National Aeronautics and
Space Administration

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What is the NASA University Student Launch Initiative?

The NASA University Student Launch Initiative (USLI) involves students in designing, building and testing reusable rockets with associated scientific payloads. This unique hands-on experience allows students to demonstrate proof-of-concept for their designs and gives previously abstract concepts tangibility.

Both new and returning teams compete to construct the vehicle that is designed to reach an altitude of one mile above ground level (AGL). In addition to actual vehicle performance, teams are also evaluated on design and other criteria. This educational experience culminates with a launch in the spring.

Proposal/Statement of Work

Timeline for the USLI Project

(Dates are subject to change.)

August 2010:

16 Request for proposal goes out to all teams.

October 2010:

1 One electronic copy of the completed proposal due to NASA MSFC.

Send Electronic Copy to:

edward.m.jeffries@nasa.gov
Jacobs ESTS Group

julie.d.clift@nasa.gov

12 Schools notified of selection.
21 USLI team teleconference (tentative)

November 2010:

1 Web presence established for each team.
19 Preliminary Design Review (PDR) report and PDR presentation slides posted on the team Web site.

December 2010:

6-10 Preliminary Design Review Presentations (tentative)

January 2011:

24 Critical Design Review (CDR) reports and CDR presentation slides posted on the team Web site.

February 2011:

2-8 Critical Design Review Presentations (tentative)

March 2011:

21 Flight Readiness Review (FRR) reports and FRR presentation slides posted on the team Web site.
28-31 Flight Readiness Review Presentations (tentative)

April 2011:

13 Travel to Huntsville
14-15 Flight Hardware and Safety Checks (tentative)
16 Launch Day

May 2011:

9 Post-Launch Assessment Review (PLAR) posted on the team Web site.
20 Announcement of winning USLI team

Design, Development, and Launch of a Reusable Rocket and Science Payload Statement of Work

NASA University Student Launch Initiative (USLI)
Academic Affairs Office
Period of Performance – Eight (8) months

The Academic Affairs Office at the NASA Marshall Space Flight Center (MSFC) will partner with universities to sponsor the NASA University Student Launch Initiative (USLI) rocket and payload teams during academic year 2010-2011. The NASA USLI is designed to engage students at the university 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 universities will sponsor student teams who will each build and launch a reusable rocket carrying the students' science payload that will launch in the spring of 2011.

USLI is a rocket and payload-building challenge designed for university 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, educational engagement, Web site development, and documenting impact made on education through reports and design reviews. Universities are encouraged to involve a diverse group of departments such as engineering, mathematics, science, technology, English, journalism, and art.

All teams, new and returning, must propose to be a part of the USLI project. All accepted teams will be required to adhere to the requirements for all formal reviews. These include a Preliminary Design Review (PDR), Critical Design Review (CDR), Flight Readiness Review (FRR), Post-Launch Assessment Review (PLAR), and other reviews as assigned.

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

1. The vehicle shall carry a science and/or engineering payload following one of two options:
    a. Option 1: The engineering or science payload may be of the team's discretion.
    b. Option 2: The Science Mission Directorate (SMD) at NASA HQ will provide a $5,000 sponsorship to any team that chooses to build and fly a deployable science payload meeting the following minimum criteria:
        - The payload shall gather data for studying the atmosphere during descent and after landing. Measurements shall include pressure, temperature, relative humidity, solar irradiance and ultraviolet radiation. Measurements shall be made at least every 5 seconds during descent and every 60 seconds after landing. Surface data collection operations will terminate 10 minutes after landing.
        - The payload shall take at least 2 pictures during descent and 3 after landing.
        - The payload shall remain in an orientation during descent and after landing such that the pictures taken portray the sky toward the top of the frame and the ground toward the bottom of the frame.
        - The data from the payload shall be stored onboard and transmitted to the team's ground station after of completion of surface operations.

- Separation of payload components at apogee will be allowed, but not advised. Separating at apogee increases the risk of drifting outside of the recovery area. The payload will carry a GPS tracking unit. Minimum separation altitude will be 2,500 feet.
- Teams shall clearly identify in the proposal whether they will fly a payload of their choice or the NASA SMD sponsored payload.

2. The vehicle shall be developed so that it delivers the science or engineering payload closest to, but not exceeding an altitude of 5,280 feet above ground level (AGL). One point will be deducted for each foot achieved below the target altitude. Two points will be deducted for each foot achieved above the target altitude. **Any team whose vehicle travels over 5,600 ft AGL according to their competition altimeter will be disqualified from being able to receive the overall competition award and will receive a score of zero for the altitude portion of their total score.**

3. The vehicle shall carry one Perfect Flight MAWD or ALT15 altimeter for recording of the official altitude used in the competition scoring. Teams may have additional altimeters to control vehicle electronics and payload experiments. At the flight hardware and safety check, a NASA official will mark the altimeter which will be used for the official scoring. At the launch field, a NASA official will also obtain the altitude by listening to the audible beeps reported by the altimeter. The following circumstances will warrant a score of zero for the altitude portion of the competition:
    a. The official, marked altimeter is damaged and/or does not report an altitude after the team's competition flight.
    b. A team does not report to the NASA official designated to record the altitude with their official marked altimeter by 5:00 pm on the day of the launch.

4. The recovery system electronics shall have the following characteristics:
    a. Redundant altimeters.
    b. Each altimeter shall be armed by a dedicated arming switch and have a dedicated battery.
    c. Each arming switch shall be accessible from the exterior of the rocket airframe.
    d. Each arming switch shall be capable of being locked in the on position for launch.
    e. The recovery system shall be designed to be armed on the pad.
    f. The recovery system electronics shall be completely independent of the payload electronics.

5. The launch vehicle and science or engineering payload shall remain subsonic from launch until landing.

6. The launch vehicle and science or engineering payload shall be designed to be recoverable and reusable. Reusable, for purposes of the competition, is defined as being able to be launched again on the same day with no repairs or modifications necessary.

7. Separation at apogee of payload components 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.

8. Dual deployment recovery shall be used.

9. Removable shear pins shall be used for both the main parachute compartment and the drogue parachute compartment.

10. The vehicle, or all un-tethered sections, shall have a landing velocity under the main parachute(s) between 17 and 22 ft/s, inclusive.

11. The vehicle, or all un-tethered sections, shall have a descent rate under the drogue parachute(s) between 50 and 100 ft/s, inclusive.

12. Each rocket shall be capable of being prepared for flight at the launch site within 4 hours, from the time the waiver opens at the field until RSO inspections have been successfully completed.

13. All vehicle and payload components shall be designed to land within 2500 ft. of the pad with a 10 mile/hour wind.

14. After being fully armed for launch, the rocket shall be capable of remaining on the pad for 1 hour before launching without losing the functionality of any vehicle or payload component.

15. Rockets with ammonium perchlorate composite propellant (APCP) motors shall be launched from a standard firing system (provided by the Range) that does not need additional circuitry or special ground support equipment to initiate the flight or complicate a normal 10 second countdown.

16. Rockets with hybrid motors shall be serviced and launched via user-supplied ground support equipment (GSE), for servicing and for launch. Hybrid GSE shall have the capability of servicing and igniting the motor at the following safe distances (minimum):
    a. For J and K hybrid motors: 300′
    b. For L and M hybrid motors: 600′

17. Data from the science or engineering payload shall be collected, analyzed, and reported by the team following the scientific method.

18. An electronic tracking device shall transmit the rockets position via radio frequency to the ground. Every un-tethered section of the vehicle must have its own transmitting tracking device. Audible beepers may be used for recovery in conjunction with an electronic, transmitting device, but shall not be used as a replacement for a transmitting tracking device.

19. Only commercially-available motors shall be used, and approved and certified by the National Association of Rocketry (NAR), Tripoli Rocketry Association (TRA) and/or the Canadian Association of Rocketry (CAR).

20. Solid motor propulsion shall use commercially available APCP motors. Motors which expel titanium sponges (Sparky, Skidmark, MetalStorm, etc.) shall not be allowed.

21. Each team shall be responsible for providing their launch equipment and energetics, with the exception of the electronic launch system which will be provided by the range for APCP motors. Teams using hybrid motors shall provide their electronic controller, per Requirement #15.

22. All teams shall successfully launch their full scale rocket prior to Flight Readiness Review (FRR) in its competition flight configuration. The vehicle and recovery system must have functioned as designed. The payload is not required to be flown during the full-scale test flight. If the payload is not flown on the full-scale test flight, mass simulators should be used to simulate the missing payload mass. If the payload changes the external surface (cameras, movable fins, etc.), those devices must be flown during the full scale test flight. The purpose of the full-scale test flight is to verify the vehicle's stability, structural integrity, recovery systems, and the team's performance. The flight certification form will be filled out by an L2 NAR/TRA observer. Sub-scale motors may be used during the full-scale test flight.

23. The additional following items are prohibited from use in the rocket:
    a. Flashbulbs. The recovery system must use commercially available low-current electric matches.
    b. Forward canards.
    c. Forward firing motors.
    d. Rear ejection parachute designs.

24. Students on the team shall do 100% of the work on the project, including design, construction, written reports, presentations, and flight preparation.

25. The maximum amount teams may spend on the rocket and payload is $5000 total. The cost is for the competition rocket as it sits on the pad, including all purchased components and materials and the fair market value of all donated components and materials. The following items may be omitted from the total cost of the vehicle:
    a. Shipping costs.
    b. Ground support equipment.
    c. Team Labor

26. Each team shall use a launch and safety checklist. The final checklist shall be included in the FRR report and used during the flight hardware and safety inspection and launch day.

At a minimum, the proposing team shall identify the following in a written proposal due to NASA MSFC by October 1, 2010:

School Information

1. Name of school/organization and 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.

3. Name and title of the individual who will take responsibility for implementation of the safety plan. (Safety Officer)

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; do not include surnames.

5. Name of the NAR/TRA section the team is associating with for launch assistance, mentoring and reviewing.

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 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 team 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 USLI Project Office. The information technology identified could include computer hardware, computer-aided drafting (CAD) system capability, Internet access, e-mail capability, and presentation simulation software

The team shall provide additional computer equipment needed to perform WebEx video teleconferencing. Minimum requirements include the following:

- Windows, Mac, Linux, Unix, or Solaris computer systems.
- Broadband internet connection
- Speakerphone capabilities in close proximity to the computer.
- USB webcam or analog video camera.
- Personal name and contact information for WebEx/connectivity issues.

4. USLI teams must implement the Architectural and Transportation Barriers Compliance Board Electronic and Information Technology (EIT) Accessibility Standards (36 CFR Part 1194) (http://www.acquisition.gov/far/current/html/Subpart%2039_2.html#wp1004775)

   Subpart B-Technical Standards (http://www.section508.gov/index.cfm?FuseAction=Content&ID=12):

   - 1194.21 Software applications and operating systems. (a-l)
   - 1194.22 Web-based intranet and internet information and applications. 16 rules (a-p)
   - 1194.26 Desktop and portable computers. (a-d)

Safety

The Federal Aviation Administration (FAA) [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 NAR [http://www.nar.org/safety.html] should be used for flight design and operations. **If solid propellant is chosen for the rocket design, a NAR or TRA certification is required for solid propellant handling.** The team official and NAR/TRA mentors shall oversee launch operations and motor handling.

1. Each team is responsible for contacting their local NAR or TRA section and establishing a relationship with a currently certified level 2 or 3 NAR/TRA mentor. This person's name and contact information should be 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 is designated as the individual owner of the rocket for liability purposes and MUST accompany the team to the USLI launch in April. A stipend will be provided.***

2. Provide a 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 procedures for NAR/TRA personnel to perform. Ensure the following:
      - Compliance with NAR high power safety code requirements [http://nar.org/NARhpsc.html].
      - Performance of all hazardous materials handling and hazardous operations.

   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 (MSDS) for your project must be included in your proposal under safety plan).

3. Each team shall provide evidence that they are cognizant of federal, state, and local laws regarding unmanned rocket launches and motor handling. Specifically, regarding the use of airspace, Federal Aviation Regulations 14 CFR, Subchapter F, Part 101, Subpart C; the handling and use of low-explosives (Ammonium Perchlorate Rocket Motors, APCP), Code of Federal Regulation Part 55 (note: these regulations are not applicable to most hybrid motors); and fire prevention, NFPA 1127 "Code for High Power Rocket Motors."

4. Each school team shall provide a plan to possess the capability to purchase, store, transport, and use rocket motors.

5. Each team traveling to Huntsville for a rocket launch shall describe in detail their plan to maintain full control of their motor(s), per all applicable federal laws, from purchase of the motors until the motors are used.

6. A written statement that all team members understand and will abide by the following safety regulations:

   a. Range safety inspections of each rocket before it is flown. Each team shall comply with the determination of the safety inspection.

   b. The Range Safety Officer has the final say on all rocket safety issues. Therefore, the Range Safety Officer has the right to deny the launch of any rocket for safety reasons.

   c. Any team that does not comply with the safety requirements will not be allowed to launch 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.

Educational Engagement

1. Provide 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 schools.

2. Include plans for at least two educational projects that engage a combined total of 75 or more younger students in rocketry to be completed prior to launch week, April 16, 2011. Comprehensive feedback on the activities must be developed and submitted.

Project Plan

1. Provide 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. Provide a budget plan for all proposed activities including travel. This should include a detailed plan on how the project will be funded.

Second Year or Returning Teams should also include the following:

1. Develop a clear plan for sustainability of the rocket project in the local area. This plan should include how to provide and maintain established partnerships and regularly engage successive classes of students in rocketry. It should also include partners (industry/community), recruitment of students, funding sustainability, and educational engagement.

2. A similar rocket project can be proposed if the team is 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 propose 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 of the other universities. All reviews must have the required level of detail and must not assume that board/panel members remember what had been accomplished the previous year. Repeat projects are discouraged.

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 or engineering payload (available for NASA MSFC display) ready for launch in April 2011.

2. A scale model of the rocket design with a payload prototype. This model should be flown prior to the CDR. A report of the data from the flight and the model should be brought to the CDR.

3. Reports and PowerPoint presentations due on November 19, 2010, January 24 and March 21, 2011 shall be submitted to the Academic Affairs Office on schedule. Reports and presentations must also be posted on the team Web site by the due date. *(Dates are tentative at this point. Final dates will be announced at the time of award.)*

4. The PLAR for the rocket and payload shall be due to the MSFC Academic Affairs Office no later than May 9, 2011, prior to receiving final incremental funding.

5. The team(s) shall have a Web presence no later than November 1, 2010. The Web site shall be maintained/updated throughout the period of performance. It will be judged at random times throughout the year.

6. Copies of any other products developed (journal, 3-D animation, media coverage, video, scrapbook, etc.) shall be displayed during launch.

7. An electronic copy of the comprehensive report pertaining to the implemented educational engagement or activities shall be submitted prior to the launch in April 2011.

