

A satellite view of Earth showing the curvature of the planet and various landmasses. A prominent yellow and black rectangular box is overlaid on the image, containing the text "'StangSat".

# 'StangSat

Aug 6<sup>th</sup> , 2011

Presented by:

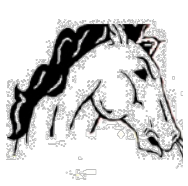
Danielle George- Project Manager  
Erin McCaskey – Systems Engineer



# Agenda



- Purpose
- Background
- Firsts
- Activities
- Mission Objectives
- Con Ops
- Mission Timeline
- Risks
- Challenges
- Power ON
- Looking Forward

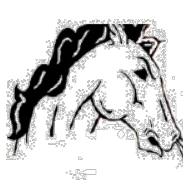


# Purpose



- Encourage interest in Science Technology Engineering Mathematics disciplines and careers (STEM)
- Mission Statement: To develop primary educational resources in the fields of science and technology through the design, construction, and flight of a picosatellite





# Background Information



- This is the first time Kennedy Space Center has ever partnered with a High School to build and potentially launch a CubeSat
- Only the second high school to participate in CubeSat development





# Firsts



- **Pilot Project of Creating Understanding and Broadening Education through Satellites (CUBES)**
- **Power on throughout launch on a NASA expendable launch vehicle**
- **Wireless transmitting during flight to another CubeSat**



