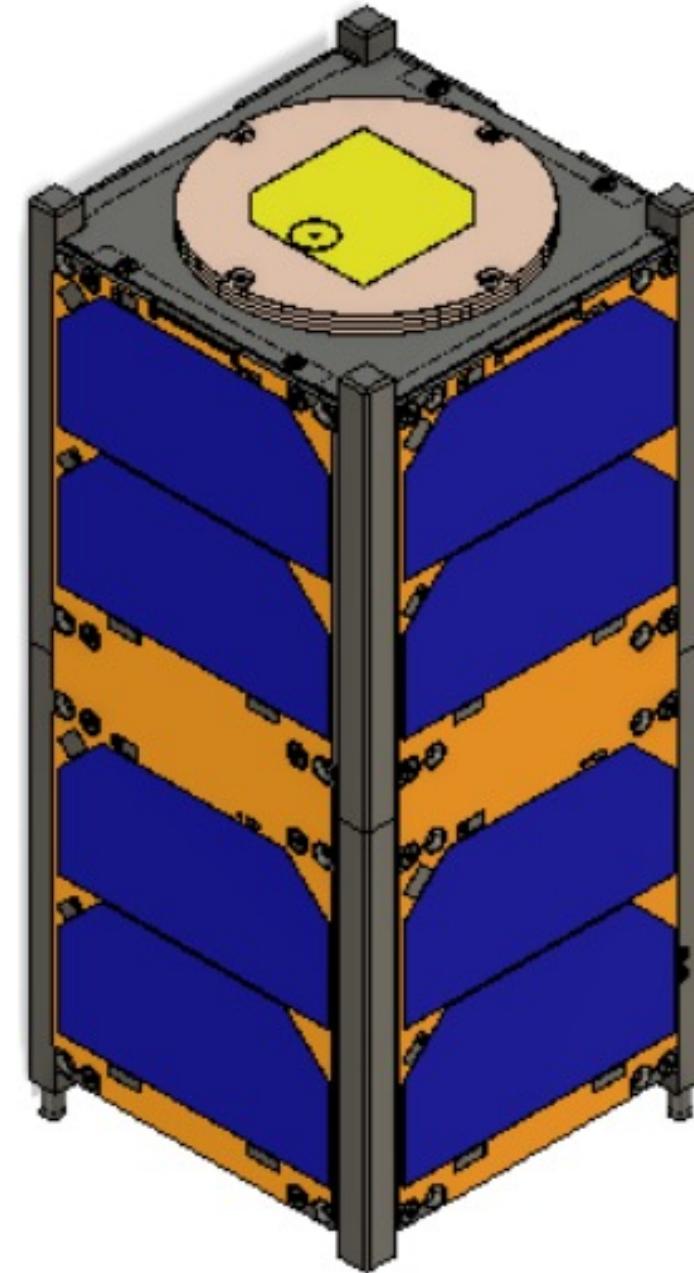


Operation Ocean-Eye

By: Colby Davis, Erich Gerstlauer, Bodie Loescher, Julian Skilton



THE PROBLEM

- 11 billion tons of cargo is transported by ship each year [10]
- Cargo ships face several challenges during transportation including, poor weather, changing tides, and piracy
- Unexpected delays and lost or damaged goods result in financial losses
- Lack of security for customers who use the ocean for transportation of goods

