Aerospace Engineering Design Symposium AY 2010/11

When? → Friday, April 15, 2011, 8:00 am – 4:00 pm.

Where? → University of Colorado at Boulder, Discovery Learning Center (DLC),
http://engineering.colorado.edu/dlc/

Questions + Registration → Patti.Gassaway@colorado.edu, (303)735-4900

Department of Aerospace Engineering Sciences, http://www.colorado.edu/aerospace/

Agenda:

* Senior Projects. # Graduate Projects. + Joint Graduate/Senior Projects

8:00 am	Registration	
8:30 am	Welcome by Chair Jeff Forbes	
Presentations TEAM		Sponsor/s
8:40 am	HPMS*	Ball Aerospace Corp
9:00 am	XROVER*	NASA-JPL
9:20 am	REDCROC*	Lockheed Martin Corp
9:40 am	EPICSat*	LASP
10:00 am	THEIA*	CSGC
10:20 am	Dream Chaser#	SNC
Break 10:40-10:50		
10:50 am	GoJett-Biomite+	eSpace
11:30 am	HySoR-HALO+	ULA/eSpace
12:10 pm	HYPERION- SOLSTICE+	Boeing/eSpace
12:50 pm Lunch		
Poster Sessions		
12:50 pm	Student Poster Presentations	
3:00 pm	AES undergraduate students view posters	
4:00 pm Adjourn		

Capstone Senior Design Project Website: http://aeroprojects.colorado.edu/

No registration fee. Parking fee all day: $7.75, http://tinyurl.com/CUParking

Please RSVP or register before April 10 is suggested and appreciated.

Hotels in walking distance: Millenium Harvest House (www.millenniumhotels.com)
Best Western Boulder Inn (http://www.boulderinn.com/)

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Project Name	Explanation of Acronym (Sponsor)	Brief Description
Biomite	Biofueled Miniature Turbojet Engine (eSpace)	Competitive turbojet product for an expanding UAV propulsion market
Dream Chaser	Dream Chaser Cockpit design (SNC)	Develop a cockpit design architecture focusing on displays, controls, and layout for the SNC Dream Chaser space system based on advances in cockpit technology.
EPICSat	Express Payload Integration CubeSat (LASP)	Design, develop and test a fully functional CubeSat bus using commercial off the shelf parts.
GoJett	Supersonic UAV (eSpace)	Design , build, and fly 1 meter span, 50kg mass, 250 lbs thrust UAV at Mach 1.2
HALO	HySoR Apparatus for Launch Operations (ULA)	Design a portable, scalable, reusable launch support system intended to safely launch the HySoR rocket
HPMS	Hydrazine Propulsion Management System (Ball)	Validate the AFT Impulse software that they use to simulate water hammer effects in their propulsion systems
HYPERION	UAV with hybrid propulsion system (Boeing, eSpace)	Conceive Design, Implement, and Operate an environmentally responsible blended flying wing with a global team of students to explore follow-the-sun design processes.
HySoR	Hybrid Sounding Rocket (ULA, eSpace)	Design, build, and launch a hybrid sounding rocket capable of lifting a 2 kg payload to an altitude of 50 km
REDCROC	REsearch and Development for the Capture and Removal of Orbital Clutter (Lockheed Martin)	Design, build, test, and evaluate an Earth-based demonstration device for the capture of orbital debris
SOLSTICE	Standalone-electric Optimized Lifting System, Transitionable Internal Combustion Engine (eSpace)	Design, manufacture & operate a hybrid engine capable of performing the Hyperion concepts of operation
THEIA	Telescopic High-definition Earth Imaging Apparatus	Design and construct an optical payload engineering unit compatible with the ALL-STAR bus that images earth in full color
XROVER	Extended Range of Versatility Exploration Rovers (JPL)	Add relay capability to the existing R3 multi-rover system in order to explore locations where communication is obstructed with the Mother Rover

Project details can be found on: http://aeroprojects.colorado.edu/

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Dream Chaser Graduate Project

Mission Statement:

"To develop a cockpit design architecture focusing on displays, controls, and layout for the SNC Dream Chaser space system based on advances in cockpit technology balanced with NASA heritage systems."

