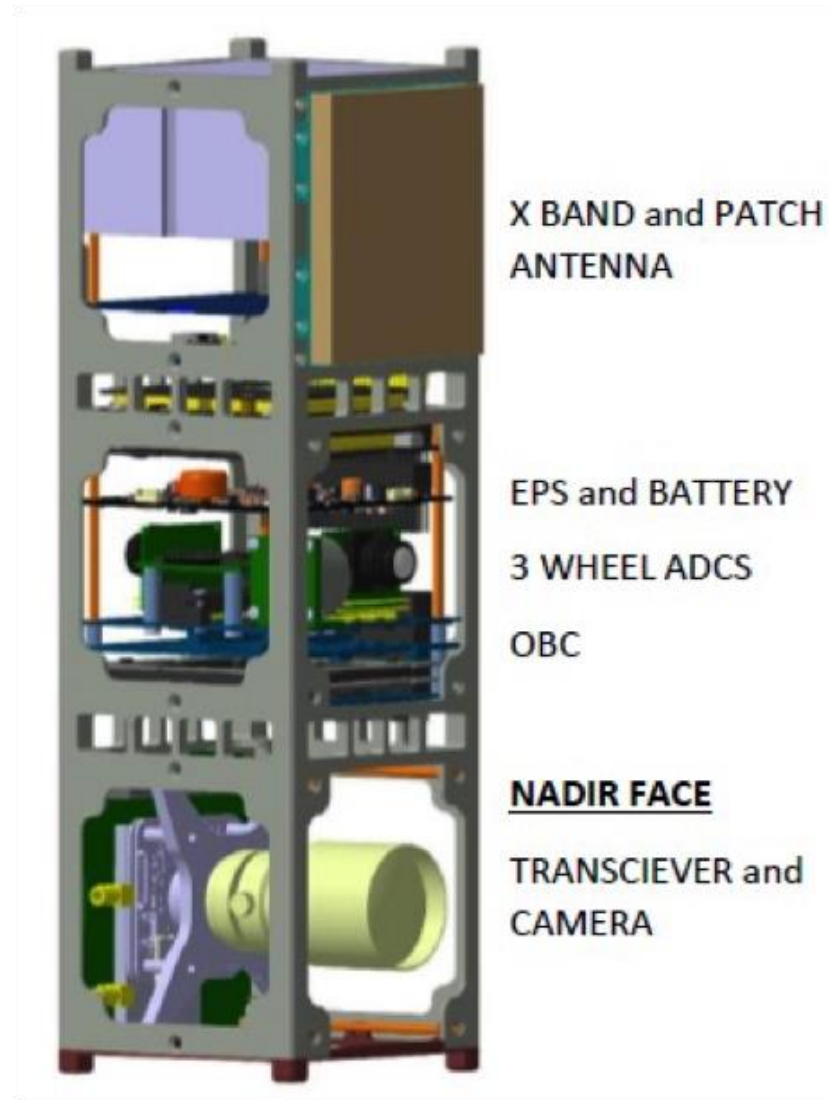
- Overview
- General Design
- Power Budget
- Solar Panel Configuration Analysis
- Attitude Determination and Control System Calculations
- TMTC and Ground Station
- Conclusion and Future Work



Overview

- 3u CubeSat at 500km SSO
- Main payload is miniaturized X-Band Transmitter
- Taking pictures 30m GSD
- Secondary payload is a dosimeter

General Design



- The main mission of the satellite is to take images and transmit it to a ground station via X-Band Transmitter. For this purpose, the design is focused on
 - Command and data handling
 - Attitude control and pointing accuracy
 - Power generation