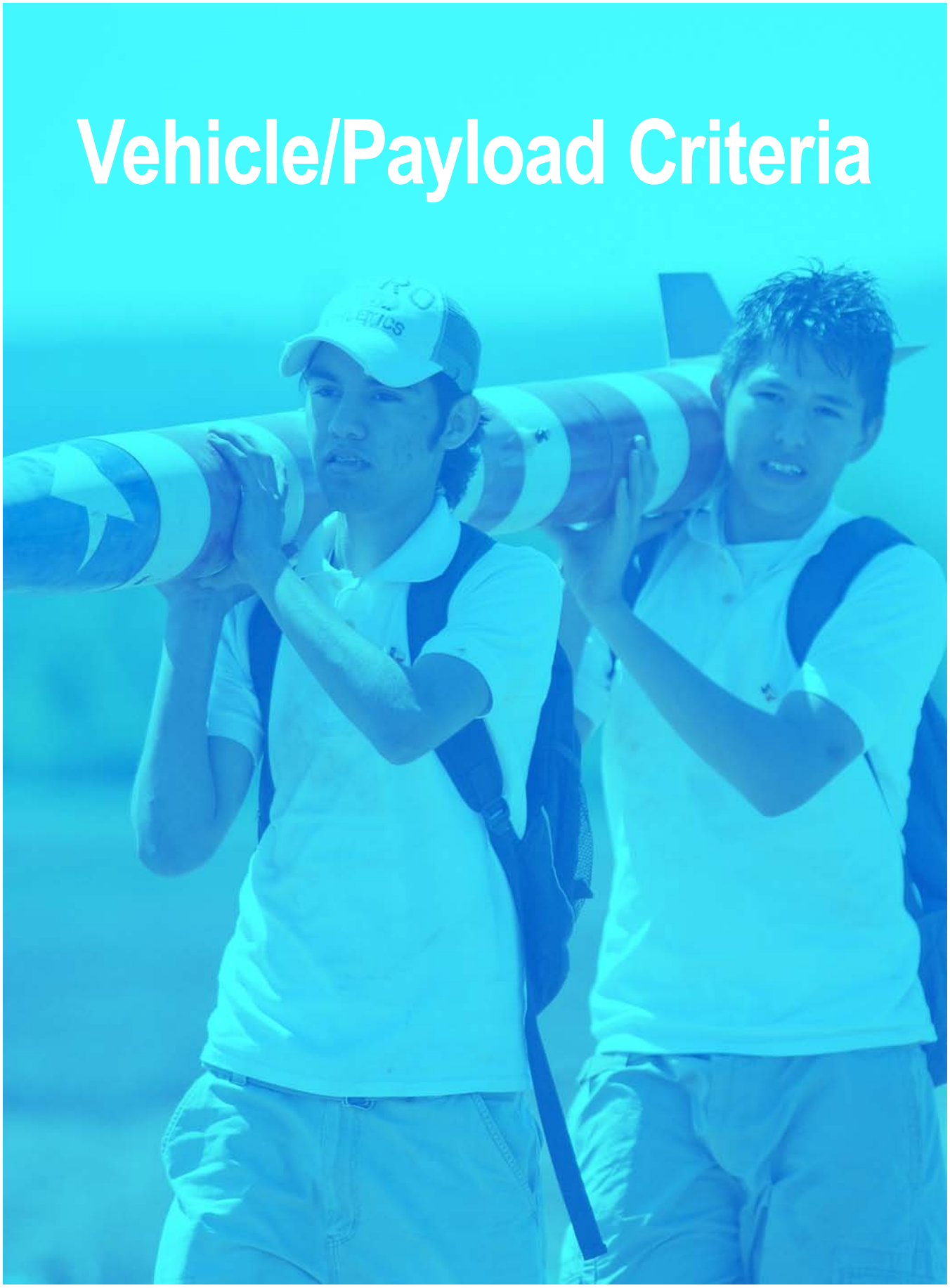
8. A safety plan outlining how NAR safety requirements will be implemented and how safety will be incorporated into all manufacturing, testing, and launching activities. The risk assessment will include such things as (but not limited to): risks associated with faculty support, school support, financial/sponsor support, use of facilities, partnering arrangements, schedule risks, risks associated with chosen designs. This will be updated throughout the program and presented at the CDR and FRR. The initial plan will be due with the PDR on November 19, 2010. (This date is tentative. Final date will be announced at time of award.)

9. A reusable rocket and science payload (available for NASA MSFC display) ready for launch in April 2011.

   The team(s) shall participate in a PDR (November 2010), CDR (January 2011), FRR (March 2011), and Launch (April 16, 2011). *(Dates are tentative and subject to change.)*

   The 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 WebEx video teleconferencing and PowerPoint presentations and should be available on the team Web site on the dates listed in the time line for the USLI project.**

Vehicle/Payload Criteria



Preliminary Design Review (PDR)
Vehicle and Payload Experiment Criteria

The PDR demonstrates that the overall preliminary design meets all requirements with acceptable risk and within the cost and schedule constraints and establishes the basis for proceeding with detailed design. It shows that the correct design options have been selected, interfaces have been identified, and verification methods have been described. Full baseline cost and schedules, as well as all risk assessment, management systems, and metrics, are presented.

The panel will be expecting a professional and polished report. Please use Arial, size 12 font for your PDR Report. It is advised to follow the order of sections as they appear below.

Preliminary Design Review Report

I) Summary of PDR report (1 page maximum)

Team Summary
- Team name
- Location
- Team official/Mentors

Launch Vehicle Summary
- Size
- Motor choice
- Recovery system

Payload Summary
- Summarize experiment

II) Changes made since Proposal (1-2 pages maximum)

Highlight all changes made since the proposal and the reason for those changes.
- Changes made to vehicle criteria
- Changes made to payload criteria
- Changes made to activity plan

III) Vehicle Criteria

Selection, Design, and Verification of Launch Vehicle
- Include a mission statement, requirements, and mission success criteria.
- Include a major milestone schedule (project initiation, design, manufacturing, verification, operations, and major reviews).
- Review the design at a system level, going through each system's functional requirements (includes sketches of options, selection rationale, selected concept, and characteristics).
- Describe the subsystems that are required to accomplish the overall mission.
- Describe the performance characteristics for the system and subsystems and determine the evaluation and verification metrics.

- Describe the verification plan and its status.
- Define the risks and the plans for reducing the risks through analysis or testing for each system. A risk plot that clearly portrays the risk mitigation schedule is highly encouraged. Take all factors that might affect the project including risks associated with testing, delivery of parts, adequate personnel, school holidays, budget costs, etc. Demonstrate an understanding of all components needed to complete the project and how risks/delays impact the project.
- Demonstrate planning of manufacturing, verification, integration, and operations. (Include component testing, functional testing, or static testing).
- Describe the confidence and maturity of design.
- Include a dimensional drawing of entire assembly.

Recovery Subsystem

- Demonstrate that analysis has begun to determine size for mass, attachment scheme, deployment process, and test results with ejection charge and electronics.

Mission Performance Predictions

- State mission performance criteria.
- Show flight profile simulations, altitude predictions with simulated vehicle data, component weights, and simulated motor thrust curve.
- Show stability margin, simulated Center of Pressure (CP)/Center of Gravity (CG) relationship and locations.

Payload Integration

- Describe integration plan with an understanding that the payload must be co-developed with the vehicle, be compatible with stresses placed on the vehicle, and integrate easily and simply.

Launch Operation Procedures

- Determine what type of launch system and platform will be used.
- Develop an outline of final assembly and launch procedures.

Safety and Environment (Vehicle)

- Identify a safety officer for your team.
- Provide a preliminary analysis of the failure modes of the proposed design of the rocket, payload integration, and launch operations, including proposed and completed mitigations.
- Provide a listing of personnel hazards and data demonstrating that safety hazards have been researched, such as material safety data sheets, operator's manuals, and NAR regulations, and that hazard mitigations have been addressed and enacted.
- Discuss any environmental concerns.

II) Payload Criteria

Selection, Design, and Verification of Payload Experiment

- Review the design at a system level, going through each system's functional requirements (includes sketches of options, selection rationale, selected concept, and characteristics).
- Describe the payload subsystems that are required to accomplish the payload objectives.
- Describe the performance characteristics for the system and subsystems and determine the evaluation and verification metrics.
- Describe the verification plan and its status.
- Describe preliminary integration plan.
- Determine the precision of instrumentation, repeatability of measurement, and recovery system.

Payload Concept Features and Definition

- Creativity and originality
- Uniqueness or significance
- Suitable level of challenge

Science Value

- Describe payload objectives.
- State the payload success criteria.
- Describe the experimental logic, approach, and method of investigation.
- Describe test and measurement, variables, and controls.
- Show relevance of expected data and accuracy/error analysis.
- Describe the preliminary experiment process procedures.

Safety and Environment (Payload)

- Identify safety officer for your team.
- Provide a preliminary analysis of the failure modes of the proposed design of the rocket, payload integration, and launch operations, including proposed and completed mitigations
- Provide a listing of personnel hazards and data demonstrating that safety hazards have been researched, such as material safety data sheets, operator's manuals, and NAR regulations, and that hazard mitigations have been addressed and enacted.
- Discuss any environmental concerns.

IV) Activity Plan

Show status of activities and schedule

- Budget plan
- Timeline
- Educational engagement

V) Conclusion

Preliminary Design Review Presentation

Please include the following in your presentation:

- Initial vehicle dimensions, materials and justifications
- Static stability margin
- Plan for vehicle safety verification and testing
- Initial motor selection and justification
- Thrust to weight ratio
- Plan for motor safety verification and testing
- Baseline payload design
- Plan for payload safety verification and testing
- Baseline recovery system design
- Plan for recovery system safety verification and testing

The PDR will be presented to a panel that may be comprised of any combination of scientists, engineers, safety experts, education specialists, and industry partners.

It is expected that the **students** deliver the report and answer all questions.

The presentation of the PDR shall be well prepared with a professional overall appearance. This includes, but is not limited to, the following: easy to see slides; appropriate placement of pictures, graphs, and videos; professional appearance of the presenters; speaking clearly and loudly; looking into the camera; referring to the slides, not reading them; and communicating to the panel in an appropriate and professional manner.

Critical Design Review (CDR)
Vehicle and Payload Experiment Criteria

The CDR demonstrates that the maturity of the design is appropriate to support proceeding full-scale fabrication, assembly, integration, and test and that the technical effort is on track to complete the flight and ground system development and mission operations in order to meet overall performance requirements within the identified cost and schedule constraints. Progress against management plans, budget, and schedule, as well as risk assessment, are presented.

The panel will be expecting a professional and polished report. Please use Arial, size 12 font for your CDR Report. It is advised to follow the order of sections as they appear below.

Critical Design Review Report

I) Summary of CDR report (1 page maximum)

Team Summary
- Team name
- Location
- Team official/Mentors

Launch Vehicle Summary
- Size
- Motor choice
- Recovery system
- Rail size

Payload Summary
- Summarize experiment

II) Changes made since PDR (1-2 pages maximum)

Highlight all changes made since PDR and the reason for those changes.
- Changes made to vehicle criteria
- Changes made to payload criteria
- Changes made to activity plan

III) Vehicle Criteria

Design and Verification of Launch Vehicle
Flight Reliability Confidence
- Include mission statement, requirements, and mission success criteria
- Include major milestone schedule (project initiation, design, manufacturing, verification, operations, and major reviews)
- Review the design at a system level.
    - Updated drawings and specifications
    - Analysis results
    - Test results
    - Motor selection

- Demonstrate that the design can meet all system level functional requirements.
- Specify approach to workmanship as it relates to mission success.
- Discuss planned additional component, functional, or static testing.
- Status and plans of remaining manufacturing and assembly.
- Discuss the integrity of design.
    - Suitability of shape and fin style for mission
    - Proper use of materials in fins, bulkheads, and structural elements
    - Proper assembly procedures, proper attachment and alignment of elements, solid connection points, and load paths
    - Sufficient motor mounting and retention
    - Status of verification
- Discuss the safety and failure analysis.

Recovery Subsystem

- Suitable parachute size for mass, attachment scheme, deployment process, and test results with ejection charge and electronics
- Safety and failure analysis

Mission Performance Predictions

- State the mission performance criteria.
- Show flight profile simulations, altitude predictions with real vehicle data, component weights, and actual motor thrust curve.
- Show thoroughness and validity of analysis, drag assessment, and scale modeling results.
- Show stability margin and the actual CP and CG relationship and locations.

Payload Integration

Ease of integration

- Describe integration plan
- Installation and removal, interface dimensions, and precision fit
- Compatibility of elements
- Simplicity of integration procedure

Launch concerns and operation procedures

- Submit draft of final assembly and launch procedures
- Recovery preparation
- Motor preparation
- Igniter installation
- Setup on launcher
- Troubleshooting
- Post flight inspection

Safety and Environment (Vehicle)

- Identify safety officer for your team
- Update the preliminary analysis of the failure modes of the proposed design of the rocket and payload integration and launch operations, including proposed and completed mitigations.
- Update the listing of personnel hazards and data demonstrating that safety hazards have been researched, such as material safety data sheets, operator's manuals, and NAR regulations, and that hazard mitigations have been addressed and enacted.
- Discuss any environmental concerns.

IV) Payload Criteria

Testing and Design of Payload Experiment

- Review the design at a system level.
    - Drawings and specifications
    - Analysis results
    - Test results
    - Integrity of design
- Demonstrate that the design can meet all system level functional requirements.
- Specify approach to workmanship as it relates to mission success.
- Discuss planned component testing, functional testing, or static testing.
- Status and plans of remaining manufacturing and assembly.
- Describe integration plan.
- Discuss the precision of instrumentation and repeatability of measurement.
- Provide a safety and failure analysis.

Payload Concept Features and Definition

- Creativity and originality
- Uniqueness or significance
- Suitable level of challenge

Science Value

- Describe science payload objectives.
- State the payload success criteria.
- Describe the experimental logic, approach, and method of investigation.
- Describe test and measurement, variables, and controls.
- Show relevance of expected data and accuracy/error analysis.
- Describe the experiment process procedures.

Safety and Environment (Payload)

- Identify safety officer for your team.
- Update the preliminary analysis of the failure modes of the proposed design of the rocket and payload integration and launch operations, including proposed and completed mitigations.
- Update the listing of personnel hazards, and data demonstrating that safety hazards have been researched (such as material safety data sheets, operator's manuals, NAR regulations), and that hazard mitigations have been addressed and mitigated.
- Discuss any environmental concerns.

V) Activity Plan

Show status of activities and schedule

- Budget plan
- Timeline
- Educational engagement

VI) Conclusion

Critical Design Review Presentation

Please include the following information in your presentation:

- Motor selection
- Rocket flight stability in static margin diagram
- Thrust to weight motor selection in flight simulation
- Rail exit velocity
- Parachute sizes and descent rates
- Test plans and procedures
- Scale model flight test
- Dual deployment avionics test
- Ejection charge amount test
- Payload integration feasibility

The CDR will be presented to a panel that may be comprised of any combination of scientists, engineers, safety experts, education specialists, and industry partners.

It is expected that the **students** deliver the report and answer all questions.

The presentation of the CDR shall be well prepared with a professional overall appearance. This includes, but is not limited to, the following: easy-to-see slides; appropriate placement of pictures, graphs, and videos; professional appearance of the presenters; speaking clearly and loudly; looking into the camera; referring to the slides, not reading them; and communicating to the panel in an appropriate and professional manner.

Flight Readiness Review (FRR)
Vehicle and Payload Experiment Criteria

The FRR examines tests, demonstrations, analyses, and audits that determine the overall system (all projects working together) readiness for a safe and successful flight/launch and for subsequent flight operations. It also ensures that all flight and ground hardware, software, personnel, and procedures are operationally ready.

The panel will be expecting a professional and polished report. Please use Arial, size 12 font for your FRR Report. It is advised to follow the order of sections as they appear below.

Flight Readiness Review Report

I) Summary of FRR report (1 page maximum)

Team Summary
- School name
- Location
- Team official/Mentors

Launch Vehicle Summary
- Size
- Motor choice (Final)
- Recovery system
- Rail size

Payload Summary
- Summarize experiment

II) Changes made since CDR (1-2 pages maximum)

Highlight all changes made since CDR and the reason for those changes.
- Changes made to vehicle criteria
- Changes made to payload criteria
- Changes made to activity plan

III) Vehicle Criteria

Testing and Design of Vehicle
- Discuss flight reliability confidence. Demonstrate that the design can meet mission success criteria. Discuss analysis, and component, functional, or static testing.
- Describe proper use of materials in fins, bulkheads, and structural elements.
- Explain composition and rationale behind selection.
- Explain strength of assembly, proper attachment and alignment of elements, solid connection points, and load paths. (Looking for optimum assembly quality.) Show sufficient or exemplary motor mounting and retention.

- Discuss the integrity of design and that you have used analysis to improve design. Demonstrate the suitability of shape and fin style for mission.
- Specify approach to workmanship as it relates to mission success, including neatness of workmanship, quality of appearance, and attractiveness.
- Provide a safety and failure analysis, including a table with failure modes, causes, effects, and risk mitigations.
- Discuss full scale launch test results.

Recovery Subsystem

- Suitable parachute size for mass, attachment scheme, deployment process, test results with ejection charge and electronics
- Safety and failure analysis. Include table with failure modes, causes, effects, and risk mitigations.

Mission Performance Predictions

- State mission performance criteria
- Provide flight profile simulations, altitude predictions with real vehicle data, component weights, and actual motor thrust curve. Include real values with optimized design for altitude. Include sensitivities.
- Thoroughness and validity of analysis, drag assessment, and scale modeling results. Compare math analysis and models to measured values.
- Provide stability margin, with actual CP and CG relationship and locations. Include dimensional moment diagram or derivation of values with points indicated on vehicle. Include sensitivities.
- Provide a safety and failure analysis. Include a table of failure models, causes, effects, and risk mitigations.

Safety and Environment (Vehicle)

- Identify safety officer for your team.
- Update the preliminary analysis of the failure modes of the proposed design of the rocket, payload integration, and launch operations, including proposed and completed mitigations.
- Update the listing of personnel hazards, including data demonstrating that safety hazards have been researched, such as material safety data sheets, operator's manuals, and NAR regulations, and that hazard mitigations have been addressed and accomplished.
- Discuss any environmental concerns.

Payload Integration

- Describe integration plan.
- Demonstrate compatibility of elements and show fit at interface dimensions.
- Describe and justify payload-housing integrity.
- Demonstrate integration: show a diagram of components and assembly with documented process.

