

## **TIMELINE**

*(Dates are subject to change.)*

### **August 2008:**

15 Request for Proposal goes out to all teams.

### **October 2008:**

1 One hardcopy and one electronic version of the completed proposal due to NASA/MSFC.

Send 1 Hardcopy to:

Procurement Office, PS22-Q, POC  
NASA Marshall Space Flight Center  
Huntsville, AL 35812

Send Electronic Copy to:

[julie.d.clift@msfc.nasa.gov](mailto:julie.d.clift@msfc.nasa.gov)

[al.krause@msfc.nasa.gov](mailto:al.krause@msfc.nasa.gov)

22 Awards granted. Schools notified of selection.

**Submit Payment Information Form**

23 SLI Teams Teleconference

31 NASA media announces new 2008-2009 SLI Teams

### **November 2008:**

5 Web presence established for each team

28 Preliminary Design Review Report due to Julie Clift and posted on website

### **January 2009:**

22 Critical Design Review Presentation Slides and CDR Report due to Julie Clift and posted on website.

**Motor Selection Due**

28-Feb. 6 Critical Design Review Presentations (*tentative*): **Submit Invoice**

### **March 2009:**

18 Flight Readiness Review Presentation Slides and FRR Report due to Julie Clift and posted on website

25-Apr. 3 Flight Readiness Review Presentations (*tentative*): **Submit Invoice**

### **April 2009:**

15 Travel to Huntsville

16 Rocket Fair/Hardware & Safety Check

18 USLI Launch Day

19 SLI Launch Day

20 Return Home

### **May 2009:**

22 Post-Launch Assessment Review (PLAR): **Submit Invoice**

## **Design, Development, & Launch of a Reusable Rocket & Science Payload Statement of Work**

### **NASA Student Launch Initiative (SLI) Education Programs Department MSFC Funding Period of Performance – Eight (8) months**

The Academic Affairs Office at the NASA Marshall Space Flight Center (MSFC) will partner with schools and informal organizations to sponsor the NASA Student Launch Initiative (SLI) Rocket and Payload Teams during the school calendar year of 2008-2009. The NASA SLI is designed to engage students at the middle and high school level in a learning opportunity that involves design, construction, test, and launch of a reusable launch vehicle and science-related payload. The initiative is intended to encourage students to pursue careers in engineering or science-related fields. Teaming with engineers from government, business, and academia, students get a hands-on, inside look at the science and engineering professions. The selected teams will each build and launch a reusable rocket carrying the students' science payload that will launch in the spring of 2009.

SLI is a rocket and payload-building challenge designed for middle and high school students. It requires an eight (8) month commitment to successfully design, construct, test, launch, and recover a reusable rocket and science payload. The initiative is more than designing and building a rocket from a commercial kit. It involves diverse aspects such as: scheduling, purchasing, performing calculations, financing the project, coordinating logistics, arranging press coverage, and documenting impact made on education through reports and design reviews. Teams are encouraged to involve a diverse group of departments such as mathematics, science, technology, English, journalism, and art.

The performance targets for the reusable launch vehicle and payload are:

- The vehicle shall carry a science payload. Time critical payloads are discouraged.
- The vehicle shall be developed so that it delivers the science payload to a specific altitude of 5,280 feet above ground level (AGL).
- The vehicle shall be designed to use a standard launch rail. Exceptions may be made for returning teams who chose to use an "L" motor
- New teams: Maximum total motor impulse provided by the entire vehicle shall not exceed 2560 Newton-seconds (K class). This total impulse constraint is applicable to any combination of a single motor, clustered motors, and staged motors.
- Returning Teams: Maximum total motor impulse provided by the entire vehicle shall not exceed 4000 Newton-seconds (L class). This total impulse constraint is applicable to any combination of a single motor, clustered motors, and staged motors.

- The vehicle shall use solid motor propulsion using ammonium perchlorate composite propellant (APCP) motors. Teams will have a choice of motors to choose from. NOTE: The motor selection date is a hard deadline.
- The launch vehicle and science payload shall be designed to be recoverable and reusable.
- Separation at apogee will be allowed but not advised. Separating at apogee increases the risk of drifting outside of the recovery area. Exception: Separating at apogee to deploy a drogue parachute. Dual deployment and shear pins are encouraged.
- Preparation of the vehicle and payload on launch day shall not exceed 4 hours. At the end of the 4-hour preparation period, the team must be prepared to launch.
- Data from the science payload shall be collected, analyzed, and reported by the team following the scientific method.
- A tracking device shall be placed on the vehicle allowing the rocket and payload to be recovered after launch.
- The following items should not be used in building the rocket:
  - No flashbulbs. The recovery system must use commercially available low-current electric matches.
  - No forward canards
  - No Mach-Busters
  - No forward firing motors
  - No rear ejection parachute designs

