SNAP Solutions: A Step For Small Satellites

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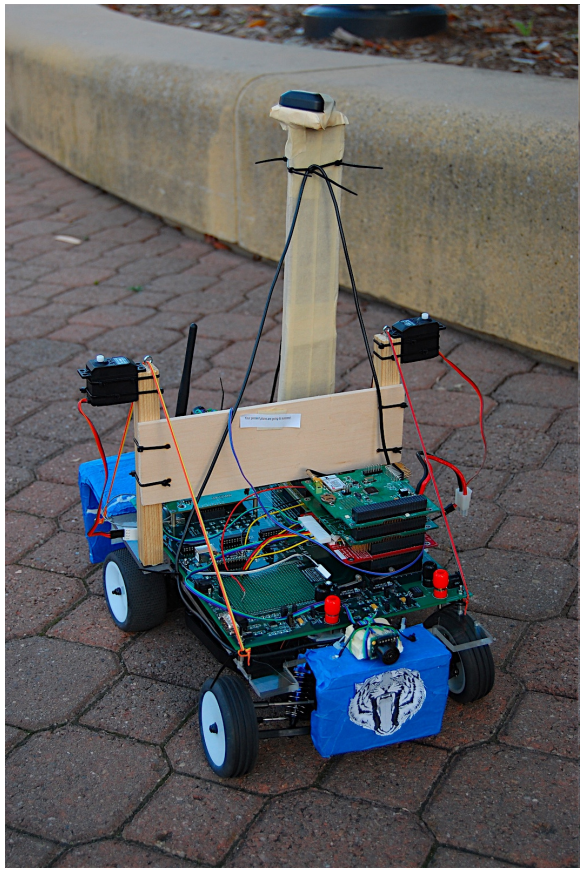
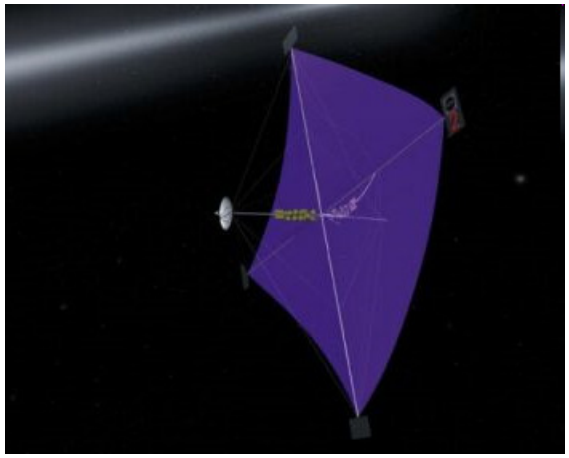
Stanford University
Department of Aeronautics and Astronautics