IV) Payload Criteria

Experiment Concept

This concerns the quality of science. Give clear, concise, and descriptive explanations.

- Creativity and originality
- Uniqueness or significance
- Suitable level of challenge

Science Value

- Describe payload objectives in a concise and distinct manner.
- State the mission success criteria.
- Describe the experimental logic, scientific approach, and method of investigation.
- Explain how it is a meaningful test and measurement, and explain variables and controls.
- Discuss the relevance of expected data, along with an accuracy/error analysis, including tables and plots.
- Provide detailed experiment process procedures.

Experiment Design of Payload

- Review the design at a system level, describe integration plan, and demonstrate that the design can meet all mission goals.
- Provide information regarding the precision of instrumentation and repeatability of measurement. (Include calibration with uncertainty.)
- Discuss the application of engineering, functionality, and feasibility.
- Provide flight performance predictions (flight values integrated with detailed experiment operations).
- Discuss flight preparation procedures.
- Specify approach to workmanship as it relates to mission success.
- Discuss completed component, functional, or static testing

Assembly

- Clear details of how the rocket is assembled.
- Integration and compatibility simplicity
- Structural integrity for flight
- Quality of construction

Safety and Environment (Payload)

This will describe all concerns, research, and solutions to safety issues related to the payload.

- Identify safety officer for your team.
- Update the preliminary analysis of the failure modes of the proposed design of the rocket, payload integration, and launch operations, including proposed and completed mitigations.
- Update the listing of personnel hazards, including data demonstrating that safety hazards have been researched, such as material safety data sheets, operator's manuals, and NAR regulations, and that hazard mitigations have been addressed and enacted.
- Discuss any environmental concerns.

V) Launch Operations Procedures

Checklist

Provide detailed procedure and check lists for the following.

- Recovery preparation
- Motor preparation
- Igniter installation
- Setup on launcher
- Launch procedure
- Troubleshooting
- Post flight inspection

Safety and Quality Assurance

Provide detailed safety procedures for each of the categories in the Launch Operations Procedures checklist. Include the following:

- Provide data demonstrating that risks are at acceptable levels.
- Provide risk assessment for the launch operations, including proposed and completed mitigations.
- Discuss environmental concerns.
- Identify individual that is responsible for maintaining safety, quality and procedures checklists.

VI) Activity Plan

Show status of activities and schedule

- Budget plan
- Timeline
- Educational engagement

VII) Conclusion

Flight Readiness Review Presentation

Please include the following information in your presentation:

- Motor choice
- Rocket flight stability in static margin diagram
- Thrust to weight motor selection in flight simulation
- Rail exit velocity
- Parachute sizes and descent rates
- Test plans and procedures
- Full scale flight test
- Dual deployment avionics test
- Ejection charge amount test
- Payload integration feasibility

The FRR will be presented to a panel that may be comprised of any combination of scientists, engineers, safety experts, education specialists, and industry partners.

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Flight Hardware and Safety Check (FHSC)
Vehicle and Payload Experiment Criteria

The FHSC is the final review prior to actual launch in order to verify that launch system and spacecraft/payloads are ready for launch.

Launch services personnel will conduct the FHSC, one or two days prior to launch. Students should be prepared to answer any and all questions about their rocket. Team officials and mentors may be present during the FHSC. Only upon specific direction of the launch services personnel conducting the FHSC should a teacher or mentor become involved.

Rockets certified by the Range Safety Officer (RSO) will be able to fly during the official launch. Teams needing to make repairs or changes as a result of the initial FHSC results can request a second FHSC to occur on launch day. The RSO will reevaluate the rocket for launch readiness and determine whether or not to allow the rocket to launch at that time.

Post-Launch Assessment Review (PLAR)
Vehicle and Payload Experiment Criteria

The PLAR is an assessment of system in-flight performance.

Your PLAR should include the following items at a minimum. Your PLAR should be about 4-15 pages in length.

- Team name
- Motor used
- Brief payload description
- Rocket height
- Rocket diameter
- Rocket mass
- Altitude reached (Feet)
- Vehicle Summary
- Data analysis & results of vehicle
- Payload summary
- Data analysis & results of payload
- Scientific value
- Visual data observed
- Lessons learned
- Summary of overall experience (what you attempted to do versus the results and how you felt your results were; how valuable you felt the experience was)
- Educational engagement summary
- Budget Summary

Educational Engagement Form

Please complete and submit this form each time you host an educational engagement event.

Team name:_____

Date of event: _____

Location of event: _____

Grade level and number of participants:

Pre K-4 (1-9 years):_____

5-8 (10-13 years): _____

9-12 (14-18 years): _____

12+ (18+ years): _____

Total: _____

Are the participants with a special group/organization (i.e., Girl Scouts, 4-H, school)? ___Y ___N

If yes, what group/organization? _____

Briefly describe your activities with this group: _____

_____

_____

_____

_____

_____

Did you conduct an evaluation of your educational engagement? If so, what were the results?

_____

_____

_____

_____

_____

NASA Project Life Cycle 101

Charles Pierce
Deputy Chief, Spacecraft & Auxiliary Propulsion Systems Branch,
NASA – Marshall Space Flight Center

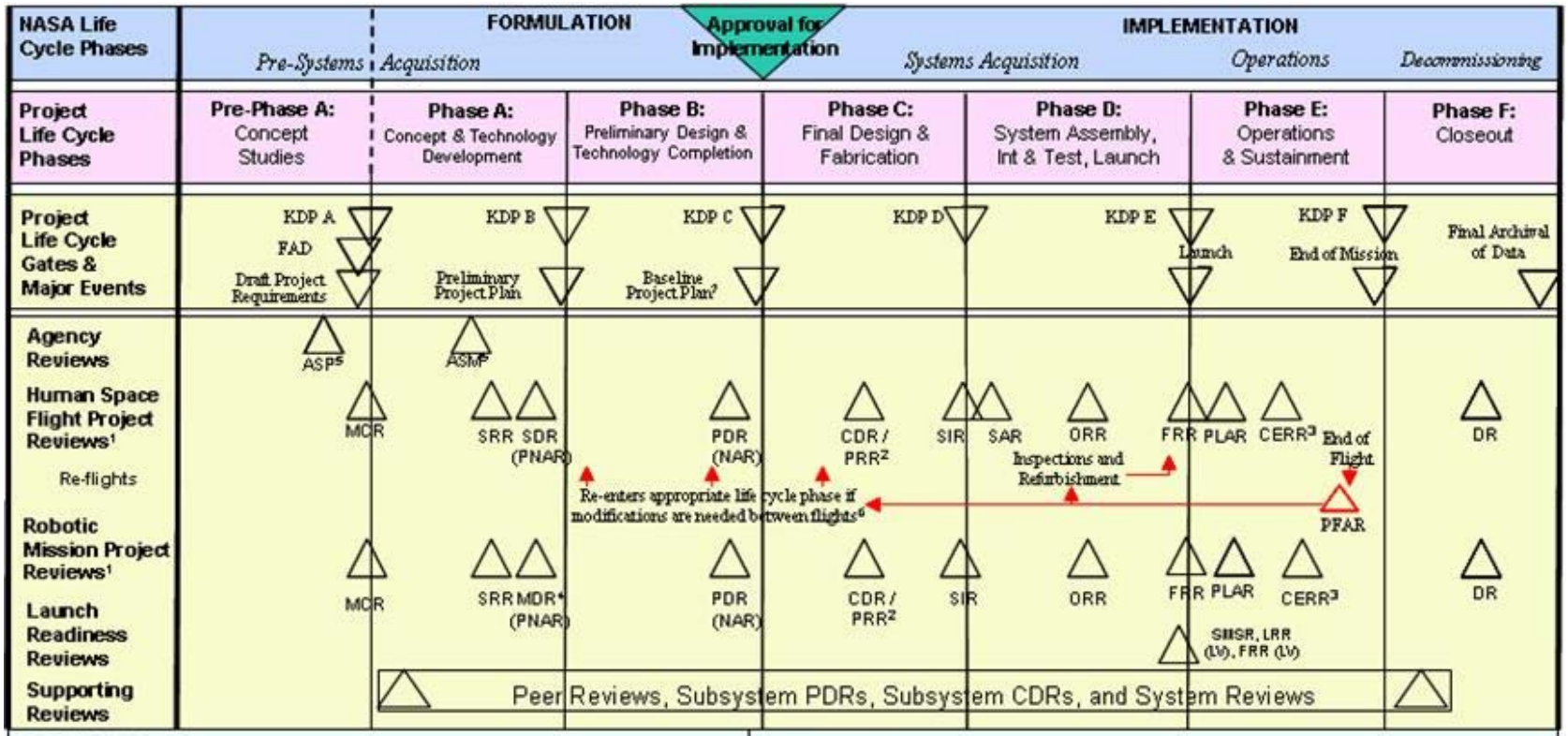
Topics

- Purpose / Objective
- NASA Project Life Cycle (Typical)
- Preliminary Design Review
- Critical (Final) Design Review
- Flight Readiness Review
- Post Flight

Purpose/Objectives of the NASA Project Life Cycle

- Plan for the design, build, verification, flight operations, and disposal of the desired system
- Maintain consistency between projects
- Set expectations for Project Managers, Scientists, & Engineers
  - Plans and Deliverables
  - Fidelity
  - Timing

Typical NASA Project Life Cycle



FOOTNOTES

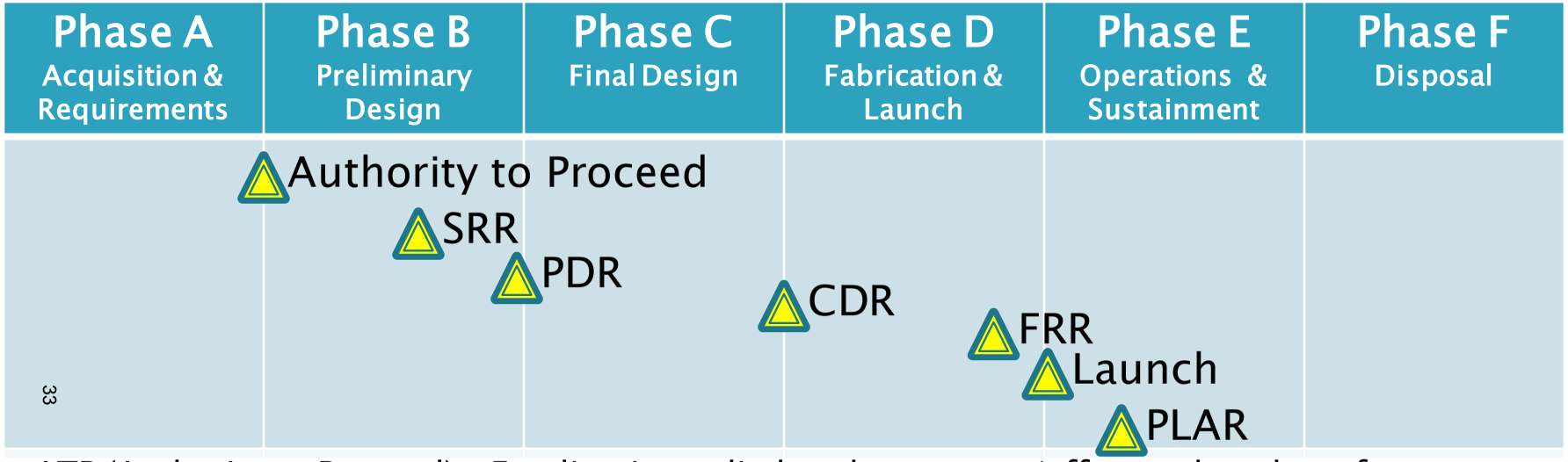
1. Flexibility is allowed in the timing, number, and content of reviews as long as the equivalent information is provided at each KDP and the approach is fully documented in the Project Plan. These reviews are conducted by the project for the independent SRB. See Section 2.5 and Table 2-6.
2. PRR needed for multiple (≥4) system copies. Timing is notional.
3. CERRs are established at the discretion of Program Offices.
4. For robotic missions, the SRR and the MDR may be combined.
5. The ASP and ASM are Agency reviews, not life-cycle reviews.
6. Includes recertification, as required.
7. Project Plans are baselined at KDP C and are reviewed and updated as required, to ensure project content, cost, and budget remain consistent.

ACRONYMS

ASP—Acquisition Strategy Planning Meeting
ASM—Acquisition Strategy Meeting
CDR—Critical Design Review
CERR—Critical Events Readiness Review
DR—Decommissioning Review
FAD—Formulation Authorization Document
FRR—Flight Readiness Review
KDP—Key Decision Point
LRR—Launch Readiness Review
MCR—Mission Concept Review
MDR—Mission Definition Review
NAR—Non-Advocate Review
ORR—Operational Readiness Review
PDR—Preliminary Design Review
PFAR—Post-Flight Assessment Review
PLAR—Post-Launch Assessment Review
PNAR—Preliminary Non-Advocate Review
PRR—Production Readiness Review
SAR—System Acceptance Review
SDR—System Definition Review
SIR—System Integration Review
SMSR—Safety and Mission Success Review
SRR—System Requirements Review

Reference: NPR 7120.5D, Figure 2-4: "The NASA Project Life Cycle"

Student Launch Projects (SLP) Life Cycle



- ATP (Authority to Proceed) – Funding is applied to the contract/effort and work performance can begin
- SRR (System Requirements Review) – Top Level Requirements are converted into system requirements. System Requirements are reviewed and authority is given to proceed into Preliminary Design. The USLI/SLI Project skips this step. Note: This review is skipped for SLP, due to time constraints.
- PDR (Preliminary Design Review) – Preliminary Design is reviewed and authority is given to proceed into Final Design.
- CDR (Critical Design Review) – Final Design is reviewed and authority is given to proceed to build the system.
- FRR (Flight Readiness Review) – As-built design and test data are reviewed and authority is given for Launch.
- PLAR (Post Launch Assessment Report) – Summarize project (cradle to grave), discuss mission results and compare to expected results, document lessons learned.

Preliminary Design Review (PDR)

- Objective
  - Prove the feasibility to build and launch the rocket/payload design.
  - Prove that all system requirements will be met.
  - Receive authority to proceed to the Final Design Phase
- Typical Products (Vehicle and Payload)
  - Preliminary Design Discussion
    - Drawings, sketches
    - Identification and discussion of components
    - Analyses (such as Vehicle Trajectory Predictions) and Simulation Results
    - Risks
    - Mass Statement and Mass Margin
  - Schedule from PDR to Launch (including design, build, test)
  - Cost/Budget Statement
  - Mission Profile (Concept of Operations)
  - Interfaces (within the system and external to the system)
  - Test and Verification Plan (for satisfying requirements)
  - Ground Support Equipment Designs/Identification
  - Safety Features

Critical Design Review (CDR)

- Objective
  - Complete the final design of the rocket/payload system
  - Receive authority to proceed into Fabrication and Verification phase
    - In a perfect world, fabrication/procurement of the final system wouldn't begin until a successful completion of CDR.
    - Due to schedule constraints, however, it is often necessary to start procurements and fabrication prior to CDR.
    - Procurements and Fabrication that start prior to CDR add an extra risk to the Project because design issues may be discovered at CDR that impact procurements or fabrication.
- Typical Products (Vehicle and Payload)
  - PDR Deliverables (matured to reflect the final design)
  - Report and discuss completed tests
  - Procedures and Checklists

Flight Readiness Review (FRR)

- Objective
  - Prove that the Rocket/Payload System has been fully built, tested, and verified to meet the system requirements
  - Prove that all system requirements have been, or will be, met
  - Receive authority to proceed to Launch
- Typical Products (Vehicle and Payload)
  - Schedule
  - Cost Statement
  - Design Overview
    - Key components
    - Key drawings and layouts
    - Trajectory and other key analyses
    - Key Safety Features
    - Mass Statement
    - Remaining Risks
  - Mission Profile
  - Presentation and analysis and models (use real test data)
  - System Requirements Verification
  - Ground Support Equipment
  - Procedures and Check Lists

