

Air Bearing Mounting Fixture for CubeSat General Atomics – EMS group

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- **General Atomics (est. 1955)**
 - Division of General Dynamics
 - Leading resource for energy applications to laser to automated flight technologies.
- **Affiliated Companies and Groups**
 - GA-Aeronautical Systems, Inc.
 - GA-Systems Integration
 - GA-Electromagnetic Systems
- **Electromagnetics Systems (EMS)**
 - Systems for electromagnetic aircraft launches and recovery systems
 - Develop pioneering technology for defense, aero, and energy applications
 - Commercial technology for electronics, transportation, and production

Clients/Stakeholders

Scott Miller

- Assembly, Integration and Test Manager
- 3 years at GA
- Masters Degree in Aerospace Engineering

Robert Baltz

- Senior Test Engineer
- 2 years at GA

General Atomics Personnel

- Mechanical Engineers
- Electrical Engineers
- Test Engineers

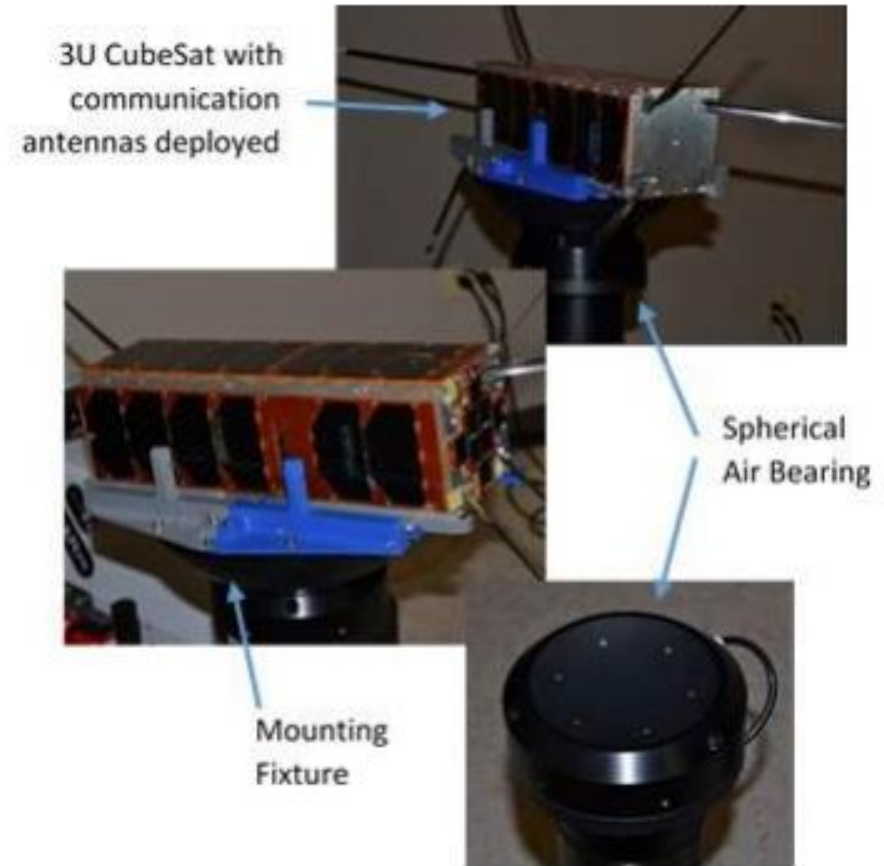
Our Project

- **Need**

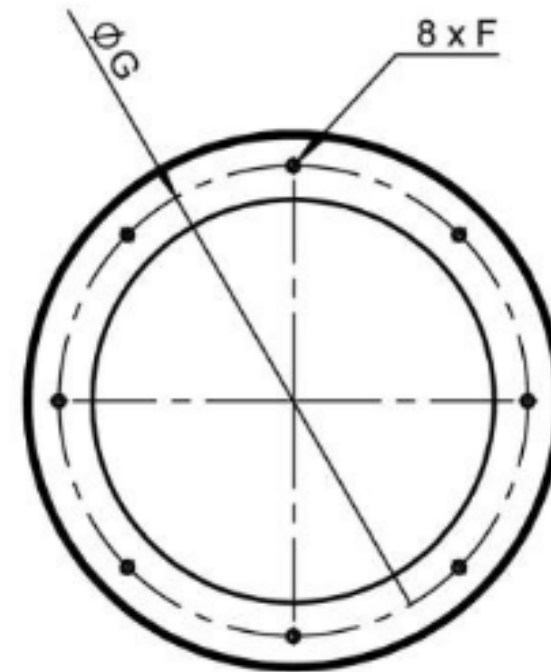
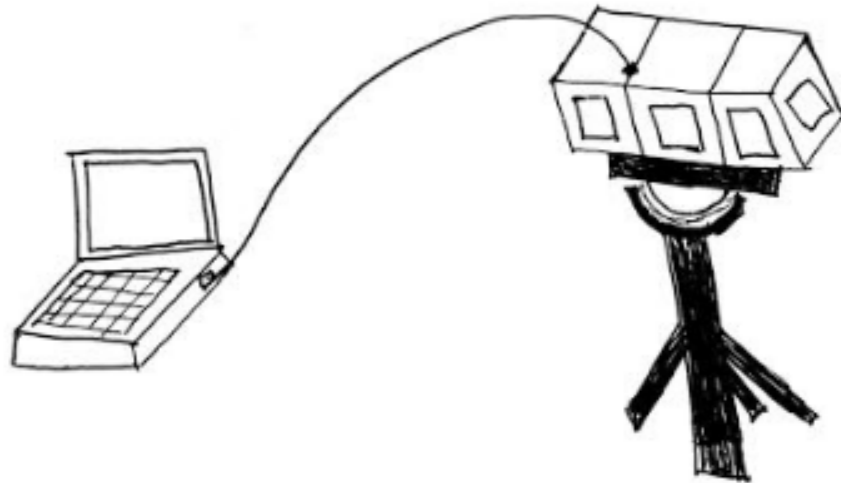
- Mounting an air-vehicle onto a test stand for ground testing
- Main testing will be for a 12U CubeSat
- Full assembly refocuses CG to designated position
- Design for compatibility with CubeSat space dispenser
- CubeSat assembly must stay on test stand through simulations

- **Stretch Goals**

- Extend compatibility 3U and 6U CubeSats
- Develop hardware for wireless diagnostic system (Bluetooth)



Our Project



Customer Needs

- Reliable
- Durable
- Non-Magnetic
- Limit Space
- Limit Overall Weight
- CubeSat Easily Installed and Removed
- Simply and Effectively Secure CubeSat
- Adjustable on all three axis
- Compactible with Air Bearing Table
- Refocus CG for Assembly
- Does not fall off test stand



Engineering Requirements

- CubeSat weight is $24\text{kg} \pm 2\text{kg}$
- Movability of $\pm 50\text{mm}$ in all three directions about the center of rotation
