2011

Northwest Indian College Space Center USLI Proposal

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Northwest Indian College Space Center USLI Team Proposal

1. School Information

ORGANIZATION NAME:	Northwest Indian College Space Center Northwest Indian College, 2522 Kwina Road, Bellingham, WA, 98226
TEAM NAME:	RezRiders (may change)
TEAM OFFICIAL:	Gary Brandt, NAR Level 2, faculty, Information Technology ATA Degree Program gbrandt@nwic.edu
ASST. TEAM OFFICIAL:	David Oreiro, NAR Level 2, Vice President, Northwest Indian College doreiro@nwic.edu
TEAM POINT OF CONTACT:	YakaiYasta, team leader, NAR Level 1 ygorman835@yahoo.com
SAFETY OFFICER:	Justin, NAR Level 1 nooksack_raiders@yahoo.com
NAR CONTACT:	William Munds, NAR Level 2 appusher@q.com
NAR SECTIONS	#730 NWIC-SC Northwest Indian College Space Center #578, Washington Aerospace Club

2011-2012 USLI TEAM MEMBERS AND RESPONSIBILITIES

YakaiYasta*	Team Lead and Airframe Lead, Sophomore, Direct Transfer Degree
Justin *	Safety Officer and Payload, Sophomore, Associate Technical Arts, Information Technology
Nicole	Design Lead and Propulsion, Freshman, Direct Transfer Degree
Kristina*	Outreach and Funding Lead and Assistant Team Lead, Sophomore, Direct Transfer Degree
Nicolas*	Flight Mechanics Lead and Propulsion, Sophomore, Direct Transfer Degree

Buffy	Web and Design, Junior, Native Environmental Science
Gordon*	Payload and Flight Mechanics, Retired
Paul*	Payload Lead and Structure, Sophomore, Associate Technical Arts, Information Technology
Thomas	Recovery Lead and Safety, Freshman, Associate Technical Arts, Information Technology
Michael	Design and Recovery, Sophomore, Direct Transfer Degree
Desmond	Recovery, Freshman, undeclared
Donald	Recovery, Sophomore, Associate Technical Arts, Information Technology