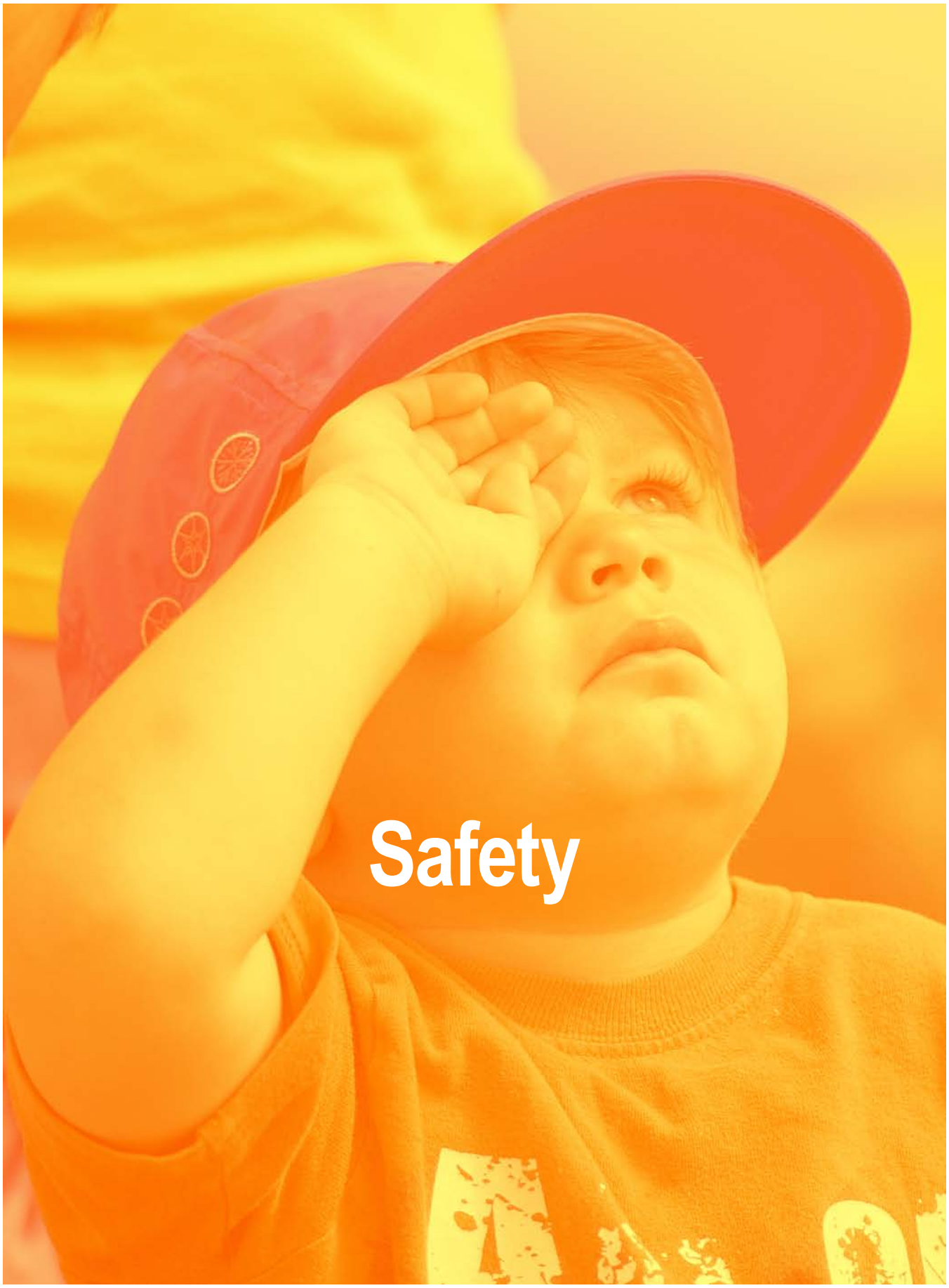
Hardware Inspections (Hands on)

- Objective
  - To perform a hands-on final inspection of the rocket system, prior to launch
  - Performed by the operators of the Launch Range
- Process
  - Rockets deconstructed
    - Mechanical components pulled and twisted
    - Electronics and Wiring inspected (as much as possible)
    - Recovery System fully inspected
  - Questions asked
    - Arming, Activation, Execution Sequences
    - Rocket and Payload Functions
  - Launch Day Procedures reviewed
  - Questions Answered (anything about Launch Day or Range Operations)
  - Actions given to repair unsafe elements in the rocket system (if any are found)

- Note: This inspection is a Pre Range Safety Officer (RSO) inspection.
  - It occurs one day before launch and it purpose is to give the Student Teams an opportunity to correct hardware issues that could otherwise result in the denial of launch of their rocket.
  - A final RSO inspection will occur at the launch site (just like a normal NAR/TRA RSO Inspection at the launch site).

Post Launch Assessment Report

- Summary of the Project
- Summary of the Vehicle and Payload
  - Especially note anything that changed after FRR
- Presentation of Vehicle and Payload Results
  - Comparison to predicted results
  - Discussion of anomalies
- Lessons Learned


Safety

High Power Rocket Safety Code
Provided by the National Association of Rocketry

1. **Certification.** I will only fly high power rockets or possess high power rocket motors that are within the scope of my user certification and required licensing.

2. **Materials.** I will use only lightweight materials such as paper, wood, rubber, plastic, fiberglass, or when necessary ductile metal, for the construction of my rocket.

3. **Motors.** I will use only certified, commercially made rocket motors, and will not tamper with these motors or use them for any purposes except those recommended by the manufacturer. I will not allow smoking, open flames, nor heat sources within 25 feet of these motors.

4. **Ignition System.** I will launch my rockets with an electrical launch system, and with electrical motor igniters that are installed in the motor only after my rocket is at the launch pad or in a designated prepping area. My launch system will have a safety interlock that is in series with the launch switch that is not installed until my rocket is ready for launch, and will use a launch switch that returns to the “off” position when released. If my rocket has onboard ignition systems for motors or recovery devices, these will have safety interlocks that interrupt the current path until the rocket is at the launch pad.

5. **Misfires.** If my rocket does not launch when I press the button of my electrical launch system, I will remove the launcher’s safety interlock or disconnect its battery, and will wait 60 seconds after the last launch attempt before allowing anyone to approach the rocket.

6. **Launch Safety.** I will use a 5-second countdown before launch. I will ensure that no person is closer to the launch pad than allowed by the accompanying Minimum Distance Table, and that a means is available to warn participants and spectators in the event of a problem. I will check the stability of my rocket before flight and will not fly it if it cannot be determined to be stable.

7. **Launcher.** I will launch my rocket from a stable device that provides rigid guidance until the rocket has attained a speed that ensures a stable flight, and that is pointed to within 20 degrees of vertical. If the wind speed exceeds 5 miles per hour I will use a launcher length that permits the rocket to attain a safe velocity before separation from the launcher. I will use a blast deflector to prevent the motor’s exhaust from hitting the ground. I will ensure that dry grass is cleared around each launch pad in accordance with the accompanying Minimum Distance table, and will increase this distance by a factor of 1.5 if the rocket motor being launched uses titanium sponge in the propellant.

8. **Size.** My rocket will not contain any combination of motors that total more than 40,960 N-sec (9208 pound-seconds) of total impulse. My rocket will not weigh more at liftoff than one-third of the certified average thrust of the high power rocket motor(s) intended to be ignited at launch.

9. **Flight Safety.** I will not launch my rocket at targets, into clouds, near airplanes, nor on trajectories that take it directly over the heads of spectators or beyond the boundaries of the launch site, and will not put any flammable or explosive payload in my rocket. I will not launch my rockets if wind speeds exceed 20 miles per hour. I will comply with Federal Aviation Administration airspace regulations when flying, and will ensure that my rocket will not exceed any applicable altitude limit in effect at that launch site.

10. **Launch Site.** I will launch my rocket outdoors, in an open area where trees, power lines, buildings, and persons not involved in the launch do not present a hazard, and that is at least as large on its smallest dimension as one-half of the maximum altitude to which rockets are allowed to be flown at that site or 1500 feet, whichever is greater.

11. **Launcher Location.** My launcher will be at least one half the minimum launch site dimension, or 1500 feet (whichever is greater) from any inhabited building, or from any public highway on which traffic flow exceeds 10 vehicles per hour, not including traffic flow related to the launch. It will also be no closer than the appropriate Minimum Personnel Distance from the accompanying table from any boundary of the launch site.

12. **Recovery System.** I will use a recovery system such as a parachute in my rocket so that all parts of my rocket return safely and undamaged and can be flown again, and I will use only flame-resistant or fireproof recovery system wadding in my rocket.

13. **Recovery Safety.** I will not attempt to recover my rocket from power lines, tall trees, or other dangerous places, fly it under conditions where it is likely to recover in spectator areas or outside the launch site, nor attempt to catch it as it approaches the ground.

Minimum Distance Table

Installed Total Impulse (Newton-Seconds)	Equivalent High Power Motor Type	Minimum Diameter of Cleared Area (ft.)	Minimum Personnel Distance (ft.)	Minimum Personnel Distance (Complex Rocket) (ft.)
0 – 320.00	H or smaller	50	100	200
320.01 – 640.00	I	50	100	200
640.01 – 1,280.00	J	50	100	200
1,280.01 – 2,560.00	K	75	200	300
2,560.01 – 5,120.00	L	100	300	500
5,120.01 – 10,240.00	M	125	500	1000
10,240.01 – 20,480.00	N	125	1000	1500
20,480.01 – 40,960.00	O	125	1500	2000

Note: A Complex rocket is one that is multi-staged or that is propelled by two or more rocket motors

Revision of July 2008

Provided by the National Association of Rocketry (www.nar.org)

Failures, Hazards and Risk

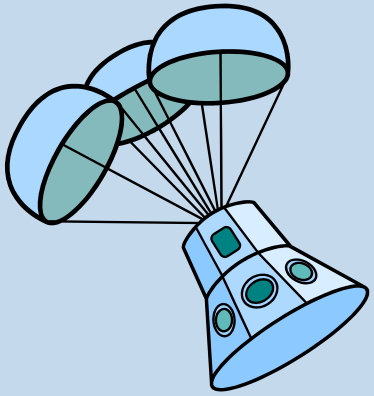
How to Identify, Track and Mitigate

Examples from Home

- Getting to work on time ("mission success")
  - **Risks**: weather, traffic jam, alarm doesn't ring
    - How do we plan for these risks?
  - **Failure**: the car doesn't start
    - How do we try to make sure that it will start?
  - **Hazard**: bad roads, other drivers, sudden changes in traffic flow
    - How do we plan for this and avoid problems?
- Getting to work on time means that we have recognized the risks, failure modes, and hazards, and have taken action to reduce their probability and impact.
- This same approach improves the probability of success for a project.

Risk Definition

- The combination of the probability of an undesired event and the consequences, impact, or severity of the event.
- Risk assessment includes
  - What can go wrong
  - How likely is it to occur
  - What the consequences are
- Risk Mitigation is
  - Application of methods to lessen the probability and/or impact of the undesired event



Examples of Risk

- Planned design will be over budget
- Key personnel will leave the program
- Unavailability of equipment when needed to support schedule
- Students have many other demands on time and do not have time to finish the project
- Parts unavailability
- Mishaps
- Communication issues
- Bad weather on launch day

Risk Management

- “Risk management is a continuous process that
  - identifies risks;
  - analyzes their impact and prioritizes them;
  - develops and carries out plans for risk mitigation or acceptance;
  - tracks risks and the implementation of mitigation plans;
  - supports informed, timely, and effective decisions to control risks and mitigation plans;
  - and assures that risk information is communicated and documented.
  - Risk management is driven by established success criteria and is performed by the whole team”

  - (from NASA Program and Project Management Processes and Requirements)

Examples of Tables to Include in PDR, CDR, FRR

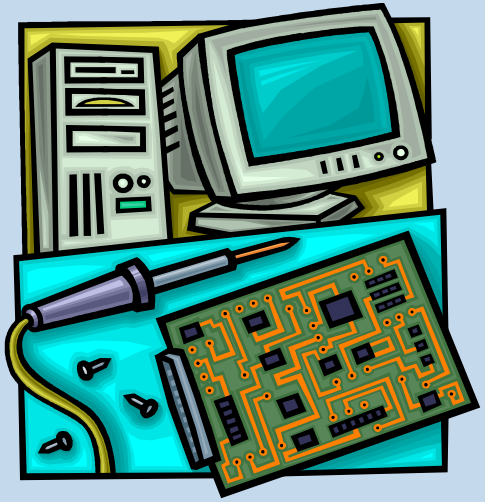
Risk	Probability	Impact	Mitigation
Project falls behind schedule due to multiple demands on time	Highly probable	Late delivery of PDR, CDR, FRR; incomplete project	Create a schedule with margin for problems, track progress; divide work among team
Parts are unavailable	Probability is low	Last minute design changes	Have design options and multiple sources; finalize design and order parts early
Key personnel leave project	Probability is low	Extra work for members; late delivery; incomplete project	Have primary and backup assignments; document activities; communicate
Project is over budget	Highly probably	Last minute design changes for cost cutting; incomplete project	Track progress; have multiple funding sources

Failures

- During the rocket design process, each component and system should be analyzed for failure modes:
  - How can it fail
  - What are the consequences of the failure
  - How can the failure be prevented
- This includes system integration and ground support equipment, as well as the rocket and payload
- Document the analysis and update as necessary

Failure Examples

- Parachutes fail to deploy
- Failure to ignite
- Unstable flight
- Failure to collect data
- Power loss

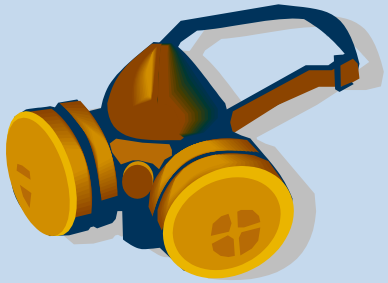


Examples of Tables to Include in PDR, CDR, FRR

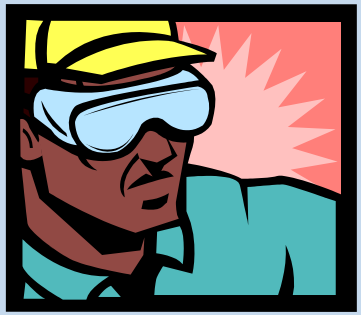
Failure Modes and Effects Analysis of Propulsion System

Propulsion Team: Daniel Chhitt, Jason Back

Function	*Potential Failure Mode*	*Potential Effects of Failure*	*Failure Prevention*
1	Propellant fails to ignite.	Total mission failure, rocket does not take off.	Proper ignition system setup.
2	Propellant ignites but extinguishes before desired burn time.	Rocket may not reach desired height, payload failure.	Proper motor and propellant inspection and testing.
3	Motor mounting fails and motor launches through the rocket.	Possible destruction of all systems; avionics, recovery, payload	Proper motor mounting structure and load testing of mounting structure.
4	Propellant ignites but causes a catastrophic explosion.	Possible destruction of all systems; avionics, recovery, payload, structure.	Proper motor and propellant inspection and testing.
5	Propellant ignites but burns through motor casing.	Severe loss of stability, possible destruction of all systems.	Proper testing of motor casing and propellant.
6	Motor casing becomes detached during flight.	Rocket may not reach desired height, motor becomes a projectile.	Proper testing and mounting of motor casing to the structure.



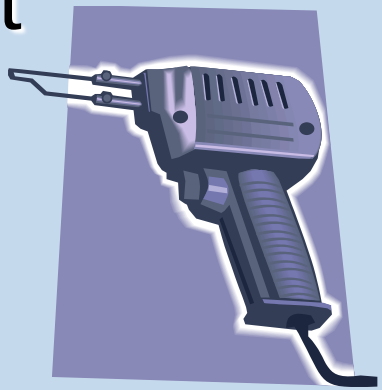
Hazards



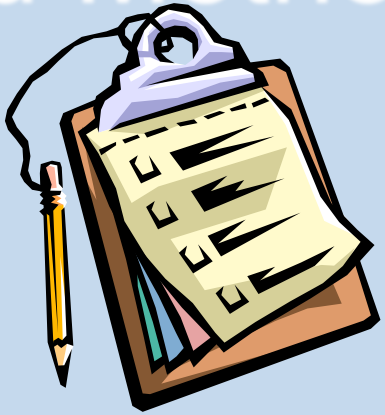
- The project can be done safely and successfully, but a few hazards must be clearly recognized, understood, and mitigated.
- Safety of the students is NASA's first priority and must never be compromised.
- There are many resources available to help with this concern.