**At a minimum, the proposing team shall identify the following in a written proposal due to NASA Marshall by October 1<sup>st</sup>, 2008:**

**School Information**

1. Name & Title of Project
2. Name and title of the administrative staff member (this person will be referred to as the "team official") dedicated to the project (ex. principal, assistant principal, counselor, leader, or troop/council leaders).
3. Names and titles of a minimum of two (2) dedicated educators or mentors.
4. Approximate number of student participants who will be committed to the project and their proposed duties. Include an outline of the project organization that identifies the key managers (students and/or administrators) and the key technical personnel. Short resumes should be included in the report for these key positions. Only use first names for identifying team members.

**Facilities/Equipment**

1. Description of facilities and hours of accessibility that will be used for the design, manufacture, and test of the rocket components, the rocket, and the science payload.
2. Necessary personnel, facilities, equipment, and supplies (not otherwise provided by the Government) that are required to design and build a competitive rocket and payload. The team shall make provisions for verifying the altitude of the rocket.
3. Computer Equipment: Describe the type of computer equipment accessible to participants for communications; for designing, building and hosting a team web site; and for document development to support design reviews. The school shall provide and maintain a web presence where the status of the project will be posted, as well as a list of needed materials and/or expertise. The team official will provide the capability to communicate via e-mail on a daily basis with the NASA SLI Projects Lead. Be sure to include:
  - a. The information technology identified could include computer hardware, computer-aided drafting (CAD) system capability
  - b. Internet access
  - c. e-mail capability
  - d. presentation simulation software

The school shall provide the additional computer equipment needed to perform Video Teleconferencing. Minimum requirements include:

- e. broadband connection

- f. Windows Vista, XP, 2K, ME or 98
- g. Microphone Headset and/or speaker phone capabilities in close proximity to the computer
- h. Firewall, USB, and analog video camera
- i. Personnel name and contact information for firewall issues

OR

- j. Video Teleconferencing Equipment

Please indicate the preferred method of teleconferencing with MSFC.

### Safety

The Federal Aviation Administration (FAA) [[www.faa.gov](http://www.faa.gov)] has specific laws governing the use of airspace. A demonstration of the understanding and intent to abide by the applicable federal laws (especially as related to the use of airspace at the launch sites and the use of combustible/flammable material), safety codes, guidelines, and procedures for building, testing, and flying large model rockets is crucial. The procedures and safety regulations of the National Association of Rocketry (NAR)

[<http://www.nar.org/safety.html>] should be used for flight design and operations. Lead educators and National Association of Rocketry (NAR)/Tripoli Rocketry Association (TRA) mentors shall oversee launch operations and motor handling.

1. Each school is responsible for contacting their local NAR or TRA chapter and establishing a relationship with a NAR/TRA mentor. This person's name and contact information should be included in the written report and included as a team member. The NAR/TRA mentor will be instrumental in helping the team learn sport rocketry practices and will be responsible for safety inspections. ***The NAR/TRA team member must be LEVEL 2 certified before April 4<sup>th</sup> 2009. One level 2 mentor MUST accompany the team to the SLI launch in April.***
2. Written safety plan addressing the safety of the materials used, facilities involved, and person responsible for insuring that the plan is followed. A risk assessment should be done for all these aspects in addition to proposed mitigations. Identification of risks to the successful completion of the project should be included. Please include the following safety requirements in your report:
  - (a.) Provide a description of the plans for National Association of Rocketry (NAR) personnel to perform or ensure the following:
    - Compliance with NAR safety requirements

- Performance of all hazardous materials handling and hazardous operations.
  - Compliance with all environmental laws and regulations
- (b.) Describe the plan for briefing students on hazard recognition and accident avoidance, and conducting pre-launch briefings.
- (c.) Describe methods to include necessary caution statements in plans, procedures and other working documents.

For example: Control of all hazardous materials (Applicable MSDS: Materials Safety Data Sheets for your project must be included in your proposal under safety plan.) [[www.msds.com/SearchPage.asp](http://www.msds.com/SearchPage.asp)] [<http://ehs.cornell.edu/msdssrch.asp>]

3. Any team that is found not compliant with Safety & Mission Assurance (S&MA) will not fly their rocket.

### **Technical Design**

1. A proposed and detailed approach to rocket and payload design.
  - a. Include projected general vehicle dimensions
  - b. Include projected motor type and size
  - c. Include a projected science payload
  - d. Address the primary requirements for rocket and payload
  - e. Include major challenges and solutions.