SSDL

AA236A Rovers



Solar Sail



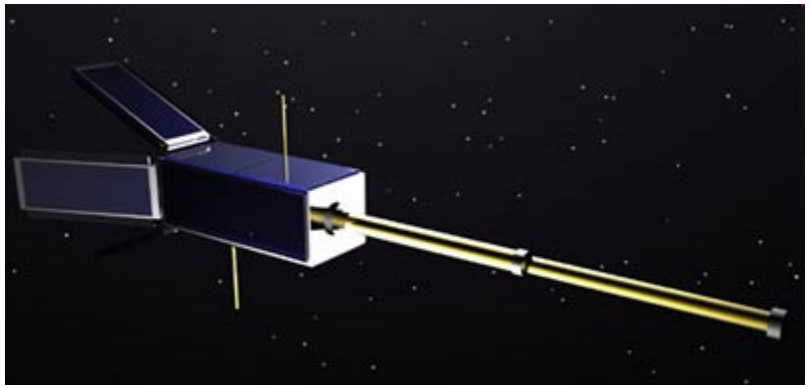
Iris: Lunar X Rover

SSDL & SmallSats

Prof Twiggs and a CubeSat – 1999

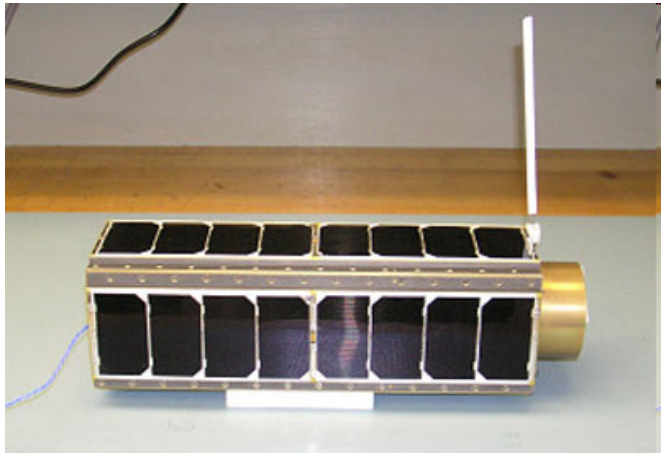
www.californiaspaceauthority.org

QuakeSat – 2003



OPAL – 2000

GeneSat – 2006



The Next Step

A Standardized Bus:

SNAP

Stanford NanoSat Affordable Payload Solutions

CubeSat Philosophy

Why?

– **Cheaper**

www.cubesatkit.com

www.cubesatkit.com

How?

– **Small and Light**

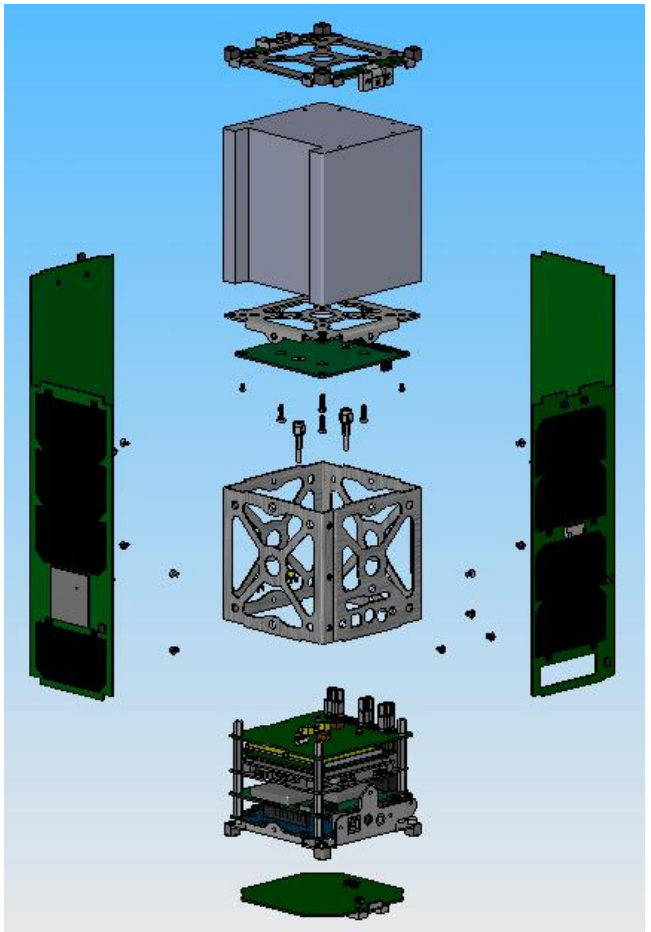
– **Short Development Cycle**

– **Standardization**

www.iccc.es

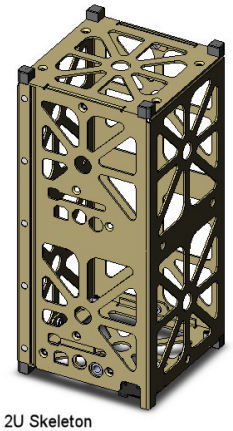
How SNAP Fits In

- **Small and Light**
  - SNAP is 1U
  - Compatible with 1U & 2U sized payload
- **Short Development Cycle**
  - LMRST took 9 months
  - Rovers take 10 weeks
- **Standardization**
  - Only constraints: power & mechanical fit