Hazard Examples

- Adhesives, solvents, and paint
- Black Powder and solid propellant
- Use of Tools
- Launch site failures
- Pressurized/cold hybrid systems
- Other hazards associated with a particular design



Safety Resources and Methods



- NAR Safety Codes and Mentors
- NAR certifications and training
- Material Safety Data Sheets
- Operators Manuals
- Development and adherence to assembly and launch procedures
- Equipment, such as goggles, gloves, sturdy shoes, hard hats, cotton clothing, fire extinguishers
- Environment, such as good ventilation, restricting cell phones around electric matches
- Planning and communication; designate someone responsible to look at activities from a safety perspective
- Use the buddy system

Examples of Tables to Include in PDR, CDR, FRR

Hazard	Effect of Hazard	Mitigation
Chemicals in paint, solvent, adhesive	Possible respiratory and skin irritation	Read MSDS for precautions; wear gloves; have good ventilation
Ignition of black powder or other pyrotechnic or explosive compounds	Fire, damage to equipment, personal injury	Follow safety rules; wear cotton clothing; do not smoke or have other static or spark producing items in the area
Use of power tools	Cuts or other injuries, damage to equipment, flying debris	Follow manufacturer's safety instructions; wear goggles; do not operate without supervision
Misfire, hangfire on launch pad	Rocket may not be safe to approach	Write procedures to plan for this contingency and follow; be patient and wait; consult with experts

Mission Success

- Mission Success is the result of attention to detail, and a thorough, honest assessment of risks, failure modes and hazards.
- Failure is often the best teacher, so plan to test as much as possible.
- Teamwork and communication are essential for a successful project.

Understanding MSDS's

By: Jeff Mitchell

MSFC Environmental Health

What is an MSDS?

- A Material Safety Data Sheet (MSDS) is a document produced by a manufacturer of a particular chemical and is intended to give a comprehensive overview of how to safely work with or handle this chemical

What is an MSDS?

- MSDS's do not have a standard format, but they are all required to have certain information per OSHA 29 CFR 1910.1200
- Manufacturers of chemicals fulfill the requirements of this OSHA standard in different ways

Required data for MSDS's

- Identity of hazardous chemical
- Chemical and common names
- Physical and chemical characteristics
- Physical hazards
- Health hazards
- Routes of entry
- Exposure limits

Required data for MSDS's (Cont.)

- Carcinogenicity
- Procedures for safe handling and use
- Control measures
- Emergency and First-aid procedures
- Date of last MSDS update
- Manufacturer's name, address, and phone number

Important Agencies

- ACGIH
  - The American Conference of Governmental Industrial Hygienist develop and publish occupational exposure limits for many chemicals, these limits are called TLV's (Threshold Limit Values)

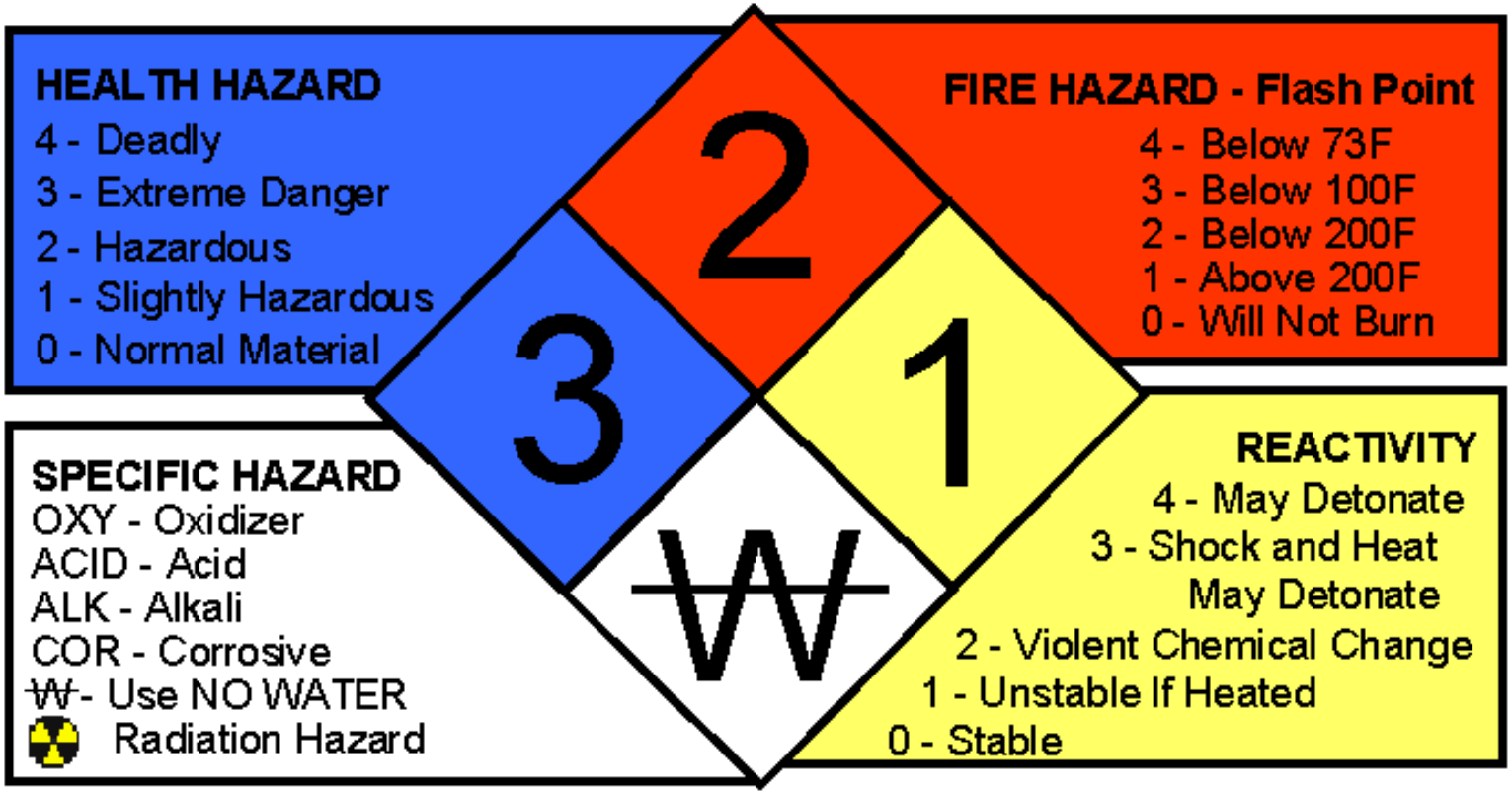
Important Agencies (Cont.)

- ANSI
  - The American National Standards Institute is a private organization that identifies industrial and public national consensus standards that relate to safe design and performance of equipment and practices

Important Agencies (Cont.)

- NFPA
  - The National Fire Protection Association, among other things, established a rating system used on many labels of hazardous chemicals called the NFPA Diamond
  - The NFPA Diamond gives concise information on the Health hazard, Flammability hazard, Reactivity hazard, and Special precautions
  - An example of the NFPA Diamond is on the next slide

NFPA Diamond



Important Agencies (Cont.)

- NIOSH
  - The National Institute of Occupational Safety and Health is an agency of the Public Health Service that tests and certifies respiratory and air sampling devices. It also investigates incidents and researches occupational safety

Important Agencies (Cont.)

- OSHA
  - The Occupational Safety and Health Administration is a Federal Agency with the mission to make sure that the safety and health concerns of all American workers are being met

Exposure Limits

- Occupational exposure limits are set by different agencies
- Occupational exposure limits are designed to reflect a safe level of exposure
- Personnel exposure above the exposure limits is not considered safe

Exposure Limits (Cont.)

- OSHA calls their exposure limits, PEL's, which stands for Permissible Exposure Limit
  - OSHA PEL's rarely change
- ACGIH, establishes TLV's, which stands for Threshold Limit Values
  - ACGIH TLV's are updated annually

Exposure Limits (Cont.)

- A Ceiling limit (noted by C) is a concentration that shall never be exceeded at any time
- An IDLH atmosphere is one where the concentration of a chemical is high enough that it may be Immediately Dangerous to Life and Health

Exposure Limits (Cont.)

- A STEL, is a Short Term Exposure Limit and is used to reflect a 15 minute exposure time
- A TWA, is a Time Weighted Average and is used to reflect an 8 hour exposure time

Chemical and Physical Properties

- Boiling Point
  - The temperature at which the chemical changes from liquid phase to vapor phase
- Melting Point
  - The temperature at which the chemical changes from solid phase to liquid phase
- Vapor Pressure
  - The pressure of a vapor in equilibrium with its non-vapor phases. Most often the term is used to describe a liquid's tendency to evaporate
- Vapor Density
  - This is used to help determine if the vapor will rise or fall in air
- Viscosity
  - It is commonly perceived as "thickness", or resistance to pouring. A higher viscosity equals a thicker liquid

Chemical and Physical Properties (Cont.)

- Specific Gravity
  - This is used to help determine if the liquid will float or sink in water
- Solubility
  - This is the amount of a solute that will dissolve in a specific solvent under given conditions
- Odor threshold
  - The lowest concentration at which most people may smell the chemical
- Flash point
  - The lowest temperature at which the chemical can form an ignitable mixture with air
- Upper (UEL) and lower explosive limits (LEL)
  - At concentrations in air below the LEL there is not enough fuel to continue an explosion; at concentrations above the UEL the fuel has displaced so much air that there is not enough oxygen to begin a reaction

Things you should learn from MSDS's

- Is this chemical hazardous?
  - Read the Health Hazard section
- What will happen if I am exposed?
  - There is usually a section called Symptoms of Exposure under Health Hazard
- What should I do if I am overexposed?
  - Read Emergency and First-aid procedures
- How can I protect myself from exposure?
  - Read Routes of Entry, Procedures for safe handling and use, and Control measures

Take your time!

- Since MSDS's don't have a standard format, what you are seeking may not be in the first place you look
- Study your MSDS's before there is a problem so you aren't rushed
- Read the entire MSDS, because information in one location may compliment information in another

The following slides are an abbreviated version of a real MSDS

Study it and become more familiar with this chemical

MSDS: METHYL ETHYL KETONE

Abbreviated MSDS

SECTION 1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MDL INFORMATION SYSTEMS, INC.
14600 CATALINA STREET
1-800-635-0064 OR
1-510-895-1313

Manufacturer name and phone #

FOR EMERGENCY SOURCE INFORMATION
CONTACT: 1-615-366-2000 USA

CAS NUMBER: 78-93-3
RTECS NUMBER: EL6475000
EU NUMBER (EINECS):
201-159-0
EU INDEX NUMBER:
606-002-00-3

SUBSTANCE: METHYL ETHYL KETONE

TRADE NAMES/SYNONYMS:
BUTANONE; 2-BUTANONE; ETHYL METHYL KETONE; METHYL ACETONE; 3-BUTANONE; MEK; SCOTCH-GRIP ® BRAND SOLVENT #3 (3M); STOP, SHIELD, PEEL REDUCER (PYRAMID PLASTICS, INC.); STABOND C-THINNER (STABOND CORP.); OATEY CLEANER (OATEY COMPANY); RCRA U159; UN1193; STCC 4909243; C4H8O; OHS14460

CHEMICAL FAMILY:
Ketones, aliphatic

Last revision

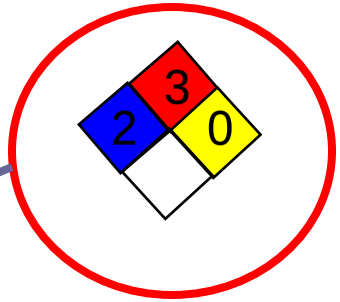
CREATION DATE: Sep 28 1984
REVISION DATE: Mar 30 1997

SECTION 2. COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: METHYL ETHYL KETONE
CAS NUMBER: 78-93-3
PERCENTAGE: 100

SECTION 3. HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): Health=2 Fire=3 Reactivity=0



Good info for labeling containers

EMERGENCY OVERVIEW:
COLOR: colorless
PHYSICAL FORM: liquid
ODOR: minty, sweet odor
MAJOR HEALTH HAZARDS: respiratory tract irritation, skin irritation, eye irritation, central nervous system depression
PHYSICAL HAZARDS: Flammable liquid and vapor. Vapor may cause flash fire

POTENTIAL HEALTH EFFECTS:

What happens when exposed?

INHALATION:

SHORT TERM EXPOSURE: irritation, nausea, vomiting, difficulty breathing,

SKIN CONTACT:

SHORT TERM EXPOSURE: irritation

LONG TERM EXPOSURE: same as effects reported in short term exposure

EYE CONTACT...

INGESTION...

CARCINOGEN STATUS:

OSHA: N

NTP: N

IARC: N

Does it cause cancer?

SECTION 4. FIRST AID MEASURES

INHALATION...

SKIN CONTACT...

EYE CONTACT...

INGESTION...

What should you do if exposed?

SECTION 5. FIRE FIGHTING MEASURES

SECTION 6. ACCIDENTAL RELEASE MEASURES

AIR RELEASE:
Reduce vapors with water spray
SOIL RELEASE:
Dig holding area such as lagoon, pond or pit for containment. Absorb with...

SECTION 7. HANDLING AND STORAGE

Store and handle in accordance ...

SECTION 8. EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:
METHYL ETHYL KETONE:

METHYL ETHYL KETONE:
200 ppm (590 mg/m3) OSHA TWA
300 ppm (885 mg/m3) OSHA STEL
200 ppm (590 mg/m3) ACGIH TWA
300 ppm (885 mg/m3) ACGIH STEL

8 hr avg

15 min avg

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

COLOR: colorless
PHYSICAL FORM: liquid
ODOR: minty, sweet odor
MOLECULAR WEIGHT: 72.12
MOLECULAR FORMULA: C-H3-C-H2-C-O-C-H3
BOILING POINT: 176 F (80 C)
FREEZING POINT: -123 F (-86 C)
VAPOR PRESSURE: 100 mmHg @ 25 C
VAPOR DENSITY (air = 1): 2.5
SPECIFIC GRAVITY (water = 1): 0.8054
WATER SOLUBILITY: 27.5%
PH: No data available
VOLATILITY: No data available
ODOR THRESHOLD: 0.25-10 ppm
EVAPORATION RATE: 2.7 (ether = 1)
VISCOSITY: 0.40 cP @25 C
SOLVENT SOLUBILITY: alcohol, ether, benzene, acetone, oils, solvents

MYTH: if it smells bad it is harmful, if it smells good it is safe

MEK vapor is heavier than air

MEK liquid will float on stagnant water

Not very soluble in water

Will likely smell MEK before being overexposed

Goes to vapor easy

SECTION 10. STABILITY AND REACTIVITY

SECTION 11. TOXICOLOGICAL INFORMATION

SECTION 12. ECOLOGICAL INFORMATION

SECTION 13. DISPOSAL CONSIDERATIONS

SECTION 14. TRANSPORT INFORMATION

SECTION 15. REGULATORY INFORMATION

SECTION 16. OTHER INFORMATION

MSDS's have an abundance of information useful in many different aspects

Awards

USLI Competition Awards

Award:	Award Description:	Determined by:	When awarded:
Vehicle Design Award	Awarded to the team with the most creative and innovative overall vehicle design for their intended payload while still maximizing safety and efficiency.	USLI panel	Launch Day
Payload Design Award	Awarded to the team with the most creative and innovative payload design while maximizing safety and science value.	USLI panel	Launch Day
Project Review (CDR/FRR) Award	Awarded to the team that is viewed to have the best combination of written reviews and formal presentations	USLI panel	Launch Day
Educational Engagement Award	Awarded to the team that is determined to have best inspired the study of rocketry and other science, technology, engineering, and math (STEM) related topics in their community. This team not only presented a high number of activities to a large number of people, but also delivered quality activities to a wide range of audiences.	USLI panel	Launch Day
Web Design Award	Awarded to the team that has the best, most efficient website with all documentation posted on time.	USLI panel	Launch Day
Altitude Award*	Awarded to the team that achieves the best altitude score according to the scoring rubric.	USLI panel	Launch Day
Best Looking Rocket	Awarded to the team that is judged by their peers to have the “Best Looking Rocket”	Peers	Launch Day
Best Team Spirit Award	Awarded to the team that is judged by their peers to display the “Best Team Spirit” on launch day.	Peers	Launch Day
Rookie Award*	Awarded to the top overall rookie team using the same criteria as the Overall Winner Award. (Only given if the overall winner is not a rookie team).	USLI panel	May 20, 2011
Overall Winner*	Awarded to the top overall team. Design reviews, outreach, website, safety, and a successful flight will all factor into the Overall Winner.	USLI panel	May 20, 2011

*** Only teams who use the required altimeter for competition scoring will be eligible.**

Procurement and Finances

Procurement and Finances

In order to receive the NASA Student Launch Initiative grant upon award, there are several important steps to take.

*Prior to awards, you can go ahead and do the following:

1. DUNS Number:
   The DUNS number is: Data Universal Numbering System.
   Go to: https://eupdate.dnb.com/requestoptions/government/ccrreg/
   Use Web site registration or contact by phone to receive a DUNS number within 48 hours.
   On the D&B Web site, it will ask for a Primary SIC: Standard Industrial Classification Code. The SIC code for Elementary and Secondary Schools is 8211. It will also ask for a primary contact (principal) and the number of employees.

2. Cage Code: (Takes about 1 hour to complete.)
   Cage Code Web site: https://www.bpn.gov/ccr/scripts/index.html
   Click “new” on the left-hand side.

