NASA Student Launch

What is NASA Student Launch?

Basic Requirements:

- Design and build a reusable rocket to one mile above ground level (AGL) carrying a scientific payload or engineering payload

- Successfully complete 4 reports, 3 reviews (presentations), and a flight hardware and safety inspection

- Provide 2 educational engagement activities reaching 200, or more teachers or students

- Develop a website for documenting progress

- 8 month commitment

- SLI/USLI Handbooks: **http://www.nasa.gov/audience/forstudents/studentlaunch/handbook/index.html**

A quick look at the timeline.

Summer: NASA Advanced Rocketry Workshop (for HS/MS educators)

September: Request for Proposal (RFP) distributed

October: Proposals due, proposals scored, teams announced

November: Preliminary Design Review (PDR), and Website due

January: Critical Design Review (CDR) due

March: Flight Readiness Review (FRR) due

April 4th/5th: Travel to Marshall Space Flight Center

April 5th-7th: Launch Readiness Reviews (LRR) /Tours/Rocket Fair

April 8th: Launch Date and Awards Banquet

April 9th: Launch rain date

May: Post-Launch Assessment Review (PLAR) due/Overall Winner Announced

2016-2017 USLI Teams

College/University

Alabama A&M University – Normal, AL
Auburn University – Auburn, AL
California Polytechnic University – Pomona, CA
California State University – Long Beach, CA
Citrus College – Glendora, CA
Cornell University – Ithaca, NY
Florida Institute of Technology – Melbourne, FL
Florida International University – Miami, FL
Georgia Institute of Technology – Atlanta, GA
Iowa State University – Ames, IA
Loyola Marymount University – Los Angeles, CA
North Carolina State University – Raleigh, NC
Northeastern University – Boston, MA
Northwestern University – Evanston, IL
Pennsylvania State University – State College, PA
Piedmont Virginia Community College – Charlottesville, VA
Purdue University – West Lafayette, IN
Rensselaer Polytechnic Institute – Troy, NY
San Jose State University – San Jose, CA
Tarleton State University – Stephenville, TX
University of Akron – Akron, OH

College/University

University of Alabama in Huntsville – Huntsville, AL
University of Arkansas – Fayetteville, AR
University of California, Berkeley – Berkeley, CA
University of Cincinnati – Cincinnati, OH
University of Evansville – Evansville, IN
University of Florida – Gainesville, FL
University of Illinois, Urbana Champaign – Champaign, IL
University of Louisville – Louisville, KY
University of Massachusetts – Amherst, MA
University of Mississippi – University, MS
University of North Carolina at Charlotte – Charlotte, NC
University of North Dakota – Grand Forks, ND
University of North Texas – Denton, TX
University of Notre Dame – South Bend, IN
University of South Alabama – Mobile, AL
University of South Florida – Tampa, FL
University of Toledo – Toledo, OH
United States Naval Academy – Annapolis, MD
Vanderbilt University – Nashville, TN

2016-2017 SLI Teams

<u>High School/Middle School Component</u>

American Institute of Aeronautics and Astronautics – Orange County – Irvine, CA

Cedar Park Home School – Cedar Park, TX

Deford Dazzlers 4-H – Deford, MI

Engineering and Technologies Academy at Roosevelt School – San Antonio, TX

Ingraham High School – Seattle, WA

Krueger Middle School – San Antonio, TX

Madison West High School – Team Arabidopsis – Madison, WI

Madison West High School – Team Smart Lander – Madison, WI

McKinney High School – McKinney, TX

Newport High School – Bellevue, WA

Northern Illinois Home School Association – Montgomery, IL

Northview Engineering-Sylvania Northview High School – Sylvania, OH

Plantation High School – Team Telemetry – Plantation, FL

Plantation High School – Team Termite – Plantation, FL

San Marcos High School – San Marcos, CA

Spring Grove Area High School – Spring Grove, PA

St. Vincent – St. Mary High School – Akron, OH

Western High School – Davie, FL

How are SLI and USLI different?