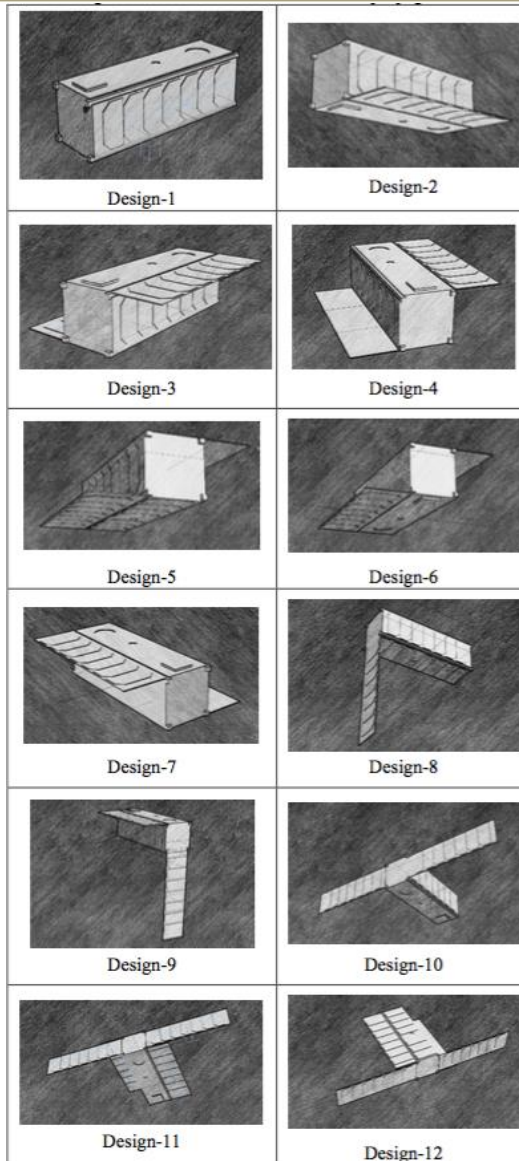


Power Budget

		Assumptions	
Altitude		500 km SSO	
Albedo		10%	
Orbit Period		5686 sec	
Inclination		97.4 Degree	
		<i>Normal Mode Orbit Average</i>	
	Power Req. (W)	Duty Cycle (%)	Power Consumed (W)
Camera	3	10	0.3
ADCS (Torquers at max)	2.236	100	2.236
X-Band	20	2	0.4
OBC	0.1	100	0.1
Modem	4	10	0.4
Beacon	1.5	16.7	0.2505
EPS	0.1	100	0.1
Total Power Consumed			3.7865
Average power generated per orbit			5.94
Margin (%)			36.25420875