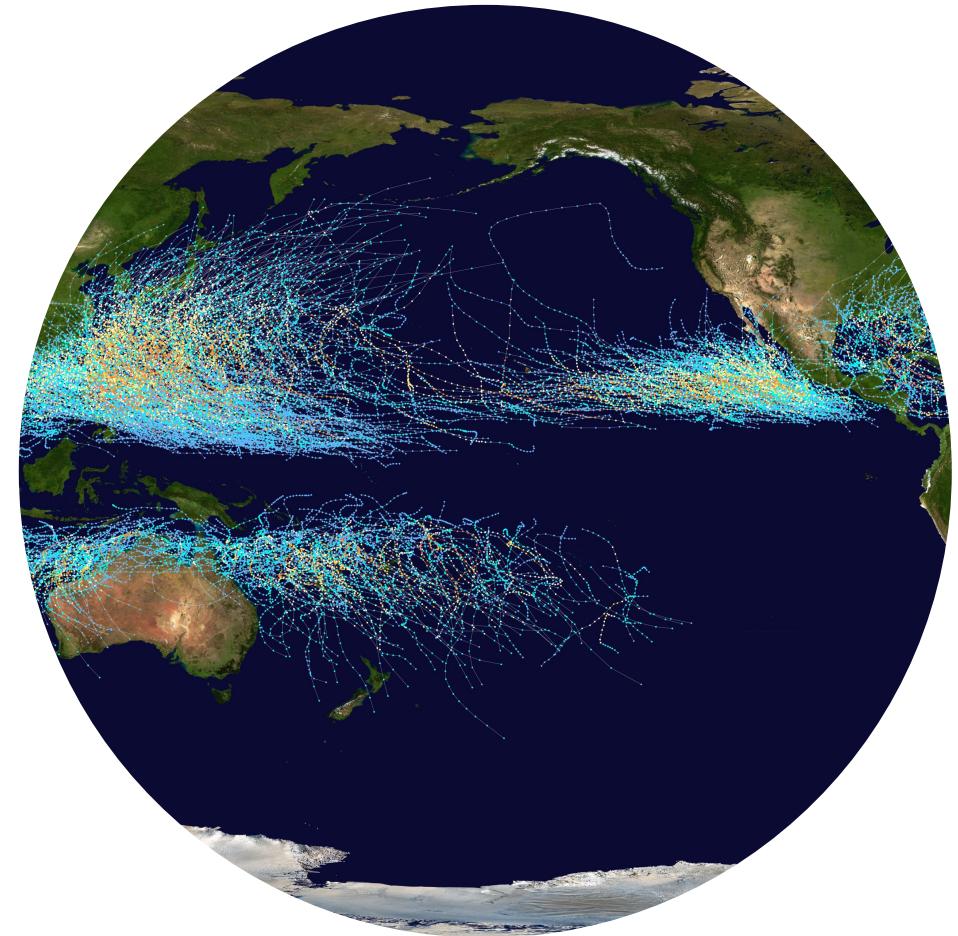


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Our Solution

Operation Ocean-Eye

- 2UCubeSat designed to track customer's goods and cargo trends
- Small global tracking solution
- Customers can view pictures and track the location of their goods
- Off the shelf components allows fast production with proven technology
 - In the future in-house components developed to reduce cost



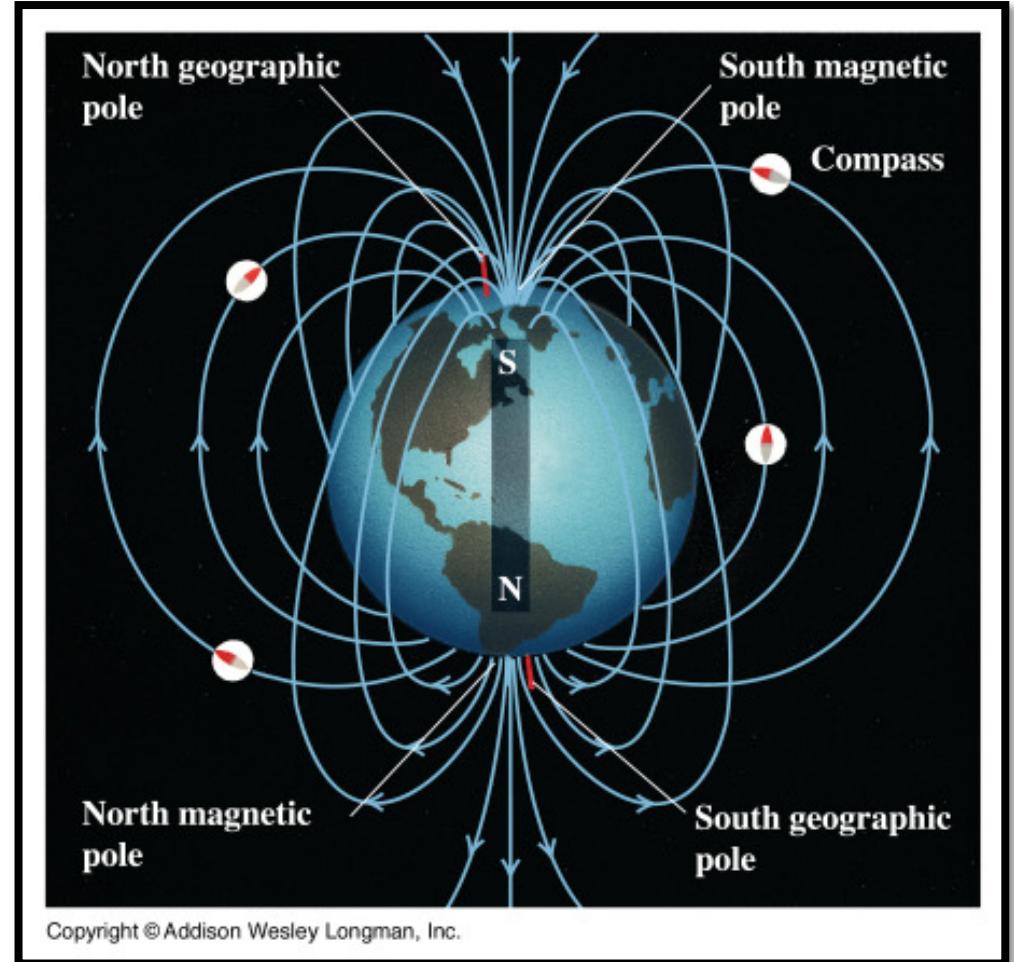
How does it work?