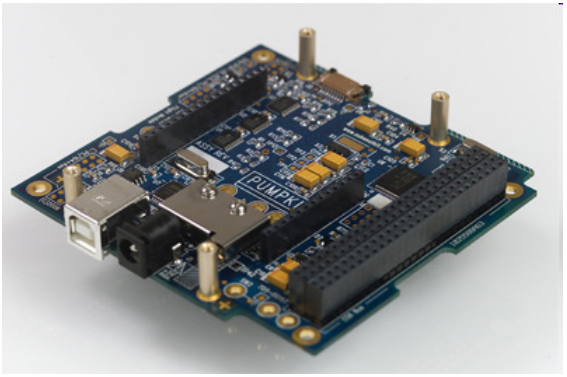


What is SNAP: COTS Components

Pumpkin Chassis, C&DH

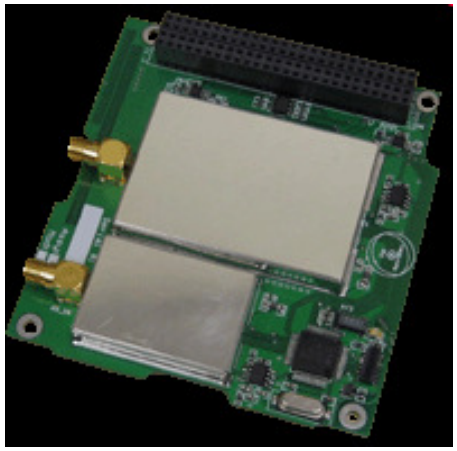


2U Skeleton
