

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

'StangSat

Aug 6th , 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**



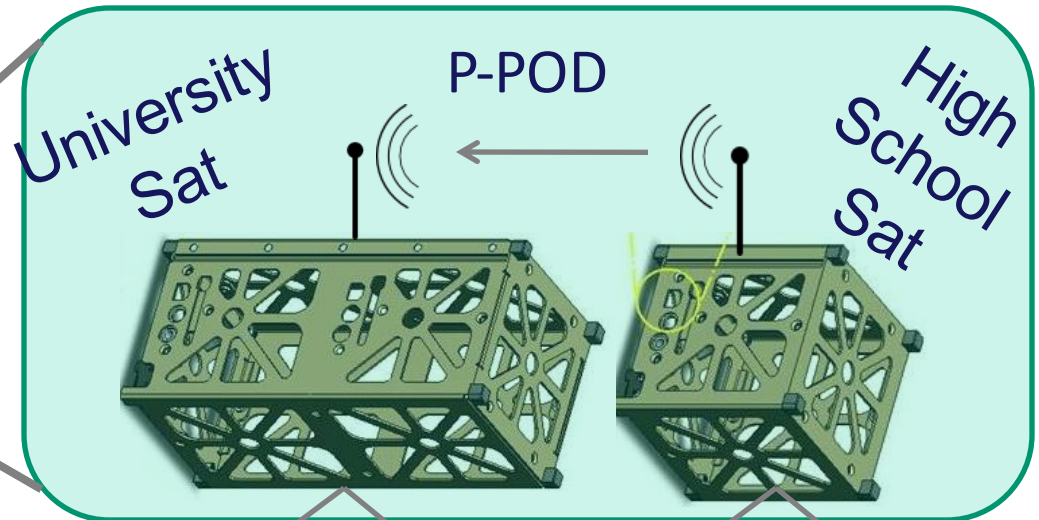
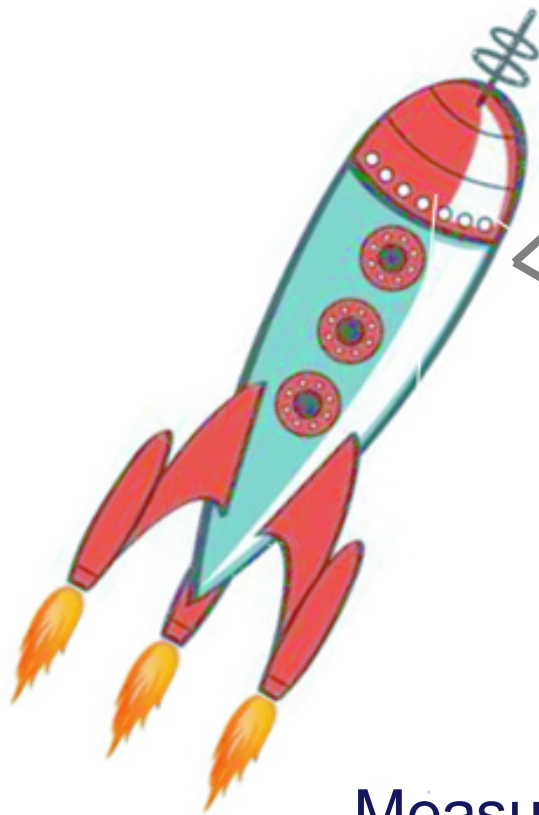
Mission Objectives



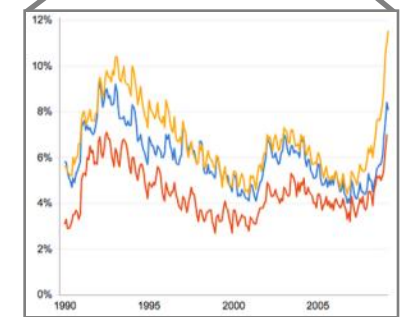
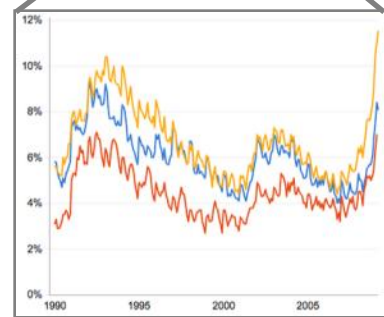
- **Measure shock and vibration environments for a CubeSat inside of a P-POD in order to better quantify flight environments**
- **Demonstrate RF transmission of a CubeSat within a P-POD with less than 1 Watt during vehicle ascent**
- **Have an image on the aft face of the cube that can be captured by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