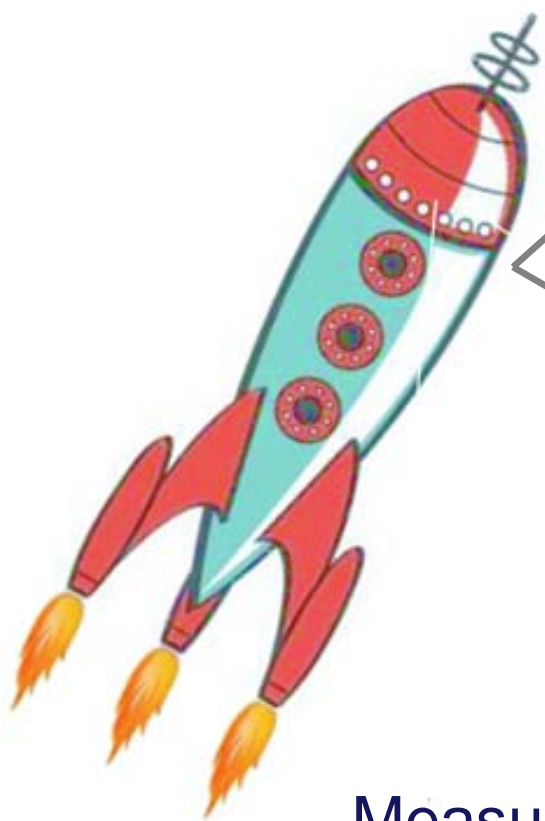
# Mission Objectives



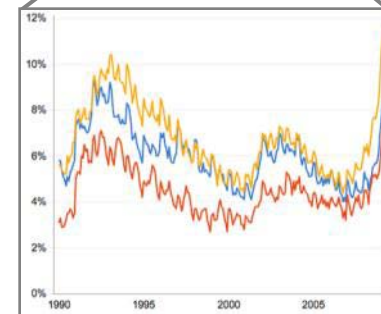
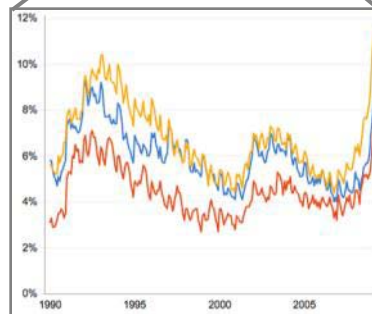
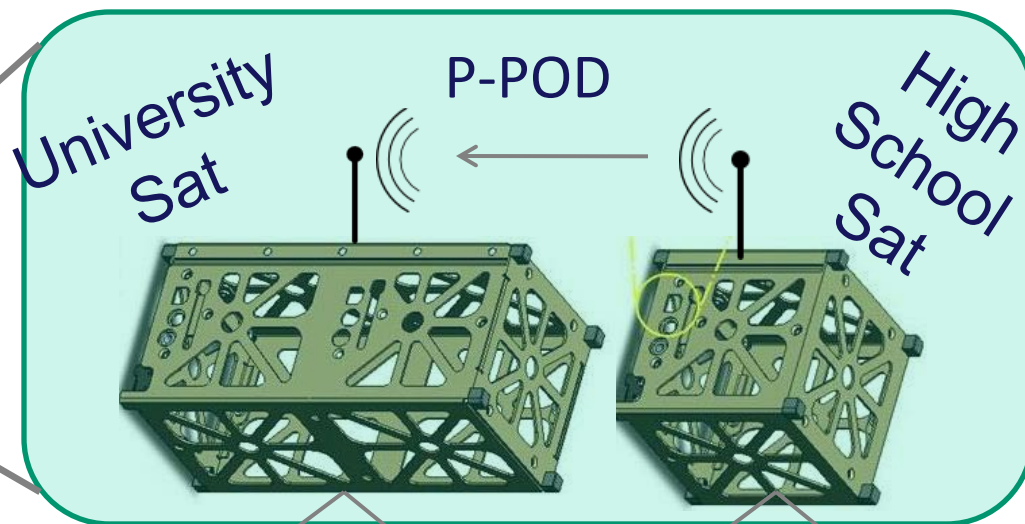
- **Measure shock and vibration environments for a CubeSat inside of a P-POD in order to better quantify flight environments**
- **Demonstrate RF transmission of a CubeSat within a P-POD with less than 1 Watt during vehicle ascent**
- **Have an image on the aft face of the cube that can be captured by the 2U (University) CubeSat**