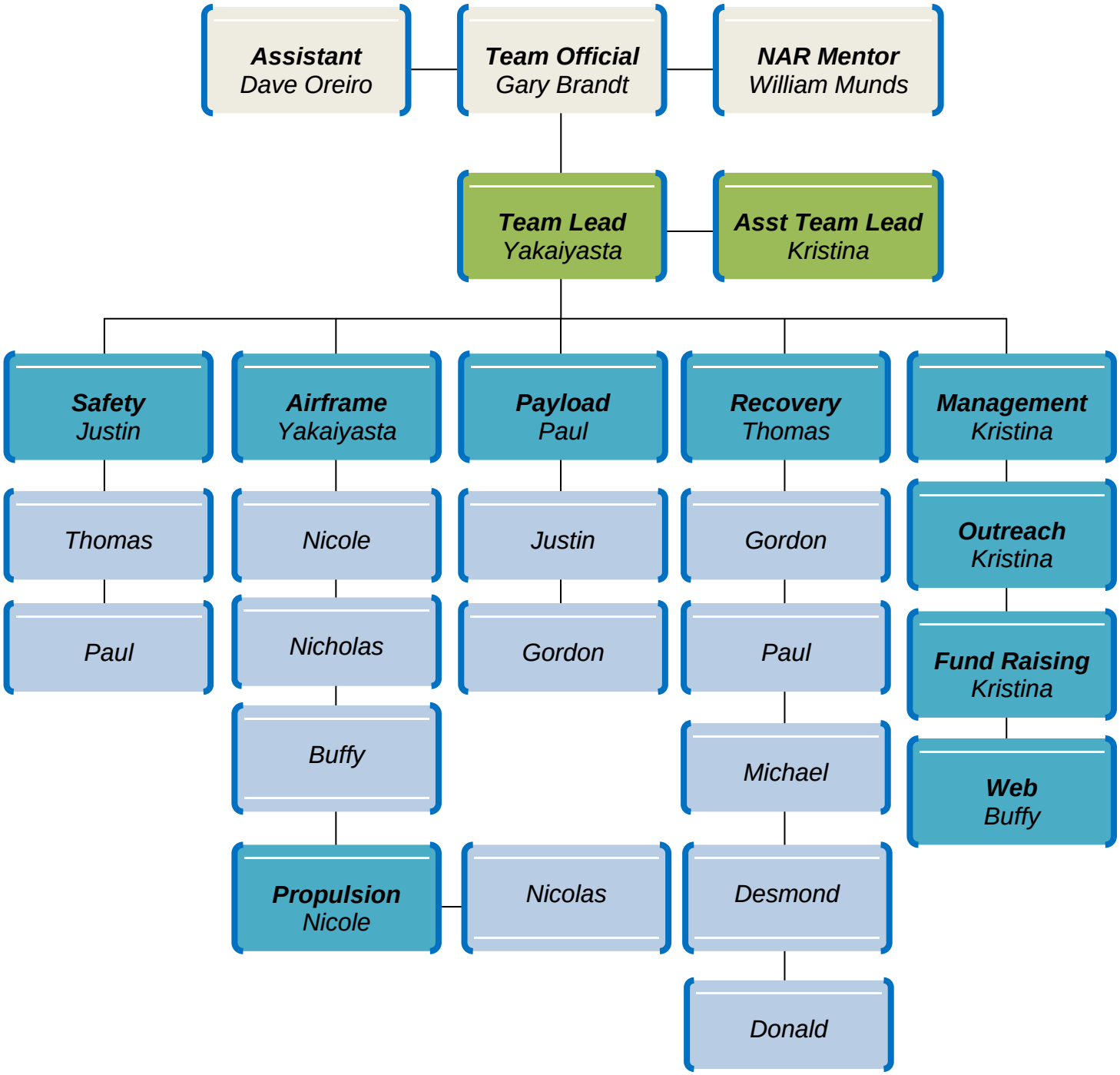
*NAR Level 1

Slightly less than 50% of the current team are returnees from last year. Since our last year's rocket did not perform successfully and since the new requirements for transmitting the data from the vehicle to a ground station will challenge the entire team, we are planning on asking to do the Science Mission Directorate (SMD) project again. We will be constructing a fresh design for the vehicle, the recovery system, and the science payload.

Our team is unique in that most of the members know each other through Tribal affiliations and/or extended family connections. This has proven to be a unifying factor that contributed highly to last year's success.

Team communication is via text messaging and email.

Team Organization



2. Facilities and Equipment

2.1 Description

The Northwest Indian College Space Center occupies a portion of Gary Brandt's classroom. The classroom houses the computer maintenance, robotics, and electronics programs. It is open from 8:00 am to 5:00 pm Monday through Friday; however due to the complexity of the USLI project, the classroom is available at anytime any of the team members need to have access. Mr. Brandt's office is also located here.

The classroom is 24' x 30' and has 15 computers arranged on the right side of the room. The left side has two-eight foot tables, one of which is a computer repair station. The other eight-foot table is where we do the majority of our rocket construction that does not result in noxious fumes or extraordinary amounts of sanding dust. The space has adequate ventilation, a fire extinguisher, a first aid kit, safety goggles, latex and nitrile gloves as well as other safety gear that ensures the safety of its occupants. MSDS's will be on hand for all necessary materials in the workshop. Our workspace occupies about 25% of our classroom.

The table top is protected with several layers of large plastic garbage bags. Additional protection to the table top is two 3/8 inch plywood pieces about four square feet in area for cutting and trimming airframes, motor mounts, fins, and etc.

We also have access to the Maintenance workshop which is connected to Mr. Brandt's classroom and entered through a separate exterior door. Its hours are also 8:00 am to 5:00 pm Monday through Friday. The maintenance shed contains the hazardous materials locker and a weather-proof area for using power tools.