Student Launch Initiative	University Student Launch Initiative
Middle and high school teams must place in the top of the Team America Rocketry Challenge (TARC) to be eligible for SLI.	Any University can submit a proposal to participate in the USLI competition.
Must send one teacher or mentor to the Advanced Rocketry Workshop (ARW). Stipends are provided to participants.	Attendance is not monitory at the Advanced Rocketry Workshop (ARW)
SLI is not a competition, but several peer awards are given.	USLI is a competition. Various awards are given. In the past, the overall winner receives $5,000 provided by Orbital ATK
Must use commercial ammonium perchlorate motors. Generally limited on motor size to K class, but experienced teams may propose to fly an L class motor.	Must use commercial ammonium perchlorate motors. Limitations on motor size to L class.

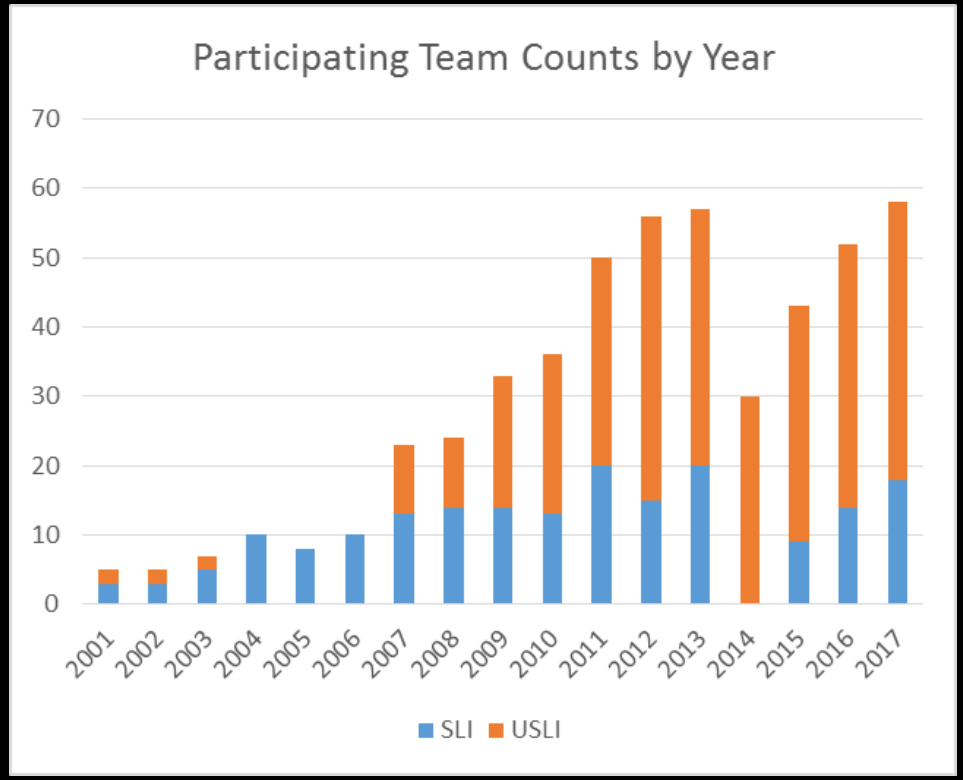
History and Evolution of Student Launch

- SLI started in 2000 by the MSFC Center Director, based on a desire to leverage off a high school student rocket program, and HARA's (local rocket club) education launch experience.

- Initially, SLI was a handful of local teams with heavy mentorship from HARA.
- A link with TARC was established in 2003
  - SLI became a national project.
  - HARA could no longer provide direct mentorship to each team.
  - Relied on the NAR/TRA rocketry network to provide mentorship.
  - Milestone reviews still required dedicated support from local rocketry SMEs.

- HARA worked closely with NASA to evolve SLI/USLI into a unique, world-class educational program.