# Concept of Operations - Launch

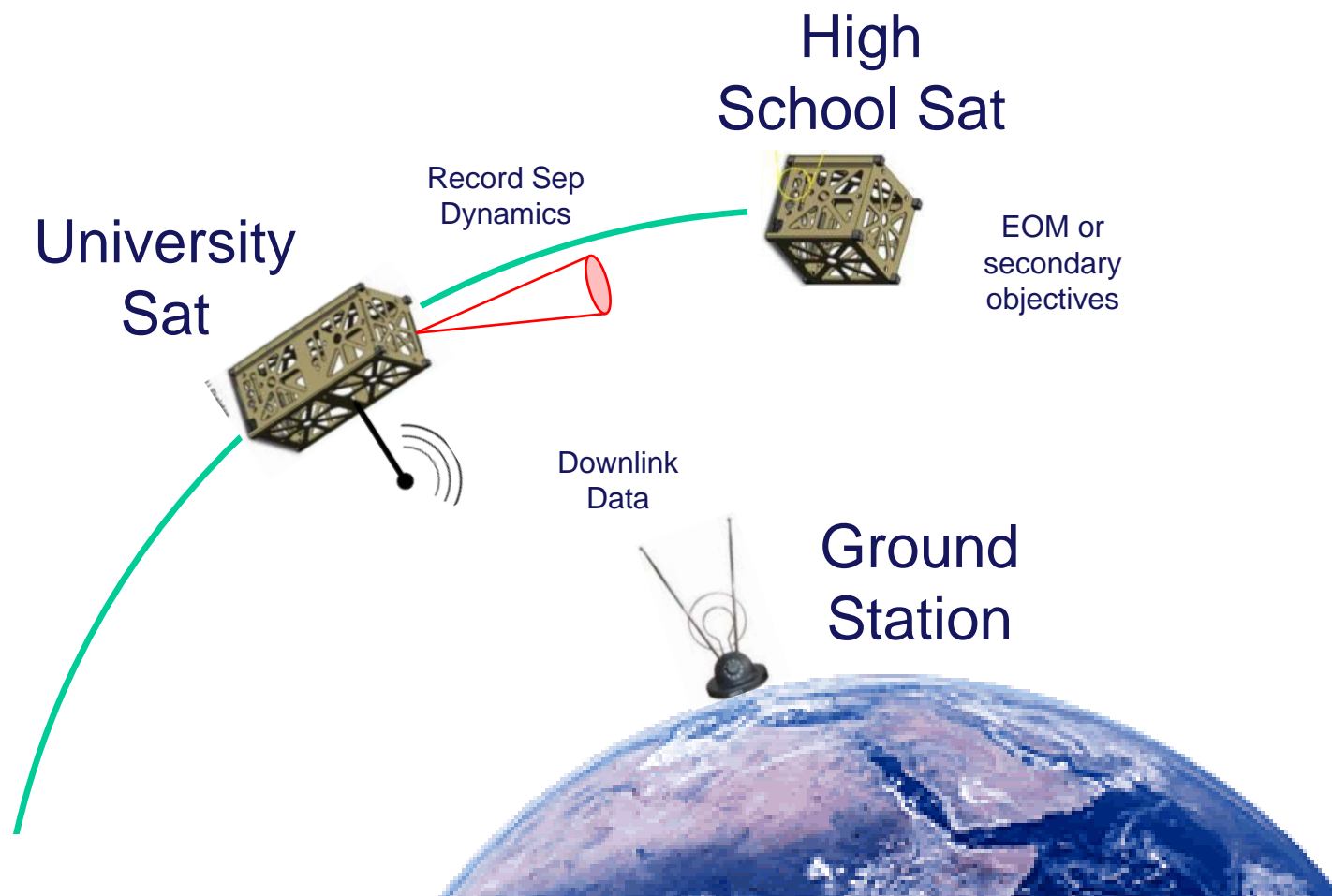


Measure Shock & Vibration

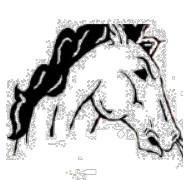




# Concept of Operations – Separation





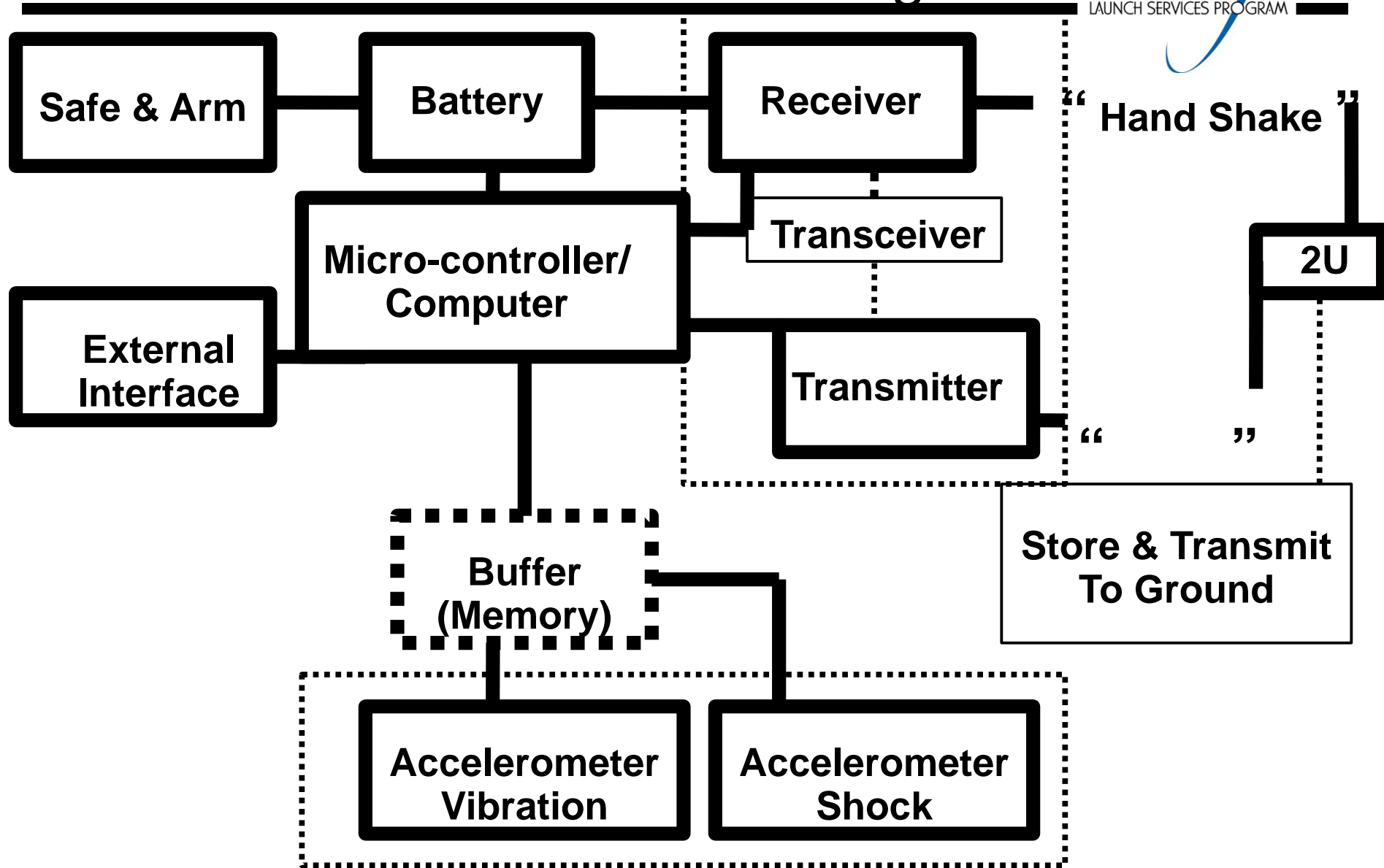


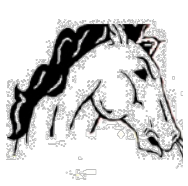
**T-30 days (integration)**     
 **T-0 (liftoff)**     
 **T+ 3 minutes\* (ascent)**     
 **T+? (ejection)**     
 **Ejection + 60 sec**     
 **Ejection + 45 min**     
 **Ejection + 24 hrs**

Ground Station(s) /TDRS						Receive data
Univ. Sat	Monitor for liftoff vibration	Acquire/Receive data (excluding video)	Acquire/Receive data (excluding video)	Acquire/Receive data (including video)	Standby / Housekeeping	(EOM) Downlink data
'Stang Sat	Standby mode	Acquire/Transmit to Univ.	Acquire/Transmit to Univ	Acquire/Transmit to Univ	Secondary objectives (if applicable)	Secondary objectives (if applicable)
P-POD (sensors)	Standby mode	Acquire/Transmit to Univ	Acquire/Transmit to Univ			



# Command & Data Handling Functional Flow Diagram



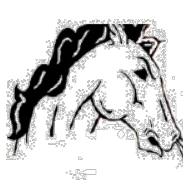


# Activities to Date



- **Cubesat Major functions activity**
  - Developed Concept of Operations
  - Mission Statement
- Learned about requirements
  - Clay Robot Workshop
- Potential Secondary Missions
  - Feasibility Studies
  - Decision Against
- **Requirements Development**
- Educational Tours
- **Mission Concept Review/ Pre-System Requirements Review presentation to NASA and industry professionals**



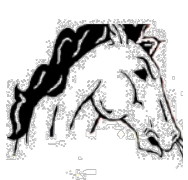


# Activities to Date



- Lessons Learned
- Florida Space Grant Consortium (FSGC) sponsored Balloon Launch Workshop
  - Communication
  - Team work
  - Schedule/ Plan
- **Trade Studies**
  - Each subsystem research components
  - Find best fit for our mission
- Budgets
  - Monetary Budget
  - Mass Budget
  - Power Budget
- Space Act Agreement signed
- Fundraising/ Sponsors