Concept of Operations - Launch

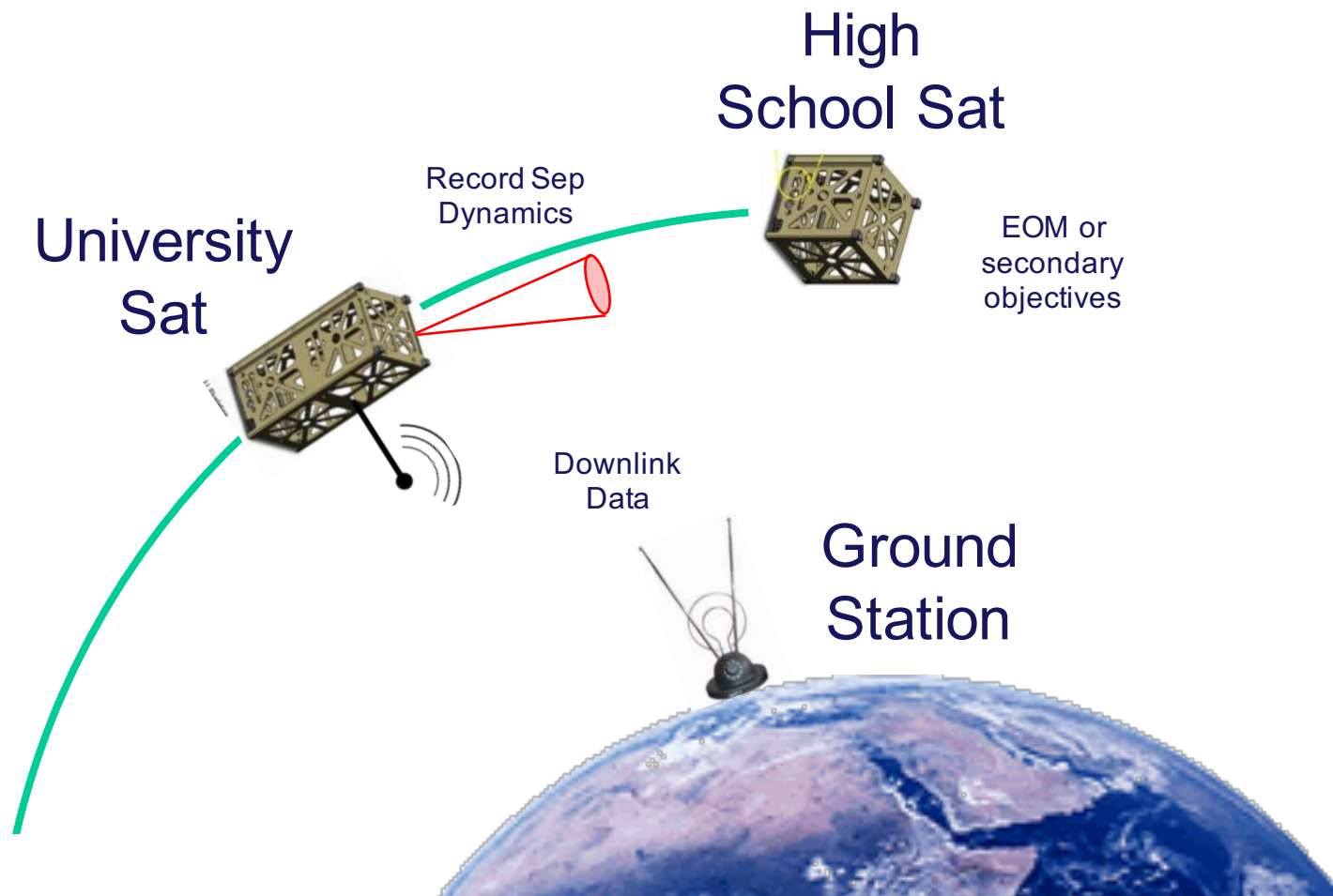


Measure Shock & Vibration





Concept of Operations – Separation



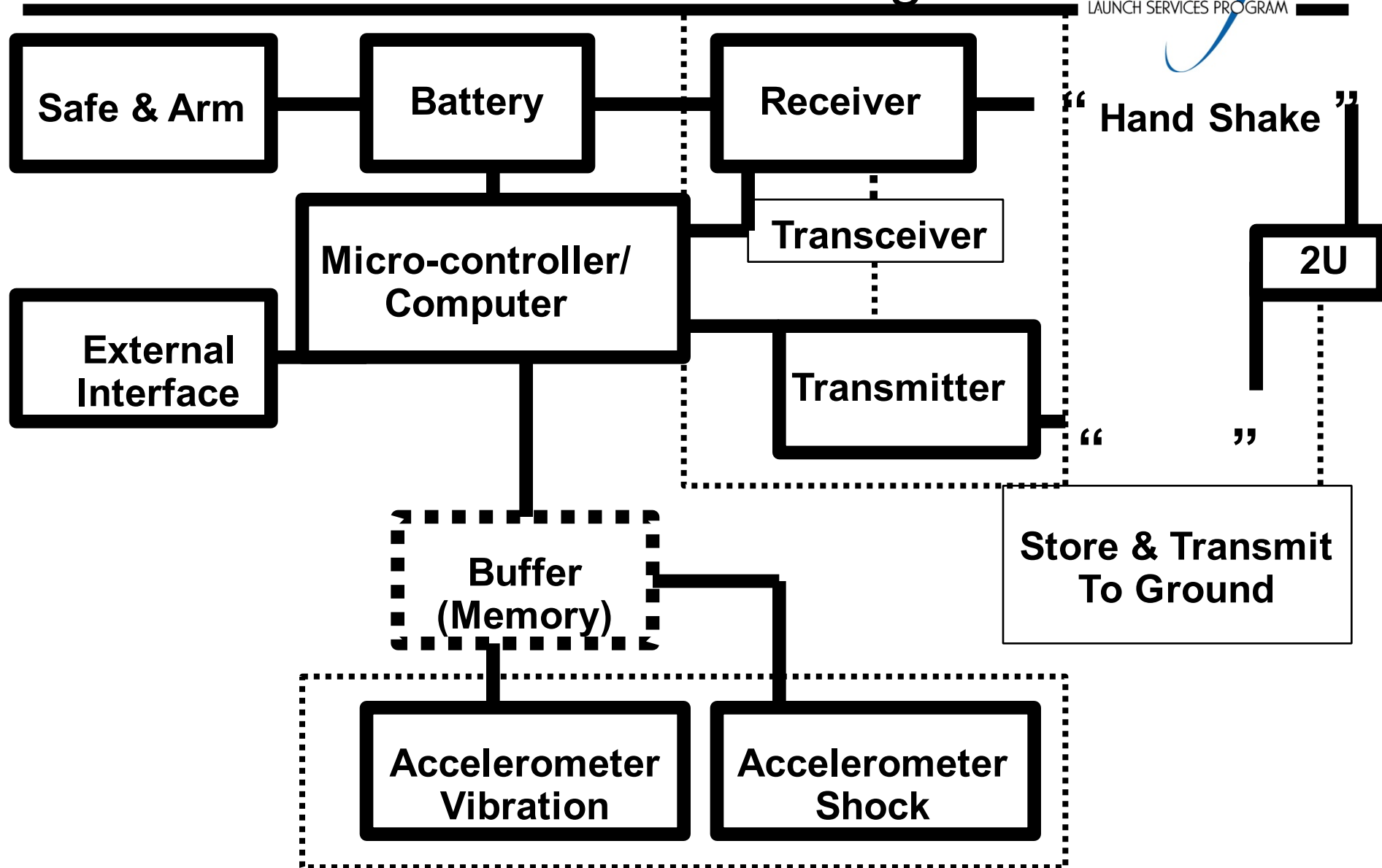


T-30 days (integration) **T-0 (liftoff)** **T+ 3 minutes* (ascent)** **T+? (ejection)** **Ejection + 60 sec** **Ejection + 45 min** **Ejection + 24 hrs**

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**





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

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