- Pictures of transporters can be taken, mapping their location, travel history, and expected path
- View sea conditions, including areas of rough seas which could result in the vessel going off-course
 - White caps and large swells
- Use data trends to predict vessel's location

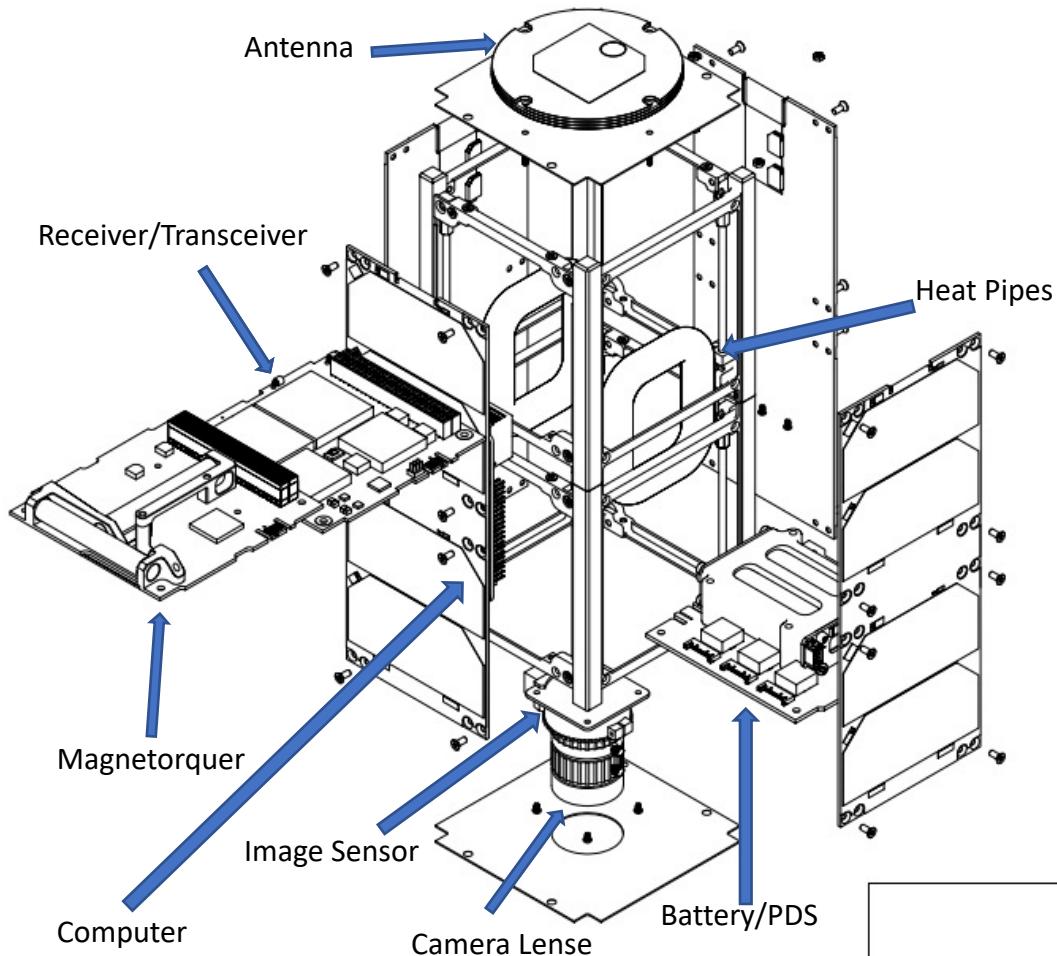


Operation Efficiency

- 90 Minute orbital period along equator
- LEO orbit (near-equatorial)
- Magnetorquer to stabilize and maintain desired attitude
- Heating/Cooling Pipes to ensure longevity
- Life Expectancy: < 1 year



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	PROJECT 2U CubeSat AE426		
	TITLE Exploded Assembly		