Sponsors:

- Sierra Nevada Corp.
- University of Colorado at Boulder
- NASA

Final Deliverables:

- Initial displays and controls architecture
- Physical Mockup (Two stages of fidelity) including the design architecture
- Human Factors Evaluation Plan and evaluation testing
- Design considerations for the Engineering Test Article

SNC SIERRA NEVADA CORPORATION Space Systems

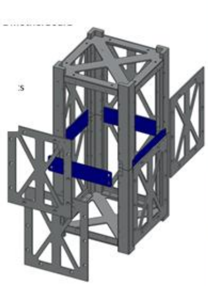
Express Payload Integration CubeSat

Goal: Design, develop and test a fully functional CubeSat bus using commercial off the shelf (COTS) parts.

Emphasis: Interfacing capability to accommodate a sensor payload, and to allow for multiple mission use.

Project Manager	**Erin Tucker**
Systems Engineer	**Swarandeep Singh**
Testing Engineer	**Joseph Freelong**
Structural Engineer	**Erin Halin**
Controls Engineer/CFO	**Greg Miller**
Software Engineer	**Chris Sawyer**
Electronics Engineer	**Jeff Severson**
Safety Engineer	**Evan Townsend**
Communications Engineer	**Erin Tucker**

Customer
Dr. Scott Palo, ____ ____?



Key Interfacing Components

- Electrical Power System (EPS)
- Command & Data Handling (C&DH)
- Communications System (COMM)
- Attitude Determination & Control System (ADCS)
- Modular Structure

Core Concepts

- Design an original 1 cube unit (1U) CubeSat bus structure, and an interfacing system to connect either a 1U or 2U payload structure.
- Adhere to official CubeSat Design Specifications (mass, dimensions, loading requirements)
- Construct system interfacing components to accommodate a sensor payload, with capability for upgrades
- Ensure EPS, C&DH and COMM subsystems consist of COTS parts, and 50% of ADCS

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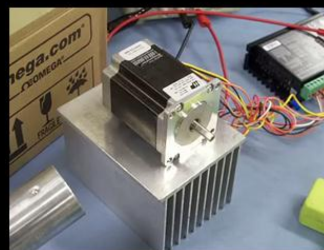
REDCROC

REsearch and Development for the Capture and Removal of Orbital Clutter

Purpose:

To design, build, test, and evaluate an Earth-based demonstration device for the capture of orbital debris.



Objectives:

1) Simulating rendezvous between the device and the debris

2) Deploying the capture device from the system chassis

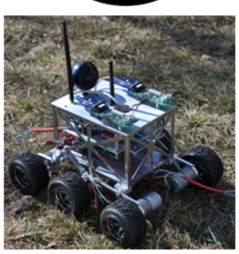
3) Sensing debris capture

4) Securing the debris

Team XROVER
(Extended Range of Versatility Exploration Rovers)

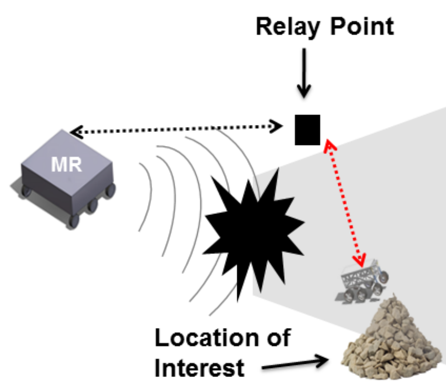
Goal: The goal of X-ROVER is to add relay capability to the existing R3 multi-rover system in order to explore locations where communication is obstructed with the MR. This functionality will be supplemented by the ability of the system to navigate and communicate over TBD terrain.