- Limited to 35° of tilt for 360° of rotation from normal axis
- All components are non-magnetic
- Must fit within a volume of 8 cubic meters
- Dimensions of each unit (U) are $10\text{cm} \times 10\text{cm} \times 11.35\text{cm}$
- Material Strength (MPa)



QFD

		Engineering Requirement																		
		Accept 24kg CubeSat																		
		Movability of 50mm for all axis																		
		Limit to 35 deg of tilt																		
		360 deg rotation about axis of rotation																		
		Weight less than 50kg																		
		Size must be less than 9 m ³																		
		Minimum Material Strength of																		
		CG not exceed ±xxcm																		
CR Rank	Customer Requirement																			
3	Reliability	0	0	0	0	0	0	0	3	3	0									
5	Durability	0	0	0	0	0	0	0	9	9	0									
5	Non Magnetic	0	0	0	0	0	0	0	3	0	0									
3	Limit space	0	0	0	0	1	9	0	1	1										
2	Limit overall weight (no CubeSat)	1	0	0	0	9	3	3	3	1										
4	CubeSat Easily Installed and Removed	0	0	0	0	1	3	1	0	3										
5	Simply and effectively secure CubeSat	0	0	0	0	0	0	3	0	3										
5	Adjustable on all three axis	0	9	3	9	0	0	0	0	9										
5	Compatible with air bearing	0	0	3	3	0	0	0	0	9										
5	Refocus CG for assembly	0	1	3	9	1	0	0	0	9										
4	Does not fall off test stand	1	3	3	3	1	1	3	9	0										
2	Opt. Compatible with diff. payloads	3	0	0	0	9	3	0	0	0										
2	Opt. Compatible with dispenser	9	0	0	0	1	1	0	0	0										
2	Opt. Account for hardware interfaces	1	0	0	0	0	1	0	0	9										
	Absolute Technical Importance (ATI)	32	62	57	117	54	59	106	99	185										
	Relative Technical Importance (RTI)	4.2	8.0	7.4	15.2	7.0	7.7	13.7	12.8	24.0										
	Target ER values	24 kg	50 mm	35°	360°	50 kg	9 m ³	200 Mpa	E04	xx cm										
	Tolerances of Ers	2kg	2.5 mm	1.75°		2.5 kg	45 m ³	10 Mpa												
	Testing Procedure (TP#)																			

Questions?