APPROVED	SIZE	CODE	DWG NO
CHECKED	B		1
DRAWN	Erich Gerstlauer	4/3/2023	REV
SCALE	1:2	WEIGHT	SHEET 1/2

Components for CubeSat

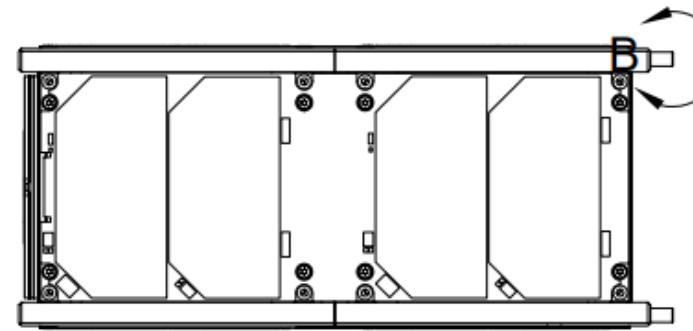
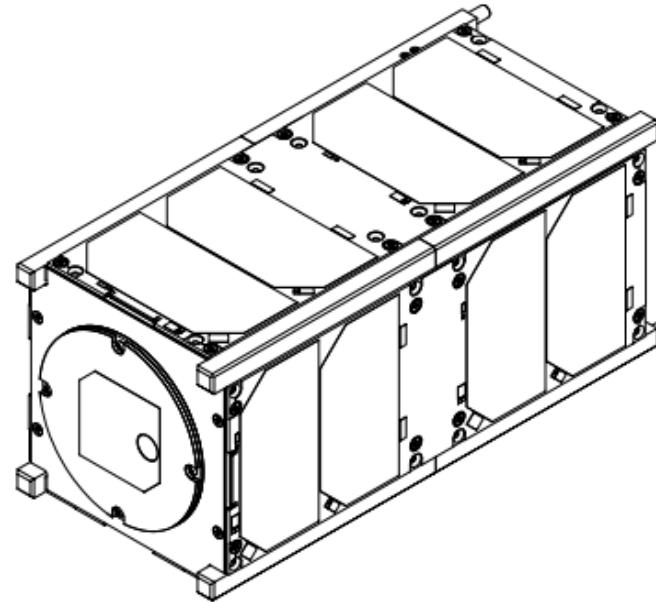
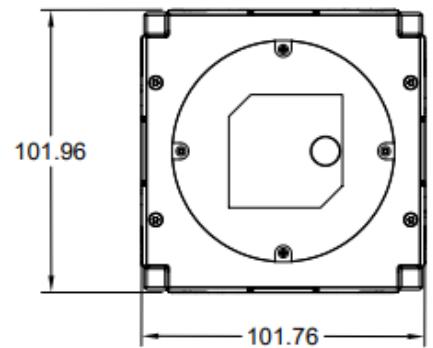
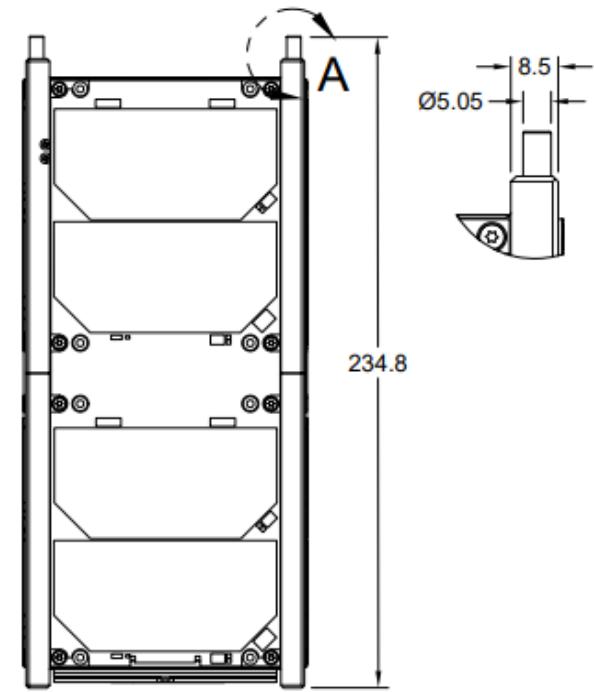
Item	Cost (\$)
Raspberry Pi HQ	75
Raspberry Pi Model 4 B	130
Camera Lens	50
Isispace 2U CubeSat Structure	3,122
Isispace 2U Solar Panels	3,967.59
Isispace 2-cell Electrical Power System	3,491.48
Isispace S-band Antenna Patch	2,274.75
VHF Uplink/Downlink Transceiver	9,325
Isispace Magnetorquer Board	10,696.65
Launch (Nanoracks)	80,000
TOTAL	\$113132.47