- Each year, the program evolves to become even better
  - Tailoring/Improving Requirements
  - NAR (instead of HARA)



Engineering Life Cycle Model

- Student Launch Projects is modeled after the Department of Defense and the NASA Engineering Life Cycle
- Tenets of the Engineering Life Cycle
  - Plan for design, build, verification, operations, and disposal of a product
  - Maintain consistency between often dissimilar projects
  - Set expectations for Project Managers, Scientists, and Engineers
    - Plans and Deliverables
    - Fidelity of products
    - Schedule and Budget
- SL is much more than build-and-launch a rocket

Educational Value

More than designing and building a rocket

- Written reports/documentation
- Presentation skills
- Budgets
- Procurement
- Timelines (Gantt charts)
- Community outreach
- Educational engagement
- Teamwork

Building the pipeline in STEM

- TARC
- SLI
- USLI
- Co-op
- Internships
- Workforce

Driving Requirements

- Vehicle shall carry a science or engineering payload of the team's discretion (HS/MS) or the project designated payload (college/university).
- Vehicle shall have a target altitude of 5,280 ft. AGL.
- All components shall be designed to land within 2,500 ft. of the pad.
  - Dual deployment recovery system shall be fully redundant.
  - Landing energy shall be no more than 75 ft.-lbs. for each individual section.
- Vehicle shall be prepped and presented for RSO inspection within 2 hours.
- Vehicle shall have a minimum pad stay time of 1 hour.
- Electronic tracking devices shall be used on every un-tethered section
- Only commercially available, certified motors shall be used in the vehicle.
- Teams shall be responsible for providing their own motors and energetics.
- Team mentors shall be certified for the class of motor to be flown with an established minimum number of successful flights.
- Prohibitions:
  - Supersonic flight
  - Forward Canards
  - Titanium sponge motors
  - Forward-firing motors