Chassis Assy Rev C



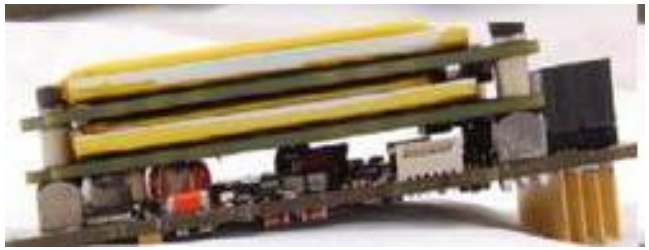
www.cubesatkit.com

AstroDev Helium Radio



www.astrodev.com

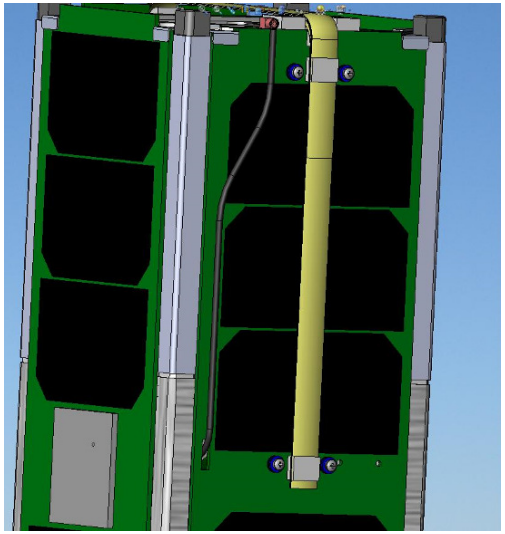