Northwest Indian College has provided us with an outside covered area to do our painting and any other work that has noxious fumes associated with the work.
For additional after-hours work, Gary has a home woodshop to which we also have access. Tools include:

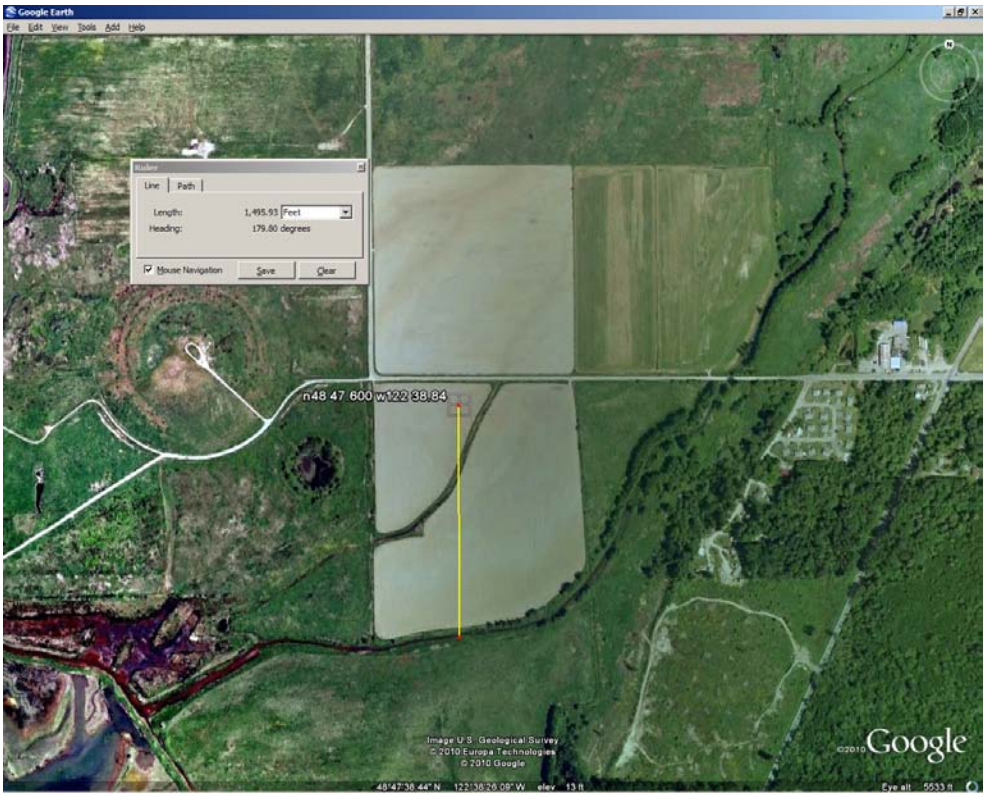
10" drill press	10" lathe	12" disk sander	12" table saw
8" scroll saw	3/8" power drill	2-Dremel tools	

2.2 Necessary Personnel, Facilities, Equipment, and Supplies

All of our students/administrators are fully capable of designing and constructing a competitive rocket and payload. Over the past 18 months we have built 17 HPR rockets and have a total of 28 launches, 3 of which have resulted in non-successful flights.

We are chartered under the National Association of Rocketry and are Section # 730

Our facilities include a high powered rocket launch facility located on the Lummi Nation Reservation. It is a five minute drive from the College and a twenty minute drive from Bellingham. We have a 5000 foot waiver from the Federal Aviation Agency and the Canadian Aviation Administration that can be used any Saturday and Sunday from 0800-1200 for flights that do not exceed 5000 above ground level.



For higher flights, we coordinate with the Washington Aerospace Club, NAR Section 538, and use their facilities at Mansfield, Washington, a 5 ½ hour drive to eastern Washington.

Currently we have three altimeters:

1 - RDAS-Tiny
2 - Perfect Flight MAWD
1 - ALTS 25

2.3 Computer Equipment

The Northwest Indian College Space Center workplace has twelve Microsoft Windows-based computers:

10 with Windows 7 and 2 with Windows XP
8 with 2.87 GHz cpu and 4 with 2.00 GHz cpu
7 with 80gb HD and 5 with 500gb HD
12 with 2GB RAM
5 have Rocksim

12 have OpenRocket and RASAero
4 have wRASP
12 have Microsoft Office 2007
12 have Rhino 3D (3D CAD)
12 have Adobe Master Suite CS4 which includes Photoshop, Dreamweaver, as well as most of the remaining Adobe suite
12 have high-speed Internet access

1 has Project 2003

We have WebEX video teleconferencing installed on the computer that is located in College's boardroom. Our website is hosted on Northwest Indian College's web server, http://blogs.nwic.edu/rocketteam. Stuart Sepp, 360-392-4274, ssepp@nwic.edu, is the contact person for Distance Learning/Web-based instruction and all things relating to the Internet.