Project Examples

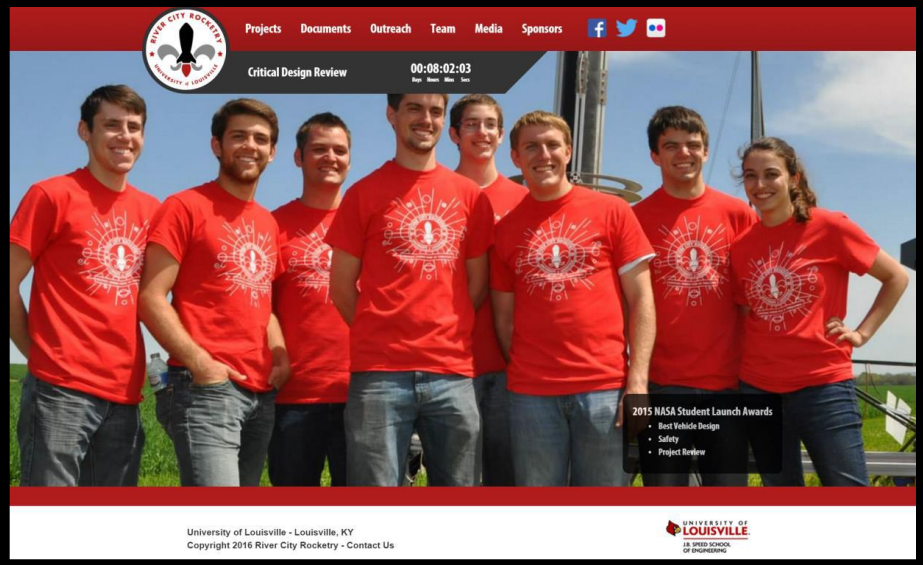
Vanderbilt University

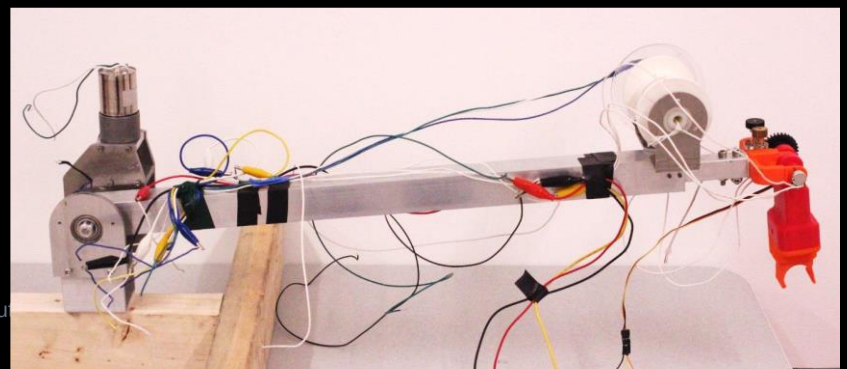
- 2015-2016 Overall Winner and Payload Design Award Winner.
- Custom built tail cone housing two Hydrogen Peroxide thrusters.
- Liquid fuel tank slosh abatement system.
- 1700+ students reached during Educational Engagement Events.

Project Examples (cont'd)

University of Louisville

- 2015-2016 2nd Place Overall, Safety Award, Website Design Award
- Autonomous payload capture and recovery from a simulated Martian environment utilizing a custom launch tower.
- 2400+ students reached during Educational Engagement Events.