Clyde Space EPS

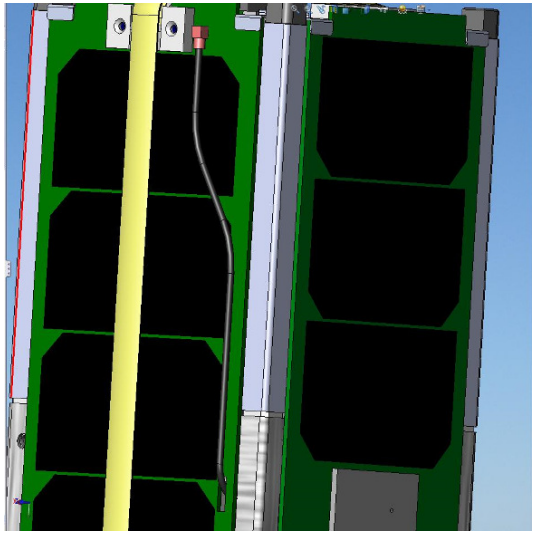


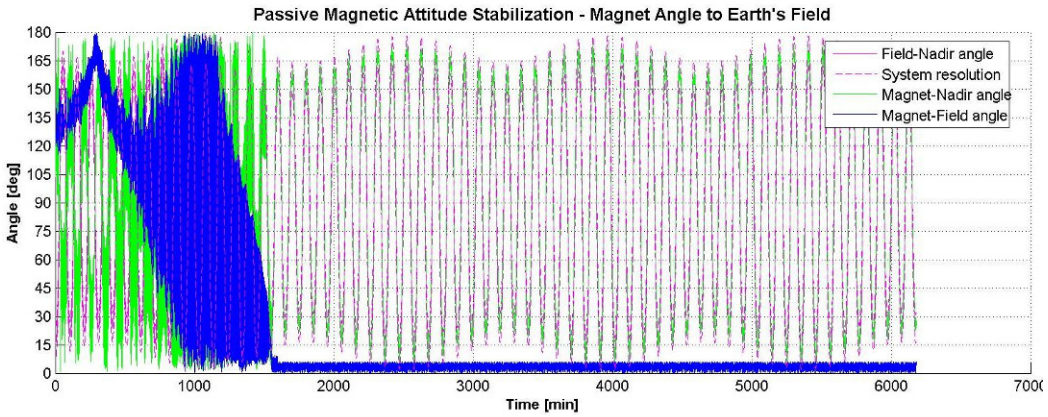
www.clyde-space.com

What is SNAP: SSDL Components