3. “Offerer Representations and Certifications”:
   You will need the DUNS number and your MPIN to fill out the Reps and Certs form. The MPIN is a 9-digit code containing at least one alpha character and one number, created by you in your CCR record
   The Reps and Certs Web site: www.bpn.gov/orca.

4. Payment Information Form
   This form must be submitted as soon as award is granted. This will allow for direct deposit of funds after each invoice is submitted.

*If your school is selected to participate in the NASA Student Launch Initiative, look closely at the following forms:

a. Consideration and Payment sheet
   This sheet will show the payment break-down. Note that anytime the words “Contractor” or “Offerer” appears, this is referring to YOU or the SCHOOL. Invoices should be sent upon completion of each milestone.

b. Delivery Schedule will provide due dates.

c. Solicitation Contract/Order for Commercial Items
   This page will contain contact information for contract questions (located in boxes 9 and 16) and financial questions (located in box 18a). Box 4 “Order Number” is your reference number for all communications with Office of Procurement and Office of Finance. Invoices should be submitted to the address in box 18a.

Information Needed to Register (Cage Code)

* Items are mandatory

General Information

* **Data Universal Numbering System (D-U-N-S) Number:** The Data Universal Numbering System (D-U-N-S) Number is a unique nine-character identification number provided by the commercial company Dun & Bradstreet (D&B). Call D&B at 1-866-705-5711 or access their Web site at <http://ccr.dnb.com/ccr/pages/CCRSearch.jsp> if you do not have a D-U-N-S Number. The process to request a D-U-N-S Number via phone takes about 10 minutes and is free of charge. Internet requests are fulfilled within 24 hours. Once a D-U-N-S Number has been issued, it will be available for use in CCR within 24 hours.

You must have a different nine-digit D-U-N-S Number for each physical location or different address in your company as well as each legal division that may be co-located. When entering your D-U-N-S Number, enter only the numbers; do not include dashes. As a result of obtaining a D-U-N-S Number, you might be included on D&B's marketing list that is sold to other companies. If you do not want your name or company name included on this marketing list, D&B has asked that you contact them anytime at the same numbers noted above to request they be removed.

D-U-N-S +4: The use of D-U-N-S+4 Numbers to identify vendors is limited to identifying different CCR records for the same vendor at the same physical location. For example, a vendor could have two records for themselves at the same physical location to identify two separate bank accounts. (Vendors wishing to register their subsidiaries and other entities should ensure that each additional location obtains a separate D-U-N-S Number from Dun & Bradstreet at 1-866-705-5711.)

CAGE Code: The Commercial and Government Entity (CAGE) Code is a five-character ID number used extensively within the federal government. Vendors with a U.S. address may submit the application without a CAGE Code if they do not have one. If your application does not contain a CAGE Code, one will be assigned to you. The CCR registration process will also verify existing CAGE Codes for all applicants. To speed up the process, make every effort to use a current CAGE Code in your application. You must have a separate CAGE Code for each physical location and separate division at the same physical location. Each separate CCR registration must have its own CAGE Code. If you think you have a CAGE Code, search the DLIS CAGE Web at <http://www.dlis.dla.mil/cage_welcome.asp>.

Note: Vendors located outside of the U.S. are required to include an NCAGE Code on the registration, or it will be considered incomplete.

* Legal Business Name and Doing Business As (DBA): Enter the legal name by which you are incorporated and pay taxes. If you commonly use another name, such as a franchise or licensee name, then include that in the DBA space below the Legal Business Name. Your legal business name as entered on the CCR registration MUST match the legal business name at Dun & Bradstreet. If the information does not match, your registration may be rejected during processing. Do not type "same" or "as shown above" in the DBA field.

* US Federal TIN: The Tax Identification Number (TIN) is the nine-digit number which is either an Employer Identification Number (EIN) assigned by the Internal Revenue Service (IRS) <http:www.irs.gov/businesses/small/article/0,,id=104331,00.html> or Social Security Number (SSN) assigned by the Social Security Administration (SSA) <http:/www.ssa.gov/replace_sscard.html>.

If you do not know your TIN/EIN, contact the IRS at 1-866-255-0654 (Option 2). If you operate as an individual sole proprietorship, you may use your Social Security Number if you do not have a TIN/EIN. If you are located outside the United States and do not pay employees within the U.S., you are not required to provide a TIN. When entering your TIN (EIN or SSN) on the Website enter only the numbers; do not include the dashes (Example: 123456789 not 123-45-6789)

Note: Authority: 31 U.S.C. 7701 (c) (3) Principal Purpose(s). The TIN may be used by the Federal Government to collect and report on delinquent amounts arising out of the offer's relationship with the Federal Government.

Note: As of October 30, 2005, all TINs will be validated by the IRS. You will not be allowed to have an active CCR registration without a validated TIN. The TIN matching process is a joint effort between the General Services Administration (GSA), Department of Defense (DOD), and the IRS to improve the quality of data in government acquisition systems. A notice has gone out to CCR registrants informing them of the IRS validation in CCR registration.

In order to complete your CCR registration and qualify as a vendor eligible to bid for federal government contracts or apply for federal grants, the TIN and Taxpayer Name combination you provide in CCR must match exactly to the TIN and Taxpayer Name used in federal tax matters.

It will take one to two business days to validate new and updated records prior to becoming active in CCR.

Division Name and Number: If you do business as a division of a larger company, use this space to indicate the proper name for your division. If a number identifier commonly distinguishes your division, enter that in the division number field. Otherwise, leave blank.
Company URL: If applicable, provide your company's homepage URL. Both upper and lower cases are acceptable.

* **Physical Street Address 1:** PO Box and c/o may not be used in this space. You must include a valid street address where your business is located. If you use a PO Box for correspondence, this may be included in the space allocated for "mailing address." Your street address, as entered on the CCR registration, MUST match the street address assigned to your D&B D-U-NS Number. If the information does not match, your registration may be rejected during processing. You may not register a branch of the business with the branch address and the headquarters D-U-N-S Number.

Physical Street Address 2: Use this space to continue your physical street address, if needed.

* **City, State, Zip:** The nine-digit zip code is mandatory. When entering the nine-digit zip code on the web, enter numbers only; do not include the dash. (Example: 123456789 not 12345-6789)
* **Country:** Choose the appropriate country code abbreviation from the list provided.
* **Mailing Address Information:** If you are unable to receive mail at your physical address, enter a proper mailing address here. A Post Office Box is permissible. Any address used here will receive all CCR correspondence. If the Point of Contact is in a different location than the legal business address and wishes to receive the mail directly, please enter the appropriate address here.
* **Date Business Started:** Enter the date your business was started in its present form. This may be used to distinguish you from others with similar names. When entering the information on the Website, you must enter as mm/dd/yyyy. (Example: 01/01/1995)
* **Fiscal Year End Close Date:** Enter the day on which you close your fiscal year. For example, if you use the calendar year, enter 12/31. When entering the information on the Website, you must enter as mm/dd.

* **Average Number of Employees:** Be sure to provide accurate information about the number of employees for your business, as this value is part of determining your business size classification. The calculation must include the employees of all affiliates, not just your individual branch. For more information, see <http://www.sba.gov/size>.

* **Annual Revenue:** Be sure to provide accurate information about the three-year average annual revenue for your business, as this value is part of determining your business size classification. The calculation must include the revenue of *all affiliates*, not just your individual branch. For more information, see <http://www.sba.gov/size>. Annual revenue cannot be zero; you must enter a number. When entering revenue in the Website, enter numbers only, no dollar signs or commas.

Company Security Level: If applicable, choose the correct level of security for the facility.

Highest Employee Security Level: If applicable, choose the security level of the employee with the highest employee security level at that facility.

Frequently Asked Questions (FAQ)

Who can see my records?

ORCA records are considered public information. Anyone with access to the Internet, that knows your DUNS number, can search the archives to view an ORCA record.

What is ORCA?

Please refer to the Acquisition.gov website for an explanation. http://www.acquisition.gov/faqs_whatis.cfm

Why was ORCA created?

Prior to ORCA, vendors were required to submit Reps and Certs for each individual large purchase contract award. Now, using ORCA, a contractor can enter their Reps and Certs information once for use on all Federal contracts. This site not only benefits the contractor by allowing them to maintain an accurate and complete record but also the Contracting Officer as they can view every record, including archives, with the click of a mouse.

Who needs to register in ORCA?

You must be registered in ORCA if the solicitation you are responding to requires that you have an active registration in CCR.

What is the difference between CCR and ORCA and why must I register in both systems?

Central Contractor Registration (CCR) is the primary vendor database for the U.S. Federal Government. Since October 1, 2003, it is federally mandated that any business wishing to do business with the federal government under a FAR-based contract must be registered in CCR before being awarded a contract. In addition, vendors must maintain their CCR records annually.

Online Representations and Certifications Application (ORCA) replaces most of the paper based Representations and Certifications (Reps and Certs) in Section K of solicitations with an Internet application. FAR 52.204-8 mandates the use of ORCA on or after January 1, 2005.

CCR and ORCA are complimentary systems. ORCA reuses data pulled from CCR and pre-populates many of the required Representations and Certifications. Then, the vendor completes the remaining Reps and Certs with the understanding that with each solicitation they are certifying to current, accurate and complete information.

Where do I register?

ORCA is an on-line system that is located on the Internet. The ORCA site can be found by going to http://www.bpn.gov and clicking on "Online Reps and Certs Application" on the left side of the screen. If you do not have access to the Internet or feel you need extra Internet help please contact the Procurement Technical Assistance Center (PTAC) (www.dla.mil/db/procurem.htm) closest to you.

What information will I need to complete my ORCA registration?

Two items are needed prior to registration; (1) An active record in CCR, (2) An MPIN from that active CCR record. Visit www.ccr.gov to complete these tasks if you haven't already. More information about the questions asked in ORCA can be found in the ORCA Handbook.

What is an MPIN?

Please refer to the Acquisition.gov website for an explanation. http://www.acquisition.gov/faqs_whatis.cfm

Why is there a questionnaire?

The questionnaire is to help you gather information you need for the clauses. The questionnaire is not the official version. Be sure to read the clauses carefully.

How often do I fill out the questionnaire?

You need to update ORCA at least once a year. You can update or change your Reps and Certs information whenever necessary and the 365 day clock will start over from the day of change.

Why does it say “See Section K” beside the NAICS codes and what does that mean?

When it says “See Section K” beside your NAICS code, that means you have identified NAICS codes with exceptions and there are multiple criteria to determine size standard. SBA cannot pass to ORCA the information of a determination of small business classification for the NAICS codes with exceptions. Therefore, you must provide the contracting officer in writing a response to Section K of the solicitation with the provision number, NAICS code, small business classification, and a short explanation.

Why is no signature required when I submit my Reps and Certs?

Formal certification of ORCA data occurs when a vendor signs a solicitation. At that time a vendor is certifying that data in ORCA is current, accurate, and complete.

Where can the SF 330 Part II be submitted electronically?

The SF 330 Part II has been incorporated into the Online Representations and Certifications Application (ORCA). The ORCA link can be found at http://www.bpn.gov.

Why was the SF 330 Part II incorporated in to ORCA?

To ease the burden on vendors, the government determined that the qualifications of A-E firms could be easily submitted via an electronic method. ORCA was chosen as the place to collect and store the 330 Part II information. Now a vendor can enter ORCA at any time and supply both their reps and certs and 330 Part II information. Since the site is available 24/7 the vendor can enter, update or change any of their information with the click of a mouse. If there is no change to the information posted, a company record remains active for 365 days. When a change is made, that record is archived and the current record becomes activated and the expiration date is reset for another 365 days. This reduces time spent and paper collected by both the government and the vendor.

Do I have to register my SF 330 Part II information in ORCA?

Submission of the SF 330 Part II through ORCA is voluntary.

On ORCA, I don’t see a direct link to the SF 330 Part II information. Where do I add my information?

Question number 24 on the ORCA questionnaire collects all SF 330 information. However, you must fill out all the other answers on the questionnaire, not just #24

Do I have to answer all the Reps and Certs questions or just provide SF330 Part II information?

Yes, you must answer all the Reps and Certs in order to provide any SF330 Part II information.

52.212-3 Offeror Representations and Certifications: Commercial Items

(August 2009)

An offeror shall complete only paragraphs (b) of this provision if the offeror has completed the annual representations and certificates electronically at http://orca.bpn.gov . If an offeror has not completed the annual representations and certifications electronically at the ORCA website, the offeror shall complete only paragraphs (c) through (m) of this provision.

(a) *Definitions.* As used in this provision--

"Emerging small business" means a small business concern whose size is no greater than 50 percent of the numerical size standard for the NAICS code designated.

"Forced or indentured child labor" means all work or service—

(1) Exacted from any person under the age of 18 under the menace of any penalty for its nonperformance and for which the worker does not offer himself voluntarily; or

(2) erformed by any person under the age of 18 pursuant to a contract the enforcement of which can be accomplished by process or penalties.

"Inverted domestic corporation" means a foreign incorporated entity which is treated as an inverted domestic corporation under 6 U.S.C. 395(b), *i.e.*, a corporation that used to be incorporated in the United States, or used to be a partnership in the United States, but now is incorporated in a foreign country, or is a subsidiary whose parent corporation is incorporated in a foreign country, that meets the criteria specified in 6 U.S.C. 395(b), applied in accordance with the rules and definitions of 6 U.S.C. 395(c).

"Manufactured end product" means any end product in Federal Supply Classes (FSC) 1000-9999, except—

(1) FSC 5510, Lumber and Related Basic Wood Materials;

(2) Federal Supply Group (FSG) 87, Agricultural Supplies;

(3) FSG 88, Live Animals;

(4) FSG 89, Food and Related Consumables;

(5) FSC 9410, Crude Grades of Plant Materials;

(6) FSC 9430, Miscellaneous Crude Animal Products, Inedible;

(7) FSC 9440, Miscellaneous Crude Agricultural and Forestry Products;

(8) FSC 9610, Ores;

(9) FSC 9620, Minerals, Natural and Synthetic; and

(10) FSC 9630, Additive Metal Materials.

"Place of manufacture" means the place where an end product is assembled out of components, or otherwise made or processed from raw materials into the finished product that is to be provided to the Government. If a product is disassembled and reassembled, the place of reassembly is not the place of manufacture.

“Restricted business operations” means business operations in Sudan that include power production activities, mineral extraction activities, oil-related activities, or the production of military equipment, as those terms are defined in the Sudan Accountability and Divestment Act of 2007 (Pub. L. 110-174). Restricted business operations do not include business operations that the person (as that term is defined in Section 2 of the Sudan Accountability and Divestment Act of 2007) conducting the business can demonstrate—

(1) Are conducted under contract directly and exclusively with the regional government of southern Sudan;

(2) Are conducted pursuant to specific authorization from the Office of Foreign Assets Control in the Department of the Treasury, or are expressly exempted under Federal law from the requirement to be conducted under such authorization;

(3) Consist of providing goods or services to marginalized populations of Sudan;

(4) Consist of providing goods or services to an internationally recognized peacekeeping force or humanitarian organization;

(5) Consist of providing goods or services that are used only to promote health or education; or

(6) Have been voluntarily suspended.

“Service-disabled veteran-owned small business concern”—

(1) Means a small business concern—

(i) Not less than 51 percent of which is owned by one or more service-disabled veterans or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more service-disabled veterans; and

(ii) The management and daily business operations of which are controlled by one or more service-disabled veterans or, in the case of a service-disabled veteran with permanent and severe disability, the spouse or permanent caregiver of such veteran.

(2) Service-disabled veteran means a veteran, as defined in 38 U.S.C. 101(2), with a disability that is service-connected, as defined in 38 U.S.C. 101(16).

“Small business concern” means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding on Government contracts, and qualified as a small business under the criteria in 13 CFR Part 121 and size standards in this solicitation.

“Veteran-owned small business concern” means a small business concern—

(1) Not less than 51 percent of which is owned by one or more veterans(as defined at 38 U.S.C. 101(2)) or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more veterans; and

(2) The management and daily business operations of which are controlled by one or more veterans.

“Women-owned business concern” means a concern which is at least 51 percent owned by one or more women; or in the case of any publicly owned business, at least 51 percent of the its stock is owned by one or more women; and whose management and daily business operations are controlled by one or more women.

"Women-owned small business concern" means a small business concern --

(1) That is at least 51 percent owned by one or more women or, in the case of any publicly owned business, at least 51 percent of the stock of which is owned by one or more women; and

(2) Whose management and daily business operations are controlled by one or more women.

(b)

(1) *Annual Representations and Certifications*. Any changes provided by the offeror in paragraph (b)(2) of this provision do not automatically change the representations and certifications posted on the Online Representations and Certifications Application (ORCA) website.