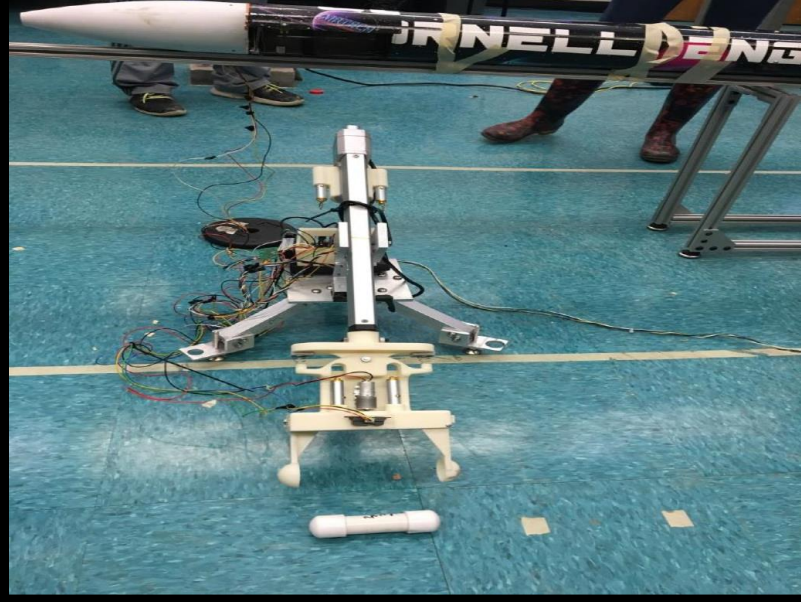


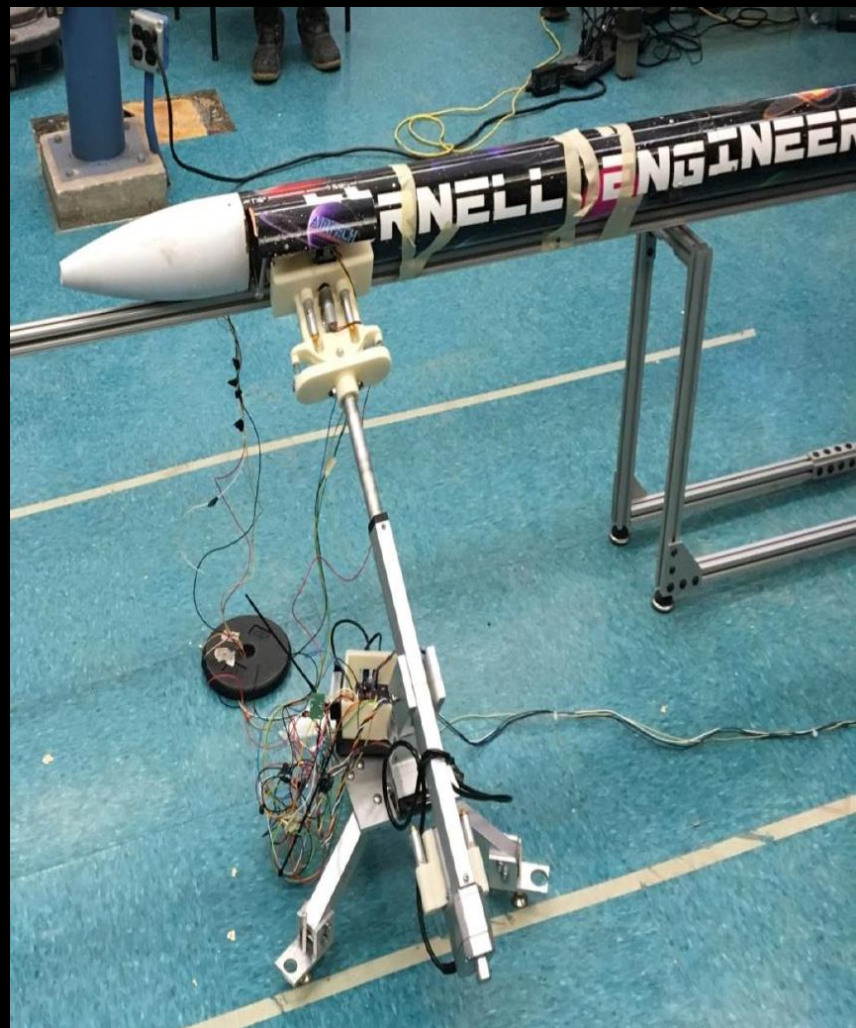


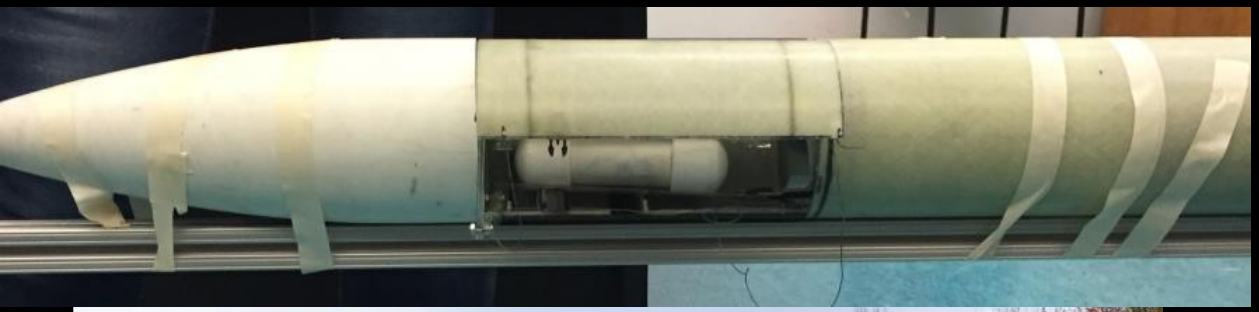
Project Examples (cont'd)

Cornell University

- 2015-2016 3rd Place Overall and Vehicle Award Autonomous Martian payload recovery and insertion into launch vehicle.
- Custom motor driven and externally accessible Payload Enclosure Mechanism.







More about NASA Student Launch…

Rocket Fair

Tours

Launch Day

Contact Information:

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https://www.nasa.gov/education/slp