SSDL Antennas and Solar Panels

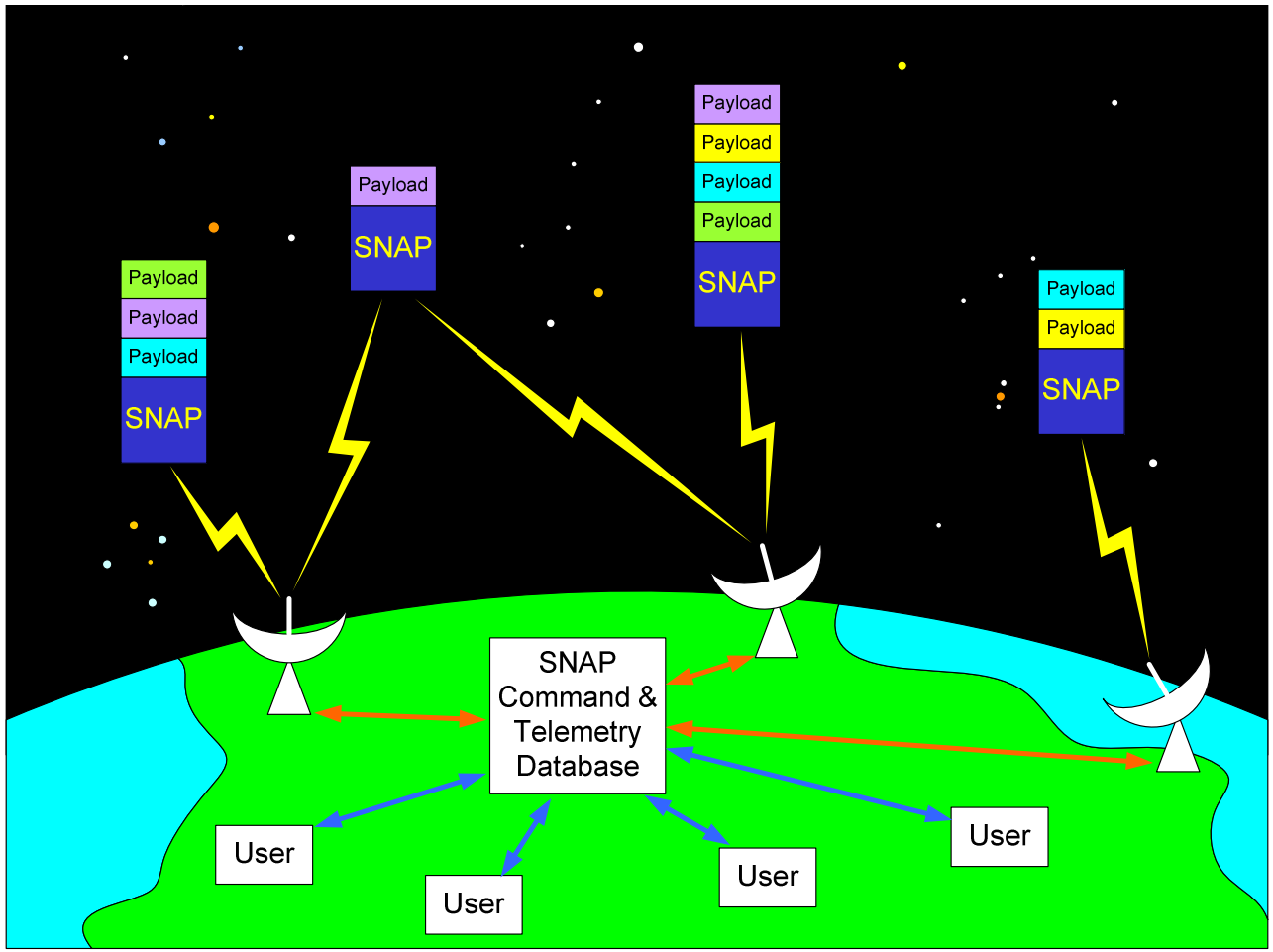






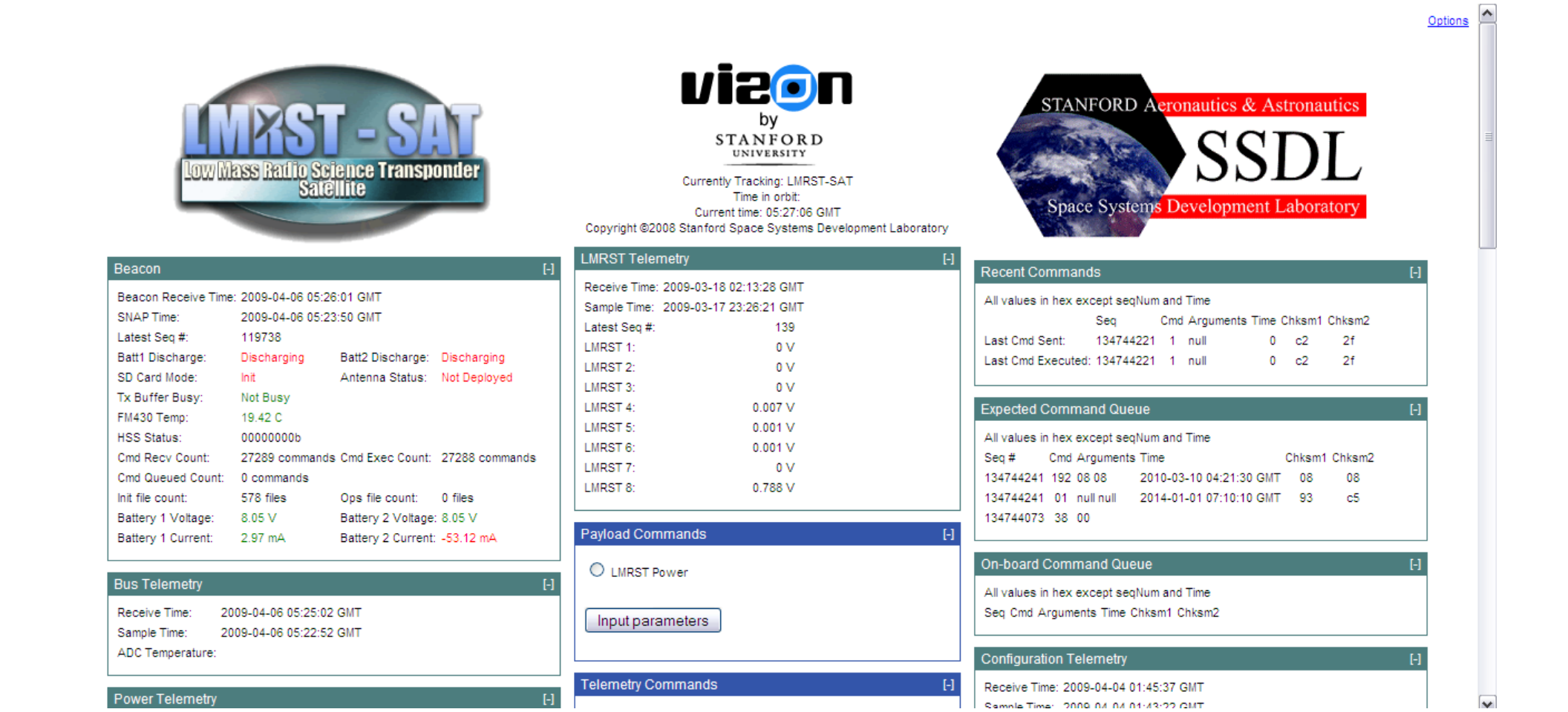
SSDL Passive Magnetic Stabilization System