(2) The offeror has completed the annual representations and certifications electronically via the ORCA website at http://orca.bpn.gov .After reviewing the ORCA database information, the offeror verifies by submission of this offer that the representation and certifications currently posted electronically at FAR 52.212-3, Offeror Representations and Certifications—Commercial Items, have been entered or updated in the last 12 months, are current, accurate, complete, and applicable to this solicitation (including the business size standard applicable to the NAICS code referenced for this solicitation), as of the date of this offer and are incorporated in this offer by reference (see FAR 4.1201), except for paragraphs _____. *[Offeror to identify the applicable paragraphs at (c) through (n) of this provision that the offeror has completed for the purposes of this solicitation only, if any. These amended representation(s) and/or certification(s) are also incorporated in this offer and are current, accurate, and complete as of the date of this offer. Any changes provided by the offeror are applicable to this solicitation only, and do not result in an update to the representations and certifications posted on ORCA.]*

(c) Offerors must complete the following representations when the resulting contract is to be performed in the United States or its outlying areas. Check all that apply.

(1) *Small business concern*. The offeror represents as part of its offer that it [_] is, [_] is not a small business concern.

(2) Veteran-owned small business concern. [Complete only if the offeror represented itself as a small business concern in paragraph (c)(1) of this provision.] The offeror represents as part of its offer that it [_] is, [_] is not a veteran-owned small business concern.

(3) Service-disabled veteran-owned small business concern. [Complete only if the offeror represented itself as a veteran-owned small business concern in paragraph (c)(2) of this provision.] The offeror represents as part of its offer that it [_] is, [_] is not a service-disabled veteran-owned small business concern.

(4) Small disadvantaged business concern. [Complete only if the offeror represented itself as a small business concern in paragraph (c)(1) of this provision.] The offeror represents, for general statistical purposes, that it [_] is, [_] is not, a small disadvantaged business concern as defined in 13 CFR 124.1002.

(5) Women-owned small business concern. [Complete only if the offeror represented itself as a small business concern in paragraph (c)(1) of this provision.] The offeror represents that it [_] is, [_] is not a women-owned small business concern.

Note: Complete paragraphs (c)(6) and (c)(7) only if this solicitation is expected to exceed the simplified acquisition threshold.

(6) Women-owned business concern (other than small business concern). [Complete only if the offeror is a women-owned business concern and did not represent itself as a small business concern in paragraph (c)(1) of this provision.]. The offeror represents that it [_] is, a women-owned business concern.

(7) *Tie bid priority for labor surplus area concerns.* If this is an invitation for bid, small business offerors may identify the labor surplus areas in which costs to be incurred on account of manufacturing or production (by offeror or first-tier subcontractors) amount to more than 50 percent of the contract price:

_____

(8) Small Business Size for the Small Business Competitiveness Demonstration Program and for the Targeted Industry Categories under the Small Business Competitiveness Demonstration Program. *[Complete only if the offeror has represented itself to be a small business concern under the size standards for this solicitation.]*

(i) [Complete only for solicitations indicated in an addendum as being set-aside for emerging small businesses in one of the designated industry groups (DIGs).] The offeror represents as part of its offer that it [_] is, [_] is not an emerging small business.

(ii) [Complete only for solicitations indicated in an addendum as being for one of the targeted industry categories (TICs) or designated industry groups (DIGs).] Offeror represents as follows:

(A) Offeror's number of employees for the past 12 months (check the Employees column if size standard stated in the solicitation is expressed in terms of number of employees); or

(B) Offeror's average annual gross revenue for the last 3 fiscal years (check the Average Annual Gross Number of Revenues column if size standard stated in the solicitation is expressed in terms of annual receipts).

(Check one of the following):

Number of Employees	Average Annual Gross Revenues
50 or fewer	$1 million or less
51-100	$1,000,001-$2 million
101-250	$2,000,001-$3.5 million
251-500	$3,500,001-$5 million
501-750	$5,000,001-$10 million
751-1,000	$10,000,001-$17 million
Over 1,000	Over $17 million

(9) [Complete only if the solicitation contains the clause at FAR 52.219-23, Notice of Price Evaluation Adjustment for Small Disadvantaged Business Concerns, or FAR 52.219-25, Small Disadvantaged Business Participation Program—Disadvantaged Status and Reporting, and the offeror desires a benefit based on its disadvantaged status.]

(i) *General.* The offeror represents that either—

(A) It [_] is, [_] is not certified by the Small Business Administration as a small disadvantaged business concern and identified, on the date of this representation, as a certified small disadvantaged business concern in the database maintained by the Small Business Administration (PRO-Net), and that no material change in disadvantaged ownership and control has occurred since its certification, and, where the concern is owned by one or more individuals claiming disadvantaged status, the net worth of each individual upon whom the certification is based does not exceed $750,000 after taking into account the applicable exclusions set forth at 13 CFR 124.104(c)(2); or

(B) It [_] has, [_] has not submitted a completed application to the Small Business Administration or a Private Certifier to be certified as a small disadvantaged business concern in accordance with 13 CFR 124, Subpart B, and a decision on that application is pending, and that no material change in disadvantaged ownership and control has occurred since its application was submitted.

(ii) *Joint Ventures under the Price Evaluation Adjustment for Small Disadvantaged Business Concerns*. The offeror represents, as part of its offer, that it is a joint venture that complies with the requirements in 13 CFR 124.1002(f) and that the representation in paragraph (c)(9)(i) of this provision is accurate for the small disadvantaged business concern that is participating in the joint venture. [*The offeror shall enter the name of the small disadvantaged business concern that is participating in the joint venture:* _____.]

(10) HUBZone small business concern. [Complete only if the offeror represented itself as a small business concern in paragraph (c)(1) of this provision.] The offeror represents, as part of its offer, that--

(i) It [_] is, [_] is not a HUBZone small business concern listed, on the date of this representation, on the List of Qualified HUBZone Small Business Concerns maintained by the Small Business Administration, and no material change in ownership and control, principal office, or HUBZone employee percentage has occurred since it was certified by the Small Business Administration in accordance with 13 CFR part 126; and

(ii) It [_] is, [_] not a joint venture that complies with the requirements of 13 CFR part 126, and the representation in paragraph (c)(10)(i) of this provision is accurate for the HUBZone small business concern or concerns that are participating in the joint venture. [*The offeror shall enter the name or names of the HUBZone small business concern or concerns that are participating in the joint venture*: _____.] Each HUBZone small business concern participating in the joint venture shall submit a separate signed copy of the HUBZone representation.

(d) Representations required to implement provisions of Executive Order 11246 --

(1) Previous contracts and compliance. The offeror represents that --

(i) It [_] has, [_] has not, participated in a previous contract or subcontract subject to the Equal Opportunity clause of this solicitation; and

(ii) It [_] has, [_] has not, filed all required compliance reports.

(2) *Affirmative Action Compliance*. The offeror represents that --

(i) It [_] has developed and has on file, [_] has not developed and does not have on file, at each establishment, affirmative action programs required by rules and regulations of the Secretary of Labor (41 CFR parts 60-1 and 60-2), or

(ii) It [_] has not previously had contracts subject to the written affirmative action programs requirement of the rules and regulations of the Secretary of Labor.

(e) *Certification Regarding Payments to Influence Federal Transactions* (31 U.S.C. 1352). (Applies only if the contract is expected to exceed $100,000.) By submission of its offer, the offeror certifies to the best of its knowledge and belief that no Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress or an employee of a Member of Congress on his or her behalf in connection with the award of any resultant contract. If any registrants under the Lobbying Disclosure Act of 1995 have made a lobbying contact on behalf of the offeror with respect to this contract, the offeror shall complete and submit, with its offer, OMB Standard Form LLL, Disclosure of Lobbying Activities, to provide the name of the registrants. The offeror need not report regularly employed officers or employees of the offeror to whom payments of reasonable compensation were made.

(f) *Buy American Act Certificate.* (Applies only if the clause at Federal Acquisition Regulation (FAR) 52.225-1, Buy American Act – Supplies, is included in this solicitation.)

(1) The offeror certifies that each end product, except those listed in paragraph (f)(2) of this provision, is a domestic end product and that for other than COTS items, the offeror has considered components of unknown origin to have been mined, produced, or manufactured outside the United States. The offeror shall list as foreign end products those end products manufactured in the United States that do not qualify as domestic end products, *i.e.*, an end product that is not a COTS item and does not meet the component test in paragraph (2) of the definition of "domestic end product." The terms "commercially available off-the-shelf (COTS) item," "component," "domestic end product," "end product," "foreign end product," and "United States" are defined in the clause of this solicitation entitled "Buy American Act—Supplies."

(2) Foreign End Products:

LINE ITEM NO.	COUNTRY OF ORIGIN

[List as necessary]

(3) The Government will evaluate offers in accordance with the policies and procedures of FAR Part 25.

(g)

(1) *Buy American Act -- Free Trade Agreements -- Israeli Trade Act Certificate*. (Applies only if the clause at FAR 52.225-3, Buy American Act -- Free Trade Agreements -- Israeli Trade Act, is included in this solicitation.)

(i) The offeror certifies that each end product, except those listed in paragraph (g)(1)(ii) or (g)(1)(iii) of this provision, is a domestic end product and that for other than COTS items, the offeror has considered components of unknown origin to have been mined, produced, or manufactured outside the United States. The terms "Bahrainian, Moroccan, Omani, or Peruvian end product," "commercially available off-the-shelf (COTS) item," "component," "domestic end product," "end product," "foreign end product," "Free Trade Agreement country," "Free Trade Agreement country end product," "Israeli end product," and 'United States' are defined in the clause of this solicitation entitled "Buy American Act--Free Trade Agreements--Israeli Trade Act."

(ii) The offeror certifies that the following supplies are Free Trade Agreement country end products (other than Bahrainian, Moroccan, Omani, or Peruvian end products) or Israeli end products as defined in the clause of this solicitation entitled "Buy American Act—Free Trade Agreements—Israeli Trade Act":

Free Trade Agreement Country End Products (Other than Bahrainian or Moroccan End Products) or Israeli End Products:

LINE ITEM NO.	COUNTRY OF ORIGIN

[*List as necessary*]

(iii) The offeror shall list those supplies that are foreign end products (other than those listed in paragraph (g)(1)(ii) or this provision) as defined in the clause of this solicitation entitled "Buy American Act—Free Trade Agreements—Israeli Trade Act." The offeror shall list as other foreign end products those end products manufactured in the United States that do not qualify as domestic end products, *i.e.*, an end product that is not a COTS item and does not meet the component test in paragraph (2) of the definition of "domestic end product."

Other Foreign End Products:

LINE ITEM NO.	COUNTRY OF ORIGIN

[*List as necessary*]

(iv) The Government will evaluate offers in accordance with the policies and procedures of FAR Part 25.

(2) *Buy American Act—Free Trade Agreements—Israeli Trade Act Certificate, Alternate I*. If Alternate I to the clause at FAR 52.225-3 is included in this solicitation, substitute the following paragraph (g)(1)(ii) for paragraph (g)(1)(ii) of the basic provision:

(g)(1)(ii) The offeror certifies that the following supplies are Canadian end products as defined in the clause of this solicitation entitled "Buy American Act—Free Trade Agreements—Israeli Trade Act":

Canadian End Products:

Line Item No.:

_____

[List as necessary]

(3) *Buy American Act—Free Trade Agreements—Israeli Trade Act Certificate, Alternate II.* If Alternate II to the clause at FAR 52.225-3 is included in this solicitation, substitute the following paragraph (g)(1)(ii) for paragraph (g)(1)(ii) of the basic provision:

(g)(1)(ii) The offeror certifies that the following supplies are Canadian end products or Israeli end products as defined in the clause of this solicitation entitled ``Buy American Act--Free Trade Agreements--Israeli Trade Act'':

Canadian or Israeli End Products:

Line Item No.:	Country of Origin:

[*List as necessary*]

(4) *Trade Agreements Certificate*. (Applies only if the clause at FAR 52.225-5, Trade Agreements, is included in this solicitation.)

(i) The offeror certifies that each end product, except those listed in paragraph (g)(4)(ii) of this provision, is a U.S.-made or designated country end product as defined in the clause of this solicitation entitled "Trade Agreements."

(ii) The offeror shall list as other end products those end products that are not U.S.-made or designated country end products.

Other End Products

Line Item No.:	Country of Origin:

[*List as necessary*]

(iii) The Government will evaluate offers in accordance with the policies and procedures of FAR Part 25. For line items covered by the WTO GPA, the Government will evaluate offers of U.S.-made or designated country end products without regard to the restrictions of the Buy American Act. The Government will consider for award only offers of U.S.-made or designated country end products unless the Contracting Officer determines that there are no offers for such products or that the offers for such products are insufficient to fulfill the requirements of the solicitation.

(h) *Certification Regarding Responsibility Matters (Executive Order 12689)*. (Applies only if the contract value is expected to exceed the simplified acquisition threshold.) The offeror certifies, to the best of its knowledge and belief, that the offeror and/or any of its principals--

(1) [_] Are, [_] are not presently debarred, suspended, proposed for debarment, or declared ineligible for the award of contracts by any Federal agency;

(2) [_] Have, [_] have not, within a three-year period preceding this offer, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a Federal, state or local government contract or subcontract; violation of Federal or state antitrust statutes relating to the submission of offers; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion, violating Federal criminal tax laws, or receiving stolen property; and

(3) [_] Are, [_] are not presently indicted for, or otherwise criminally or civilly charged by a Government entity with, commission of any of these offenses enumerated in paragraph (h)(2) of this clause; and

(4) [_] Have, [_] have not, within a three-year period preceding this offer, been notified of any delinquent Federal taxes in an amount that exceeds $3,000 for which the liability remains unsatisfied.

(i) Taxes are considered delinquent if both of the following criteria apply:

(A) *The tax liability is finally determined.* The liability is finally determined if it has been assessed. A liability is not finally determined if there is a pending administrative or judicial challenge. In the case of a judicial challenge to the liability, the liability is not finally determined until all judicial appeal rights have been exhausted.

(B) *The taxpayer is delinquent in making payment.* A taxpayer is delinquent if the taxpayer has failed to pay the tax liability when full payment was due and required. A taxpayer is not delinquent in cases where enforced collection action is precluded.

(ii) Examples.

(A) The taxpayer has received a statutory notice of deficiency, under I.R.C. §6212, which entitles the taxpayer to seek Tax Court review of a proposed tax deficiency. This is not a delinquent tax because it is not a final tax liability. Should the taxpayer seek Tax Court review, this will not be a final tax liability until the taxpayer has exercised all judicial appear rights.

(B) The IRS has filed a notice of Federal tax lien with respect to an assessed tax liability, and the taxpayer has been issued a notice under I.R.C. §6320 entitling the taxpayer to request a hearing with the IRS Office of Appeals Contesting the lien filing, and to further appeal to the Tax Court if the IRS determines to sustain the lien filing. In the course of the hearing, the taxpayer is entitled to contest the underlying tax liability because the taxpayer has had no prior opportunity to contest the liability. This is not a delinquent tax because it is not a final tax liability. Should the taxpayer seek tax court review, this will not be a final tax liability until the taxpayer has exercised all judicial appeal rights.

(C) The taxpayer has entered into an installment agreement pursuant to I.R.C. §6159. The taxpayer is making timely payments and is in full compliance with the agreement terms. The taxpayer is not delinquent because the taxpayer is not currently required to make full payment.

(D) The taxpayer has filed for bankruptcy protection. The taxpayer is not delinquent because enforced collection action is stayed under 11 U.S.C. §362 (the Bankruptcy Code).

(i) Certification Regarding Knowledge of Child Labor for Listed End Products (Executive Order 13126). [The Contracting Officer must list in paragraph (i)(1) any end products being acquired under this solicitation that are included in the List of Products Requiring Contractor Certification as to Forced or Indentured Child Labor, unless excluded at 22.1503(b).]

(1) Listed End Product

Listed End Product:	Listed Countries of Origin:

(2) Certification. [If the Contracting Officer has identified end products and countries of origin in paragraph (i)(1) of this provision, then the offeror must certify to either (i)(2)(i) or (i)(2)(ii) by checking the appropriate block.]

[_] (i) The offeror will not supply any end product listed in paragraph (i)(1) of this provision that was mined, produced, or manufactured in the corresponding country as listed for that product.

[_] (ii) The offeror may supply an end product listed in paragraph (i)(1) of this provision that was mined, produced, or manufactured in the corresponding country as listed for that product. The offeror certifies that is has made a good faith effort to determine whether forced or indentured child labor was used to mine, produce, or manufacture any such end product furnished under this contract. On the basis of those efforts, the offeror certifies that it is not aware of any such use of child labor.