Customer: Barbara Streiffert, **JPL**



Objectives:

1. Deploy and Dock on Terrain
2. Traverse through Terrain to Location of Interest
3. Communicate Around Obstacles using a Relay System
4. Maintain Previous Capabilities from REMUS and R3



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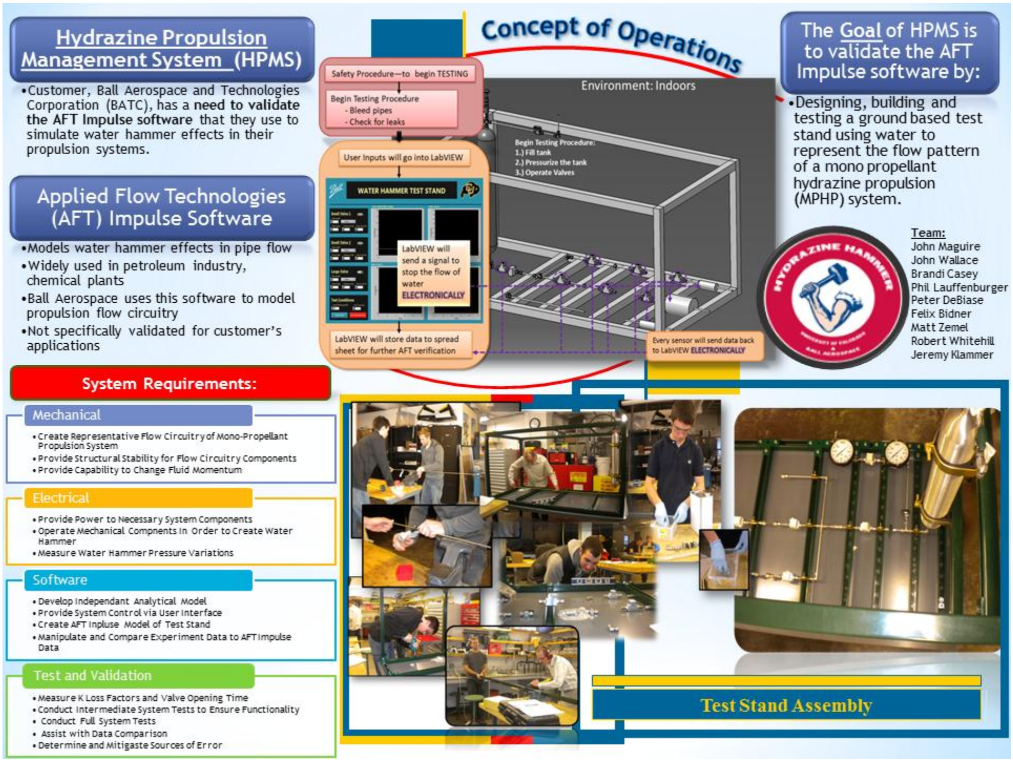
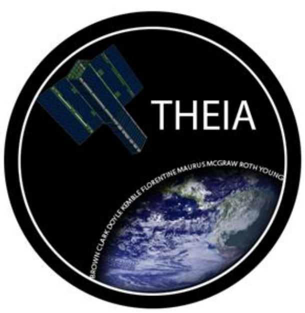


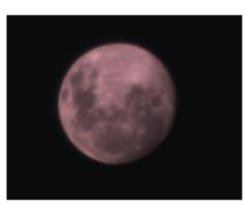


Telescopic High-definition Earth Imaging Apparatus (THEIA)

The THEIA team will **design and construct an optical payload** engineering unit compatible with the ALL-STAR bus that **images earth in full color** ultimately to **verify all capabilities of the ALL-STAR bus**, providing a **marketable proof of concept**.