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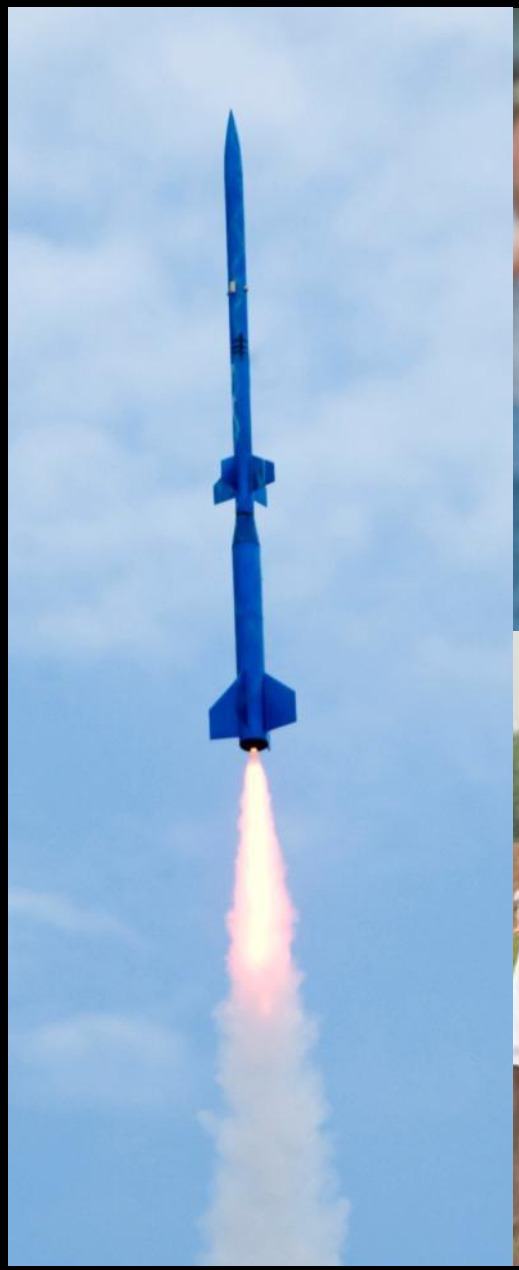

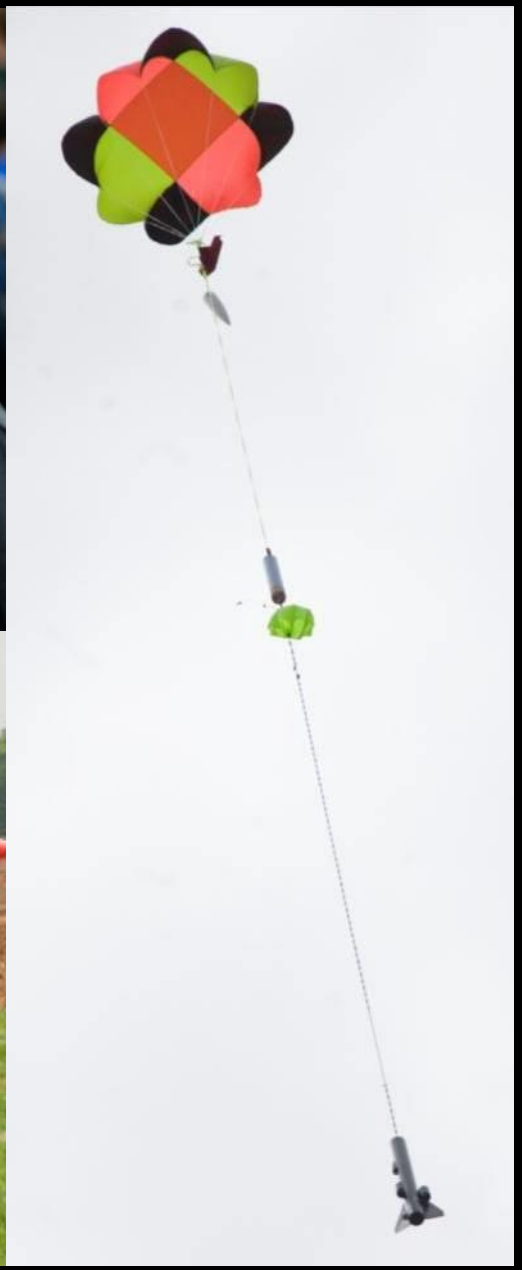

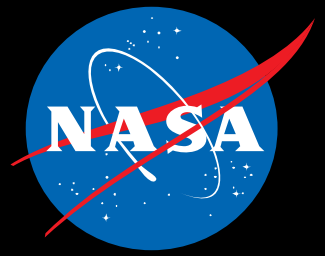
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