Ground Station & Mission Control



Vizon: SSDL Mission Control Center

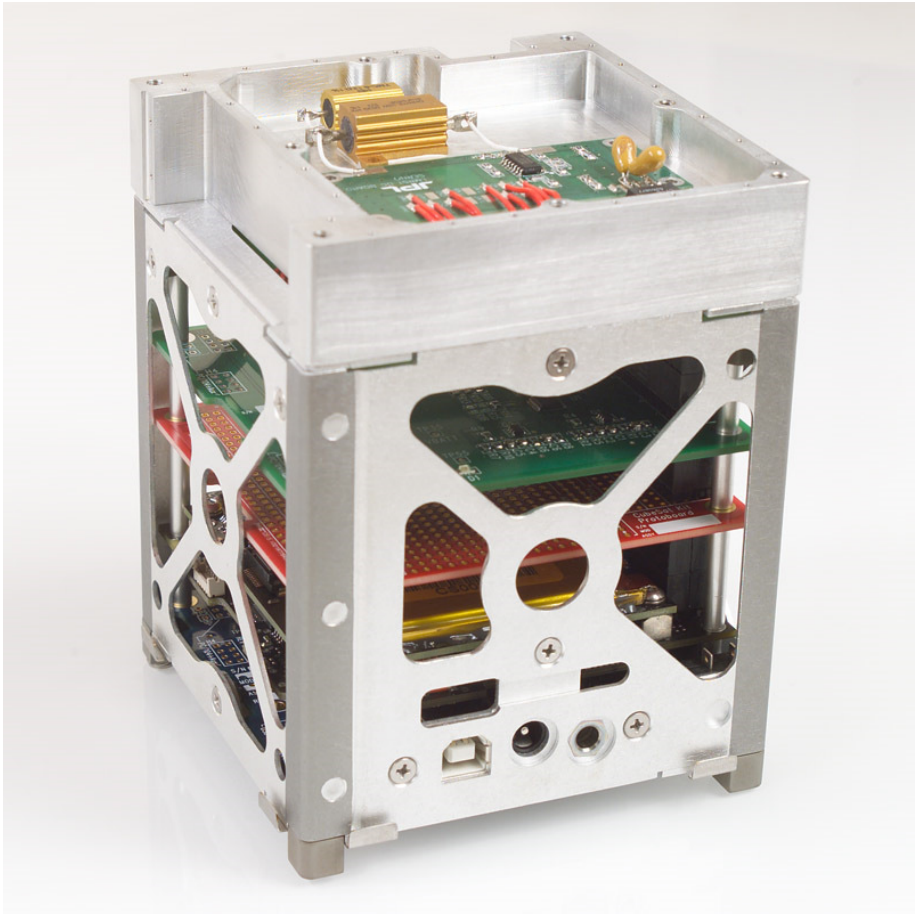
GS & MCC


Options
LMRST - SAT
Low Mass Radio Science Transponder Satellite
vizon
by
STANFORD UNIVERSITY
Currently Tracking: LMRST-SAT
Time in orbit:
Current time: 05:27:06 GMT
Copyright ©2008 Stanford Space Systems Development Laboratory
STANFORD Aeronautics & Astronautics
SSDL
Space Systems Development Laboratory
Beacon [-]
Beacon Receive Time: 2009-04-06 05:26:01 GMT
SNAP Time: 2009-04-06 05:23:50 GMT
Latest Seq #: 119738
Batt1 Discharge: Discharging
Batt2 Discharge: Discharging
SD Card Mode: Init
Antenna Status: Not Deployed
Tx Buffer Busy: Not Busy
FM430 Temp: 19.42 C
HSS Status: 00000000b
Cmd Recv Count: 27289 commands
Cmd Exec Count: 27288 commands
Cmd Queued Count: 0 commands
Init file count: 578 files
Ops file count: 0 files
Battery 1 Voltage: 8.05 V
Battery 2 Voltage: 8.05 V
Battery 1 Current: 2.97 mA
Battery 2 Current: -53.12 mA
Bus Telemetry [-]
Receive Time: 2009-04-06 05:25:02 GMT
Sample Time: 2009-04-06 05:22:52 GMT
ADC Temperature:
Power Telemetry [-]
LMRST Telemetry [-]
Receive Time: 2009-03-18 02:13:28 GMT
Sample Time: 2009-03-17 23:26:21 GMT
Latest Seq #: 139
LMRST 1: 0 V
LMRST 2: 0 V
LMRST 3: 0 V
LMRST 4: 0.007 V
LMRST 5: 0.001 V
LMRST 6: 0.001 V
LMRST 7: 0 V
LMRST 8: 0.788 V
Payload Commands [-]
LMRST Power
Input parameters
Telemetry Commands [-]
Recent Commands [-]
All values in hex except seqNum and Time
Seq Cmd Arguments Time Chksm1 Chksm2
Last Cmd Sent: 134744221 1 null 0 c2 2f
Last Cmd Executed: 134744221 1 null 0 c2 2f
Expected Command Queue [-]
All values in hex except seqNum and Time
Seq # Cmd Arguments Time Chksm1 Chksm2
134744241 192 08 08 2010-03-10 04:21:30 GMT 08 08
134744241 01 null null 2014-01-01 07:10:10 GMT 93 c5
134744073 38 00
On-board Command Queue [-]
All values in hex except seqNum and Time
Seq Cmd Arguments Time Chksm1 Chksm2
Configuration Telemetry [-]
Receive Time: 2009-04-04 01:45:37 GMT