Customer:
Colorado Space Grant Consortium
Christopher Koehler

PAB Advisor:
Dr.Scott Palo



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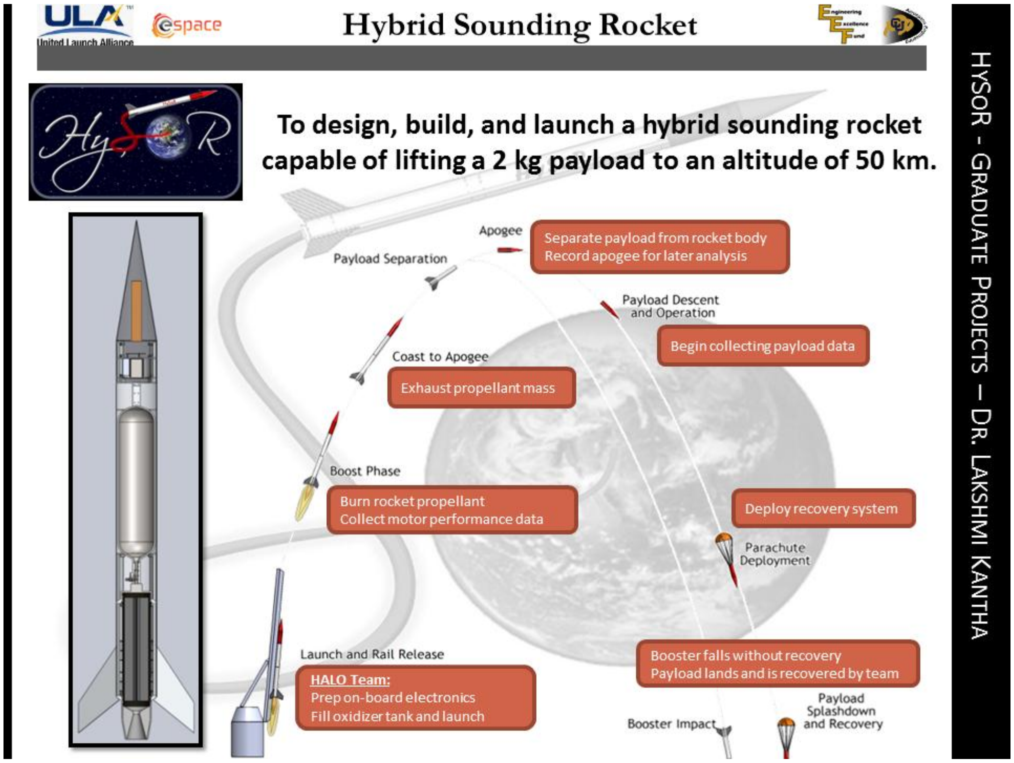

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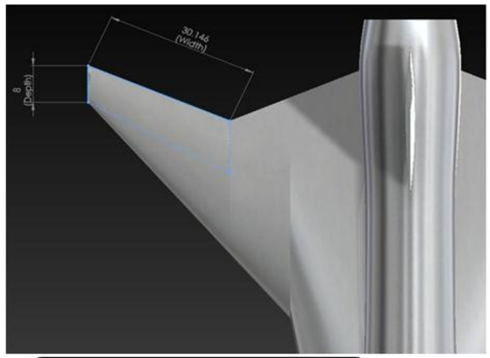
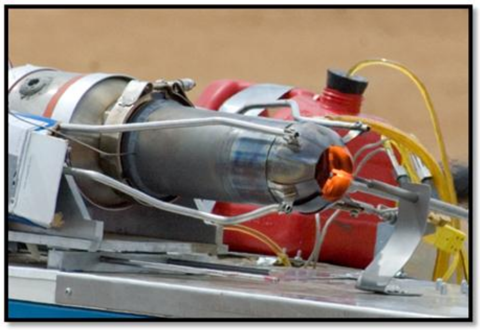
GOJETT Supersonic UAV

Characteristics

- 2 meter length, 1 meter span
- 50kg mass
- Fluidic injection thrust vectoring
- 250 lbs thrust with afterburner