Power Requirements 1

System	Power Used per Hour (watt-hour)
Raspberry Pi (idle)	1.2
Raspberry Pi (max usage)	5
Magnetorquer (idle)	0.175
Magnetorquer (actuation)	1.2
Uplink Transceiver (receiver only)	0.48
Uplink Transceiver (transmitter on)	4
Total (minimum)	1.855
Total (maximum)	10.2

Point Mass Locations Relative to A Corner of the CubeSat

Names	Mass(g)	CGx(mm)	CGy(mm)	CGz(mm)
Camera Window	14	50	-50	7.35
Magnetorquer	194	57.883	-50.197	181.177
Communications System	108	45.118	-47.774	167.77
Front Solar Panel Cluster	100	100.056	-50.085	113.827
Left Solar Panel Cluster	100	50.085	0.056	113.827
Antenna	68.4	50.074	-50	222.7
Camera Window	40	50	-50	7.25
Raspberry PI HQ Camera	201.9	50	-48.153	37.043
Battery and Power Delivery System	215.6	51.43	-45.445	63.951
Raspberry PI 4 Model B	50.7	10.783	-50.539	119.703
Back Solar Panel Cluster	100	49.915	-100.056	113.827
Right Solar Panel Cluster	100	-0.056	-49.915	113.827
CubeSat Structure	231	50.987	-49.881	120.652
All MSBR fasteners and hex screws	11.2	50.969	-51.231	117.201
Top Plate	43	49.937	-50	219.549
Heat Pipes	43	56.81	-50.43	116.352
Total	1620.8	49.93919768	-49.06137421	121.3953317



PROJECT
2U CubeSat AE426
TITLE
Exterior Dimensions

APPROVED	SIZE	CODE	DWG NO	REV
CHECKED	B		1	
DRAWN Erich Gerstlauer 4/3/2023	SCALE 1:2	WEIGHT	SHEET 2/2	

Moment of Inertia, PMOI, and EigenVectors

Moments of Inertia			Eigenvalue/PMOI			Eigen Vectors		
7993	8.166	-92.14	2066	0	0	0.0029	-0.5837	0.0107
8.166	8059	60.97	0	8004.5	0	-0.9952	-0.8120	0.9999
-92.14	60.97	2698	0	0	8670.5	0.0978	0.0008	0.0100

References

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