Research Partner 1: JPL

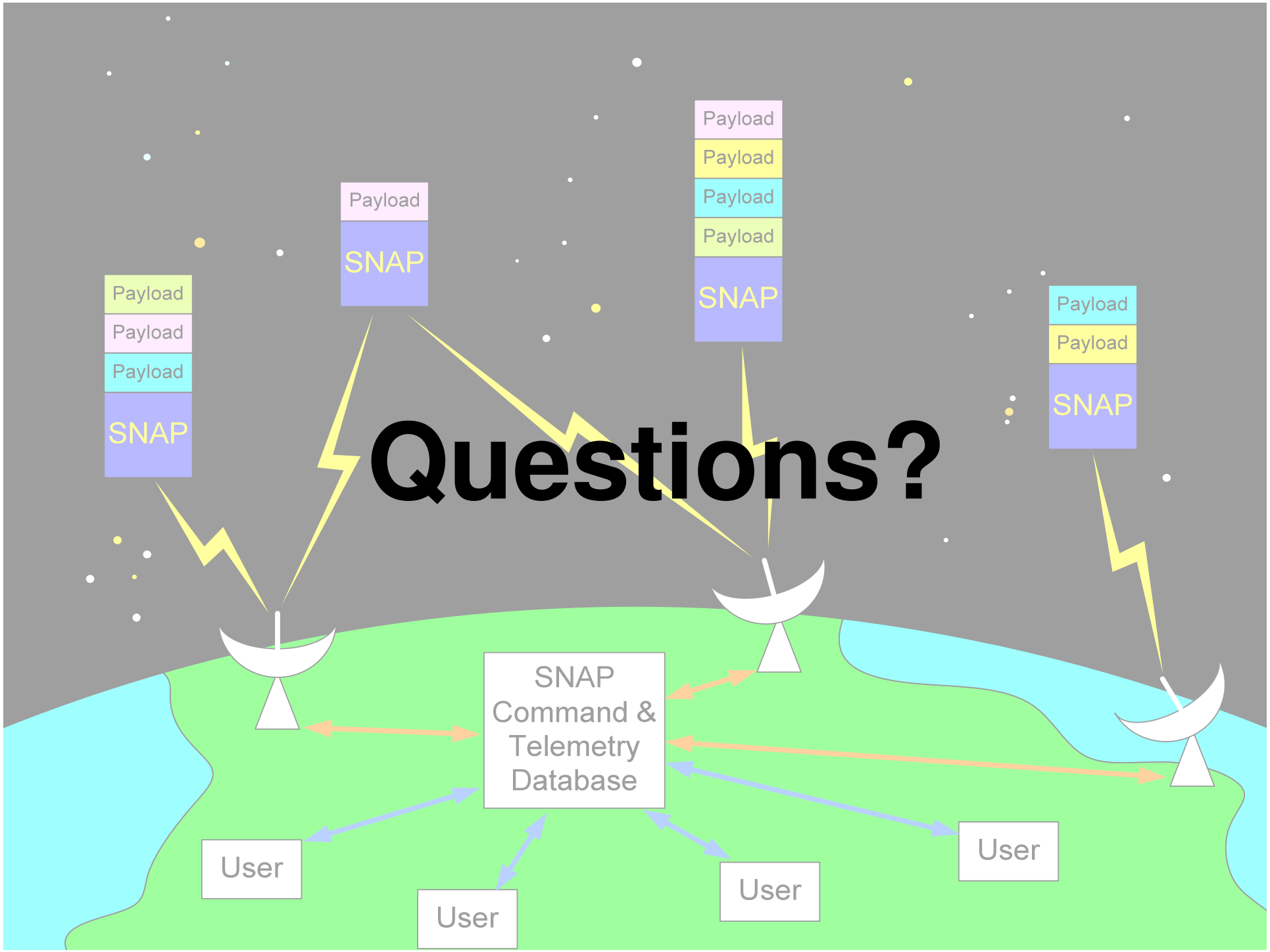
JPL – LMRST

Low Mass Radio Science Transponder for SmallSats



Future Research Partners

- KatySat: Mission involving K-12 students
- Other flight qualification tests
- Earth science missions
- Satellite constellation missions, fractionated control
- **You?**


Payload
Payload
Payload
SNAP
Payload
SNAP
Payload
Payload
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SNAP
Payload
Payload
SNAP
Questions?
SNAP
Command &
Telemetry
Database
User
User
User
User