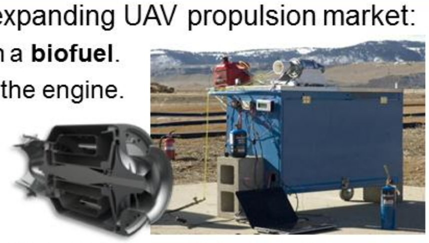


Capabilities

- World's fastest UAV at Mach 1.2
- Tailless flight
- 100km range
- HTOL

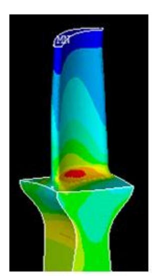
Biofueled **Mi**niature **T**urbojet **E**ngine BIOMITE

- **Competitive** turbojet **product** for an expanding UAV propulsion market:
  - Adapt the engine as necessary to burn a **biofuel**.
  - Increase the **thrust-to-weight** ratio of the engine.



- **Engine modifications:**
  - Add a variable area nozzle
  - Combustion system redesign
  - Fuel change to Synthetic Paraffinic Kerosene biofuel analog
  - Commercial-off-the-shelf turbine replacement

- **Supporting analysis:**
  - Real Brayton cycle analysis
  - Shapiro and Ballal flow analysis
  - ANSYS turbine thermomechanical models
  - Shaft natural frequency and rotordynamics modeling



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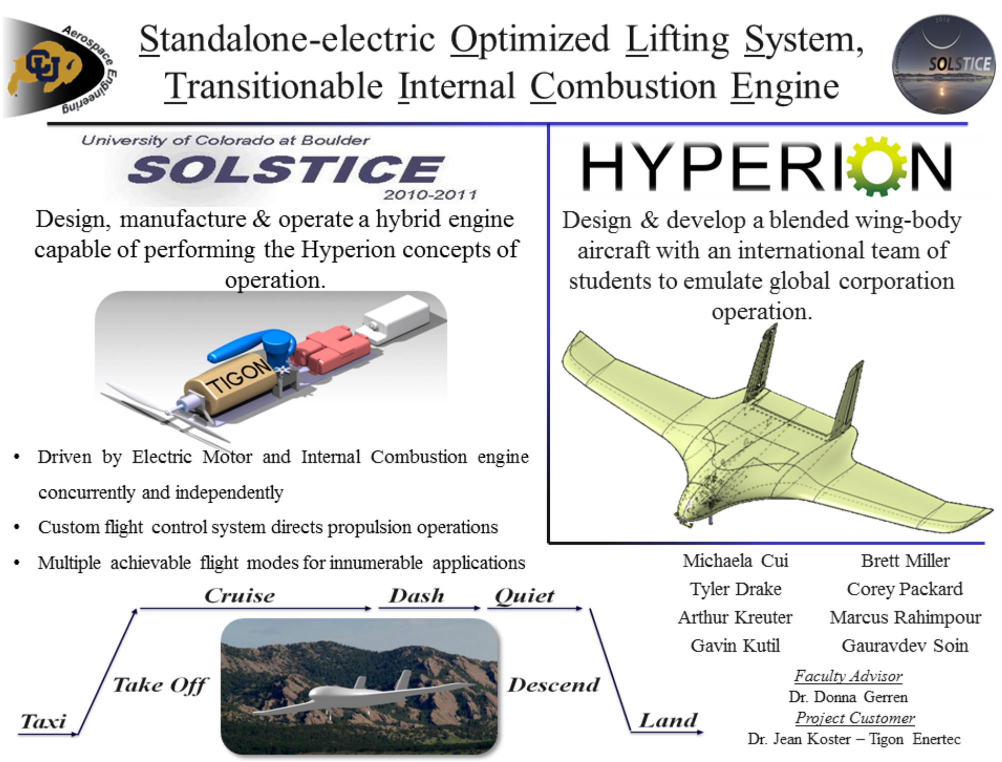

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