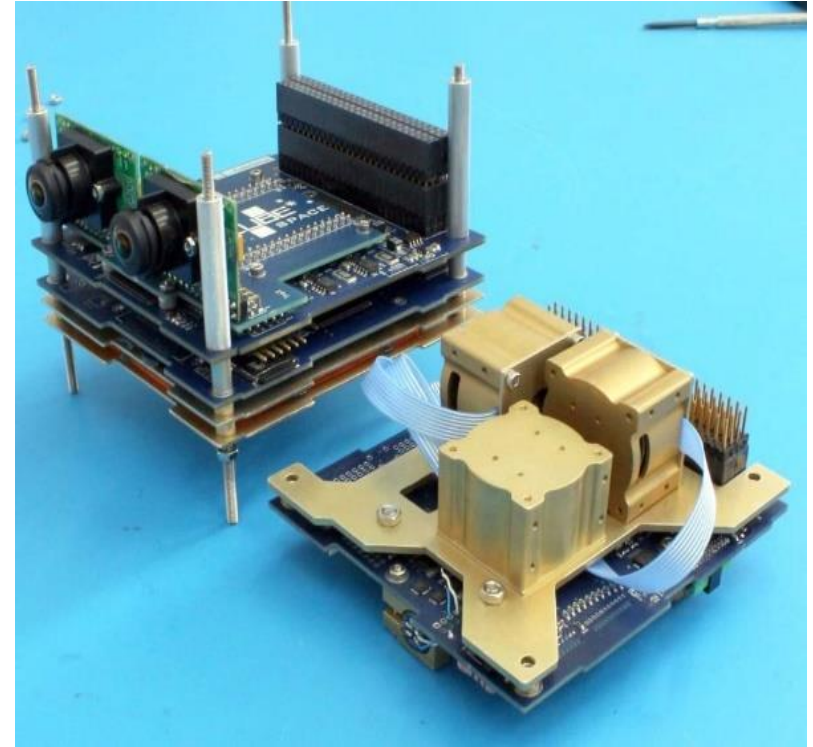
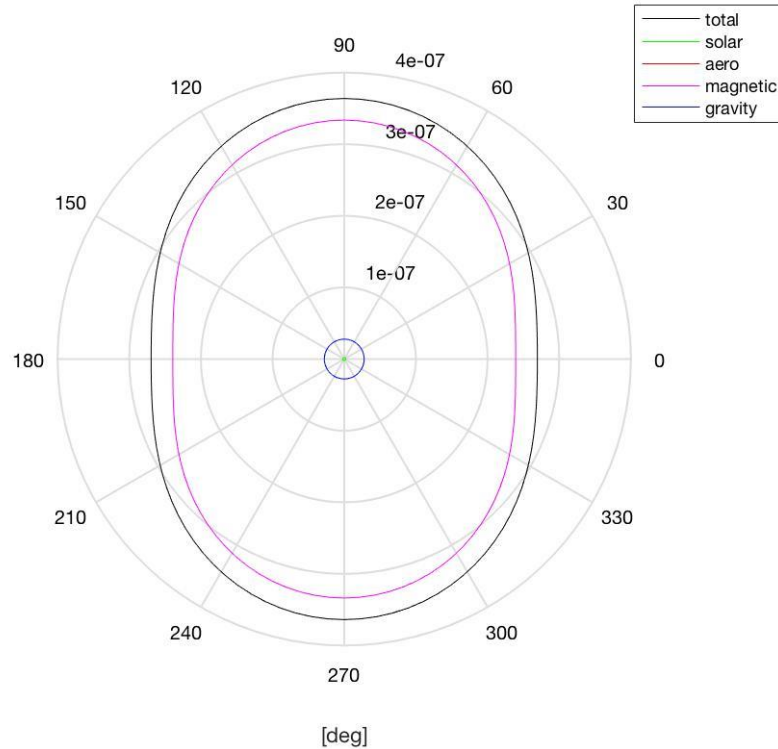
Solar Panel Configuration Analysis



	12AM-12PM (Watt)	6 AM-6 PM (Watt)	9 AM-9 PM (Watt)
Design-1	2.99	8.91	6
Design-2	3.2	9.64	6.3
Design-3	3.27	10.09	4.9
Design-4	5.77	10.09	6.24
Design-5	5.77	10.09	6.24
Design-6	3.15	2.27	2.58
Design-7	5.76	10.1	6.57
Design-8	4.10	9.63	7.44
Design-9	4.31	10.36	7.75
Design-10	6.68	9.96	8.42
Design-11	6.78	3.59	5.53
Design-12	9.39	3.61	7.31

- Calculation total disturbance torques
 - Atmospheric
 - Gravity gradient
 - Magnetic
- Momentum Wheel sizing
 - 80% Cyclic Angular Momentum
 - 20% Secular Angular Momentum





Total Angular Momentum	1.8 mNms
Cyclic Angular Momentum	1.4 mNms
Secular Angular Momentum	0.36198 mNms

Small CubeWheel	
Maximum momentum storage	1.7 mNms
Maximum wheel speed	± 8000 rpm
Maximum torque	0.15 mNm

TMTC and Ground Station

- X-Band
- UHF-VHF
- Ax.25 Protocol
- Software for commanding satellite is being developed.



Conclusion and Future Work



- Project is in the PDR phase.
- Challenges with subsystems
- Expected to be completed 2018



Thank You!