### **Outreach**

1. A written plan for soliciting additional "community support," which could include, but is not limited to, expertise needed, additional equipment/supplies, monetary donations, services (such as free shipping for launch vehicle components, if required, advertisement of the event, etc.), or partnering with industry or other public, private, or parochial universities.
2. Include plans of at least two outreach projects that engage a combined total of 75 or more younger students in rocketry. Comprehensive feedback on the activity must be developed.

### **Project Plan**

1. A top-level development schedule/timeline which should outline the project milestones and the basic schedule for designing, building, testing, and launching the rocket and payload(s).
2. Budget for all proposed activities, including travel to/from Huntsville.

3. Describe how the program meets curriculum framework and national education standards.
  - a. Outline standards met at your local level
  - b. Outline standards met at the National level.

**Second Year or Returning Teams should also include the following:**

1. Develop a clear plan for sustainability of the rocket program in the local area. This plan should include how to provide and maintain established partnerships and regularly engage successive classes of students and rocketry. It should also include partners (industry/community), recruitment of students, funding sustainability, and community outreach.
2. A similar rocket project can be proposed if the team is comprised of mostly new students who were not involved in the previous year's work, but this needs to be shown. Otherwise the team of returning students must show an advanced project appropriate to a second year of expertise. Keep in mind that veteran teams get no preference in the evaluations and must still compete against all other proposals. All reviews must have the required level of detail and must not assume that board/panel remembers what had been accomplished the previous year.

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Prior to award, all proposing entities may be required to brief NASA representatives. The time and the place for the briefings will be determined by the NASA/MSFC Academic Affairs Office.

**Deliverables shall include:**

1. A reusable rocket and science payload (available for NASA/MSFC display) ready for launch in April of 2009.
2. A scale model of the rocket design with a payload prototype should be flown before Critical Design Review (CDR). A report of the data from the flight as well as the model should be brought to the CDR.
3. Reports and PowerPoint presentations due on November 28, January 22, and March 18 shall be submitted to the Academic Affairs Office prior to receiving incremental funding. Reports and presentations must also be posted on the team website by the due date. *(Dates are tentative at this point. Final dates will be announced at time of award.)*
4. The Post-Launch assessment Review (PLAR) for the rocket and payload shall be due to the MSFC Procurement Office with a copy to the MSFC Academic Affairs Office no later than May 22, 2009, prior to receiving final incremental funding.
5. The team(s) shall have a web presence no later than November 5<sup>th</sup>. The web site shall be maintained/updated throughout the school year.

6. Copies of any other products developed (journal, 3-D animation, media coverage, video, scrapbook, etc.) shall be delivered to the NASA/MSFC Academic Affairs Office prior to the final launch.
7. An electronic copy of the comprehensive report pertaining to the implemented Outreach activity or activities.
8. A safety plan outlining how NAR safety requirements will be implemented and how safety will be incorporated into all manufacturing, testing, and launching activities. The risk assessment will include such things as (but not limited to): risks associated with faculty support, school support, financial/sponsor support, use of facilities, partnering arrangements, schedule risks, risks associated with chosen designs. This will be updated throughout the program and presented at the Critical Design Review (CDR) and Flight Readiness Review (FRR). The initial plan will be due with the Preliminary Design Review on November 28<sup>th</sup>, 2008. *(This date is tentative. Final date will be announced at time of award.)*

The team(s) shall participate in a Preliminary Design Review (PDR) (approximately November 2008), Critical Design Review (CDR) (approximately January 2009), Flight Readiness Review (FRR) (March 2009), and Launch (April 2009). Exact dates and locations will be provided at time of award.

The PDR, CDR, and FRR will be presented to NASA at a time and location to be determined by NASA/MSFC Academic Affairs Office. **The presentation will be done using Video Teleconferencing/Web casting capabilities and PowerPoint and should be available on the team website no later than 7 days prior to the review board meetings.**

**Incremental funding of the project will be provided on the following criteria:**

1. 1500 dollars (new teams) or 750 dollars (second year teams) will be issued upon award of the contract.
2. 1600 dollars (new teams) or 1400 dollars (second year teams) can be invoiced upon receipt of the January 30, 2009 CDR report, verification of team's Web presence, and successful completion of CDR.
3. 400 dollars (new teams) or 200 dollars (second year teams) can be invoiced upon receipt of the April 3, 2009 FRR reports, and successful completion of FRR.
4. 200 dollars (new teams) or 100 dollars (second year teams) can be invoiced upon successful completion of flight and post-launch assessment review report.

*(Dates are tentative. Final dates will be announced at time of award).*

**Total SLI Budget Award of:**

- \$3700 (new teams)**
- \$2450 (second year teams)**