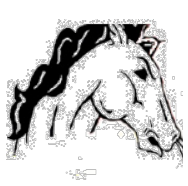




# Identified Risks



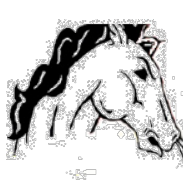
- **Power On and RF requirements must change for us to launch through the CubeSat Launch Initiative**
- **Time Limitations**
- **University selection still to be determined**
- **Lack of expertise in area and unknown factors driving up later development costs**



# Challenges



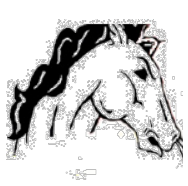
- **Power on**
  - Powered on from delivery to Cal Poly through launch
  - Potentially 120 days without recharge
- **Cooperative System's Engineering**
  - Wirelessly Communicating with University Satellite
- **Placement of accelerometer**



# Power On Options



1. Turn on/off with vibration (launch window)
2. Stay in low power until receive signal from 2U
3. Turn on from beginning (safe and arm switch)
4. Timer
  - once remove safe and arm
  - send signal
  - launch vibrations
5. Power on subsystem
6. Hardwire from LSP
7. Sending RF signal from ground
8. Microphone listening for launch cue

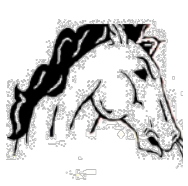


# Things to Consider



- **Relying on someone else to do it vs. doing it ourselves**
- **Complexity**
- **Length of time to implement**
- **Amount of power needed**
- **Launch windows**
- **How to turn back to sleep**
- **Loss of data depending on time of turn on (capturing full range of flight data)**





# Looking Forward



- **Flat Sat**
  - **Setting up lab for building/testing**
  - **Test components interfacing with each other**
- **Milestone Reviews**
  - **Upcoming: Preliminary Design Review and Critical Design Review**
- **Engineering Development Unit (EDU) cube**
  - **EDU will be tested during a Proof of Concept flight onboard a Sounding Rocket**



# Thank you!



- **Launch Services Program/ Mr. Garrett Skrobot**
- **Space Dynamics Lab**
- **NASA Mentors**
- **MIHS Teachers**
- **Sponsors**





# Follow Us on Facebook



## Search: MIHS CubeSat

facebook Home Profile Account

Search

**MIHS CubeSat** Edit Page  
 Non-Profit Organization · Merritt Island, Florida · [Edit Info](#)



**Wall** MIHS CubeSat · Most Recent

Hidden Posts

- Info
- Photos
- Video
- Discussions
- Events
- Links
- Notes
- Edit

About Edit

"Whether outwardly or inwardly, whether in space or time, the farther we pe..."

More

Share: [Status](#) [Photo](#) [Link](#) [Video](#) [Question](#)

Write something...

 **MIHS CubeSat**  
<http://www.floridatoday.com/article/20110731/NEWS13/107310317/NASA-Merritt-Island-High-take-satellite?odyssey=mod|newswell|text|Home|s>

 **NASA, Merritt Island High take on satellite**  
[www.floridatoday.com](http://www.floridatoday.com)  
 NASA and Merritt Island High partner up for satellite project.

77 Impressions · 0% Feedback  
[Yesterday at 11:20am](#) · [Like](#) · [Comment](#) · [Share](#)

**MIHS CubeSat** added 10 new photos to the album Balloon Workshop.

**Admins (4)** See All

- Use Facebook as MIHS CubeSat
- Notifications 2
- Promote with an Ad
- View Insights
- Invite Friends

**Quick Tips**

Get more people to like your Page with Facebook Ads today!

**Sample Ad: MIHS CubeSat**

 The text of your ad will go here.