(j) *Place of manufacture.* (Does not apply unless the solicitation is predominantly for the acquisition of manufactured end products.) For statistical purposes only, the offeror shall indicate whether the place of manufacture of the end products it expects to provide in response to this solicitation is predominantly—

(1) [_] In the United States (Check this box if the total anticipated price of offered end products manufactured in the United States exceeds the total anticipated price of offered end products manufactured outside the United States); or

(2) [_] Outside the United States.

(k) Certificates regarding exemptions from the application of the Service Contract Act. (Certification by the offeror as to its compliance with respect to the contract also constitutes its certification as to compliance by its subcontractor if it subcontracts out the exempt services.) [The contracting officer is to check a box to indicate if paragraph (k)(1) or (k)(2) applies.]

(1) [_] Maintenance, calibration, or repair of certain equipment as described in FAR 22.1003-4(c)(1). The offeror [_] does [_] does not certify that—

(i) The items of equipment to be serviced under this contract are used regularly for other than Governmental purposes and are sold or traded by the offeror (or subcontractor in the case of an exempt subcontract) in substantial quantities to the general public in the course of normal business operations;

(ii) The services will be furnished at prices which are, or are based on, established catalog or market prices (see FAR 22.1003-4(c)(2)(ii)) for the maintenance, calibration, or repair of such equipment; and

(iii) The compensation (wage and fringe benefits) plan for all service employees performing work under the contract will be the same as that used for these employees and equivalent employees servicing the same equipment of commercial customers.

(2) [_] Certain services as described in FAR 22.1003-4(d)(1). The offeror [_] does [_] does not certify that—

(i) The services under the contract are offered and sold regularly to non-Governmental customers, and are provided by the offeror (or subcontractor in the case of an exempt subcontract) to the general public in substantial quantities in the course of normal business operations;

(ii) The contract services will be furnished at prices that are, or are based on, established catalog or market prices (see FAR 22.1003-4(d)(2)(iii));

(iii) Each service employee who will perform the services under the contract will spend only a small portion of his or her time (a monthly average of less than 20 percent of the available hours on an annualized basis, or less than 20 percent of available hours during the contract period if the contract period is less than a month) servicing the Government contract; and

(iv) The compensation (wage and fringe benefits) plan for all service employees performing work under the contract is the same as that used for these employees and equivalent employees servicing commercial customers.

(l) *Taxpayer identification number (TIN) (26 U.S.C. 6109, 31 U.S.C. 7701)*. (Not applicable if the offeror is required to provide this information to a central contractor registration database to be eligible for award.)

(3) If paragraph (k)(1) or (k)(2) of this clause applies—

(i) If the offeror does not certify to the conditions in paragraph (k)(1) or (k)(2) and the Contracting Officer did not attach a Service Contract Act wage determination to the solicitation, the offeror shall notify the Contracting Officer as soon as possible; and

(ii) The Contracting Officer may not make an award to the offeror if the offeror fails to execute the certification in paragraph (k)(1) or (k)(2) of this clause or to contact the Contracting Officer as required in paragraph (k)(3)(i) of this clause.

(1) All offerors must submit the information required in paragraphs (l)(3) through (l)(5) of this provision to comply with debt collection requirements of 31 U.S.C. 7701(c) and 3325(d), reporting requirements of 26 U.S.C. 6041, 6041A, and 6050M, and implementing regulations issued by the Internal Revenue Service (IRS).

(2) The TIN may be used by the government to collect and report on any delinquent amounts arising out of the offeror's relationship with the Government (31 U.S.C. 7701(c)(3)). If the resulting contract is subject to the payment reporting requirements described in FAR 4.904, the TIN provided hereunder may be matched with IRS records to verify the accuracy of the offeror's TIN.]

(3) Taxpayer Identification Number (TIN).

[_] TIN:_____.

[_] TIN has been applied for.

[_] TIN is not required because:

[_] Offeror is a nonresident alien, foreign corporation, or foreign partnership that does not have income effectively connected with the conduct of a trade or business in the United States and does not have an office or place of business or a fiscal paying agent in the United States;

[_] Offeror is an agency or instrumentality of a foreign government;

[_] Offeror is an agency or instrumentality of the Federal Government;

(4) Type of organization.

[_] Sole proprietorship;

[_] Partnership;

[_] Corporate entity (not tax-exempt);

[_] Corporate entity (tax-exempt);

[_] Government entity (Federal, State, or local);

[_] Foreign government;

[_] International organization per 26 CFR 1.6049-4;

[_] Other _____.

(5) Common parent.

[_] Offeror is not owned or controlled by a common parent:

[_] Name and TIN of common parent:

Name _____

TIN _____

(m) *Restricted business operations in Sudan*. By submission of its offer, the offeror certifies that the offeror does not conduct any restricted business operations in Sudan.

(n) Prohibition on Contracting with Inverted Domestic Corporations.

(1) *Relation to Internal Revenue Code*. A foreign entity that is treated as an inverted domestic corporation for purposes of the Internal Revenue Code at 26 U.S.C. 7874 (or would be except that the inversion transactions were completed on or before March 4, 2003), is also an inverted domestic corporation for purposes of 6 U.S.C. 395 and for this solicitation provision (see FAR 9.108).

(2) *Representation*. By submission of its offer, the offeror represents that it is not an inverted domestic corporation and is not a subsidiary of one.

(End of Provision)

Consideration and Payment

The Contractor shall be paid as follows. Acceptance as used herein is defined as the successful completion of required tasks and deliverables for the period covered.

Payment	Milestone	Amount
1	Upon Award	$2,000
2	Acceptance of January Report, verification of Web presence, and successful completion of CDR.	$1,500
3	Acceptance of March Reports and completion of FRR.	$1,000
4	Successful completion of flight and final report	$500
	Total	$5,000

Invoices furnished by the contractor shall be submitted in triplicate to:

NASA Shared Services Center (NSSC)
Financial Management Division (FMD)- Accounts Payable
BLDG 1111, C. Road
Stennis Space Center, MS 39529
Email: NSSC-AccountsPayable@nasa.gov
Fax: 866-209-5414

OR

Electronic invoices may be submitted to:

NSSC-AccountsPayable@nasa.gov

An information copy shall be furnished to the following:

George C. Marshall Space Flight Center
Procurement Office, Attn: PS20 (Contract Specialist TBD)
Marshall Space Flight Center, AL 35812

Also send electronically to julie.d.clift@nasa.gov and edward.m.jeffries@nasa.gov

(End of clause)

Delivery Schedule

The Contractor shall deliver the items required to be furnished by the contract as follows:

Item No.	Description	Qty	Delivery Date	Email Address
1	Establish a Web presence	1	November 1, 2010	julie.d.clift@nasa.gov
2	Reports	3	November 19, 2010 January 24, 2011 March 21, 2011	same as above
3	Safety plan (updated throughout the program)	TBD	Updates to be submitted with reports	same as above
4	Reusable rocket and science payload	1	April 2011	same as above
5	Final report	1	May 2011	same as above
6	Copies of any other products developed (i.e. journal, 3-D animation, video, etc.)	1	May 2011	same as above

(End of clause)

SOLICITATION/CONTRACT/ORDER FOR COMMERCIAL ITEMS
OFFEROR TO COMPLETE BLOCKS 12, 17, 23, 24, & 30

1. REQUISITION NUMBER | PAGE 1 OF

2. CONTRACT NO. | 3. AWARD/EFFECTIVE DATE | 4. ORDER NUMBER | 5. SOLICITATION NUMBER | 6. SOLICITATION ISSUE DATE

7. FOR SOLICITATION INFORMATION CALL: | a. NAME | b. TELEPHONE NUMBER *(No collect calls)* | 8. OFFER DUE DATE/ LOCAL TIME

9. ISSUED BY | CODE

10. THIS ACQUISITION IS
☐ UNRESTRICTED OR ☐ SET ASIDE: _____ % FOR:
☐ SMALL BUSINESS ☐ EMERGING SMALL BUSINESS
NAICS:
☐ HUBZONE SMALL BUSINESS
SIZE STANDARD:
☐ SERVICE-DISABLED VETERAN-OWNED SMALL BUSINESS ☐ 8 (A)

11. DELIVERY FOR FOB DESTINATION UNLESS BLOCK IS MARKED
☐ SEE SCHEDULE

12. DISCOUNT TERMS

☐ 13a. THIS CONTRACT IS A RATED ORDER UNDER DPAS (15 CFR 700)

13b. RATING

14. METHOD OF SOLICITATION
☐ RFQ ☐ IFB ☐ RFP

15. DELIVER TO | CODE

16. ADMINISTERED BY | CODE

17a. CONTRACTOR/ OFFEROR | CODE | FACILITY CODE

TELEPHONE NO.

18a. PAYMENT WILL BE MADE BY | CODE

☐ 17b. CHECK IF REMITTANCE IS DIFFERENT AND PUT SUCH ADDRESS IN OFFER

18b. SUBMIT INVOICES TO ADDRESS SHOWN IN BLOCK 18a UNLESS BLOCK BELOW IS CHECKED ☐ SEE ADDENDUM

19. ITEM NO.	20. SCHEDULE OF SUPPLIES/SERVICES	21. QUANTITY	22. UNIT	23. UNIT PRICE	24. AMOUNT
	(Use Reverse and/or Attach Additional Sheets as Necessary)				

25. ACCOUNTING AND APPROPRIATION DATA

26. TOTAL AWARD AMOUNT *(For Govt. Use Only)*

☐ 27a. SOLICITATION INCORPORATES BY REFERENCE FAR 52.212-1, 52.212-4. FAR 52.212-3 AND 52.212-5 ARE ATTACHED. ADDENDA ☐ ARE ☐ ARE NOT ATTACHED

☐ 27b. CONTRACT/PURCHASE ORDER INCORPORATES BY REFERENCE FAR 52.212-4. FAR 52.212-5 IS ATTACHED. ADDENDA ☐ ARE ☐ ARE NOT ATTACHED

☐ 28. CONTRACTOR IS REQUIRED TO SIGN THIS DOCUMENT AND RETURN _____ COPIES TO ISSUING OFFICE. CONTRACTOR AGREES TO FURNISH AND

DELIVER ALL ITEMS SET FORTH OR OTHERWISE IDENTIFIED ABOVE AND ON ANY ADDITIONAL SHEETS SUBJECT TO THE TERMS AND CONDITIONS SPECIFIED

☐ 29. AWARD OF CONTRACT: REF. _____ OFFER

DATED _____. YOUR OFFER ON SOLICITATION (BLOCK 5), INCLUDING ANY ADDITIONS OR CHANGES WHICH ARE SET FORTH HEREIN, IS ACCEPTED AS TO ITEMS:

30a. SIGNATURE OF OFFEROR/CONTRACTOR

31a. UNITED STATES OF AMERICA *(SIGNATURE OF CONTRACTING OFFICER)*

30b. NAME AND TITLE OF SIGNER *(Type or print)* | 30c. DATE SIGNED

31b. NAME OF CONTRACTING OFFICER *(Type or print)* | 31c. DATE SIGNED

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PREVIOUS EDITION IS NOT USABLE

STANDARD FORM 1449 (REV. 3/2005)
Prescribed by GSA - FAR (48 CFR) 53.212

19. ITEM NO.	20. SCHEDULE OF SUPPLIES/SERVICES	21. QUANTITY	22. UNIT	23. UNIT PRICE	24. AMOUNT

32a. QUANTITY IN COLUMN 21 HAS BEEN

☐ RECEIVED ☐ INSPECTED ☐ ACCEPTED, AND CONFORMS TO THE CONTRACT, EXCEPT AS NOTED: _____

32b. SIGNATURE OF AUTHORIZED GOVERNMENT REPRESENTATIVE	32c. DATE	32d. PRINTED NAME AND TITLE OF AUTHORIZED GOVERNMENT REPRESENTATIVE

32e. MAILING ADDRESS OF AUTHORIZED GOVERNMENT REPRESENTATIVE	32f. TELPHONE NUMBER OF AUTHORZED GOVERNMENT REPRESENTATIVE
	32g. E-MAIL OF AUTHORIZED GOVERNMENT REPRESENTATIVE

33. SHIP NUMBER	34. VOUCHER NUMBER	35. AMOUNT VERIFIED CORRECT FOR	36. PAYMENT	37. CHECK NUMBER
☐ PARTIAL ☐ FINAL			☐ COMPLETE ☐ PARTIAL ☐ FINAL	

38. S/R ACCOUNT NO.	39. S/R VOUCHER NUMBER	40. PAID BY

41a. I CERTIFY THIS ACCOUNT IS CORRECT AND PROPER FOR PAYMENT		42a. RECEIVED BY *(Print)*	
41b. SIGNATURE AND TITLE OF CERTIFYING OFFICER	41c. DATE	42b. RECEIVED AT *(Location)*	
		42c. DATE REC'D *(YY/MM/DD)*	42d. TOTAL CONTAINERS

STANDARD FORM 1449 (REV. 3/2005) **BACK**

OMB No. 1510-0056

ACH VENDOR/MISCELLANEOUS PAYMENT ENROLLMENT FORM

This form is used for Automated Clearing House (ACH) payments with an addendum record that contains payment-related information processed through the Vendor Express Program. Recipients of these payments should bring this information to the attention of their financial institution when presenting this form for completion. See reverse for additional instructions.

PRIVACY ACT STATEMENT

The following information is provided to comply with the Privacy Act of 1974 (P.L. 93-579). All information collected on this form is required under the provisions of 31 U.S.C. 3322 and 31 CFR 210. This information will be used by the Treasury Department to transmit payment data, by electronic means to vendor's financial institution. Failure to provide the requested information may delay or prevent the receipt of payments through the Automated Clearing House Payment System.

AGENCY INFORMATION

FEDERAL PROGRAM AGENCY		
AGENCY IDENTIFIER:	AGENCY LOCATION CODE (ALC):	ACH FORMAT: ☐ CCD+ ☐ CTX
ADDRESS:		
CONTACT PERSON NAME:		TELEPHONE NUMBER: ( )
ADDITIONAL INFORMATION:		

PAYEE/COMPANY INFORMATION

NAME	SSN NO. OR TAXPAYER ID NO.
ADDRESS	
CONTACT PERSON NAME:	TELEPHONE NUMBER: ( )

FINANCIAL INSTITUTION INFORMATION

NAME:	
ADDRESS:	
ACH COORDINATOR NAME:	TELEPHONE NUMBER: ( )
NINE-DIGIT ROUTING TRANSIT NUMBER: ___ ___ ___ ___ ___ ___ ___ ___ ___	
DEPOSITOR ACCOUNT TITLE:	
DEPOSITOR ACCOUNT NUMBER:	LOCKBOX NUMBER:
TYPE OF ACCOUNT: ☐ CHECKING ☐ SAVINGS ☐ LOCKBOX	
SIGNATURE AND TITLE OF AUTHORIZED OFFICIAL: (Could be the same as ACH Coordinator)	TELEPHONE NUMBER: ( )

AUTHORIZED FOR LOCAL REPRODUCTION

SF 3881 (Rev. 2/2003)
Prescribed by Department of Treasury
31 U S C 3322; 31 CFR 210

Instructions for Completing SF 3881 Form

Make three copies of form after completing. Copy 1 is the Agency Copy; copy 2 is the Payee/Company Copy; and copy 3 is the Financial Institution Copy.

1. Agency Information Section - Federal agency prints or types the name and address of the Federal program agency originating the vendor/miscellaneous payment, agency identifier, agency location code, contact person name and telephone number of the agency. Also, the appropriate box for ACH format is checked.

2. Payee/Company Information Section - Payee prints or types the name of the payee/company and address that will receive ACH vendor/miscellaneous payments, social security or taxpayer ID number, and contact person name and telephone number of the payee/company. Payee also verifies depositor account number, account title, and type of account entered by your financial institution in the Financial Institution Information Section.

3. Financial Institution Information Section - Financial institution prints or types the name and address of the payee/company's financial institution who will receive the ACH payment, ACH coordinator name and telephone number, nine-digit routing transit number, depositor (payee/company) account title and account number. Also, the box for type of account is checked, and the signature, title, and telephone number of the appropriate financial institution official are included.

Burden Estimate Statement

The estimated average burden associated with this collection of information is 15 minutes per respondent or recordkeeper, depending on individual circumstances. Comments concerning the accuracy of this burden estimate and suggestions for reducing this burden should be directed to the Financial Management Service, Facilities Management Division, Property and Supply Branch, Room B-101, 3700 East West Highway, Hyattsville, MD 20782 and the Office of Management and Budget, Paperwork Reduction Project (1510-0056), Washington, DC 20503.

National Aeronautics and Space Administration

George C. Marshall Space Flight Center
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www.nasa.gov

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