2.4 Architectural and Transportation Barriers, Accessibility Standards

All design reports and presentations created by the team shall follow the Subpart B technical standards of the Architectural and Transportation Barriers Compliance Board Electronic and Information Technology Accessibility Standards https://www.acquisition.gov/far/current/html/Subpart%2039_2.html

Subpart B-Technical Standards
http://www.section508.gov/index.cfm?fuseAction=stdsdoc

- 1194.21 Software applications and operating systems. (a-l) - We have designed our webpage so that is can easily be used by assistive technology as well as making certain that all graphics, animations, and color schemes provide textural clues and/or options so that no one is restricted from viewing the webpage contents.

- 1194.22 Web-based intranet and internet information and applications. (a-p) – We do not use frames, server-side applications or data tables.

- 1194.26 Desktop and portable computers. (a-d) – None of our reports or presentations require any hardware other than standard consumer-oriented products.

These are the guidelines that we use to implement appropriate use of computer software, web design, and computers throughout the Northwest Indian College campus. We just reinstalled our major web-based teaching tool, Moodle, to make it more usable for sight-impaired users.

3. Safety

3.1 Responsible Safety Personnel

Justin is the safety officer for the team. He is responsible for ensuring that all safety procedures, regulations, and risk assessments are followed. Justin is a member of the National Association of Rocketry and holds his Level 1 certification.

William Munds, NAR L2 (2005) is our NAR mentor and a member of NAR Section 578, the Washington Aerospace Club. Both the advisor and the assistant advisor are NAR Level 2 certified.

3.2 Safety Plan

The NAR mentor/Team Advisor or a student team member that is NAR certified to the level required will be responsible for all motor handling operations. This includes purchase, storage, transportation and use at the launch site. They will be responsible for assembly of the motor and possession of it until it is installed in the rocket. The team advisor, NAR L2, will officially be the owner of the rocket, as is required for insurance purposes.

The NAR mentors/Team Advisor or certified student team members will be responsible for overseeing hazardous materials operations and handling.

Our team plans to build on our history of safety established within the previous 18 months of experience building and testing high-power rockets at NWIC. The current team has inherited an extensive list of materials and procedures that has led to the safe and successful launch of many rockets. The safety protocols and launch procedures will be adopted with little if any modification. The Safety Officer, Justin., is responsible for ensuring that the team's safety plan is followed. The NWIC team is aware of and compliant with all the National Association of Rocketry (NAR) requirements outlined in Appendix E.

3.21 Safety Rules and Regulations

1. All members of the team shall adhere to the NAR High Powered Safety Code. The NAR HPSC is attached as Appendix E.
2. All members of the team shall adhere to the National Fire Protection Association (NFPA) 1127: "Code for High Powered Rocket Motors".
3. All members of the team shall be aware of Federal Aviation Regulations 14 CFR, Subchapter F Subpart C "Amateur Rockets".
4. 4. All team members shall read and sign the "Range Safety Regulations" (RSR) statement. The RSR is attached as Appendix C.

Written Safety Statement

a) Compliance with NAR Section #730, Northwest Indian College Space Center range safety inspection of rocket.

b) Admission of the fact that the NWIC-SC Range Safety Officer has the final say on all rocket safety issues.
c) Any team, or member, that does not comply with the safety requirements will not be allowed to launch their rocket.

All team members will have been briefed as of Thursday, September 30, 2010 on the NAR High Power Rocket Safety Code and the risks involved with high power rocket launches.

Construction

1. The Airframe Lead has the final say while constructing any designs, subsystems, or sections of the rocket.
2. The safety officer is responsible for having all Material Safety Data Sheets (MSDS) for hazardous materials. Also, the safety officer shall inform the team of any material or substance hazards before use. A list of MSDS sheets are in Appendix D.
3. All team members are required to wear appropriate Personal Protective Equipment (PPE). PPE includes, but is not limited to, safety glasses, gloves, ear plugs, and breathing masks. The safety officer will notify team members when materials that require PPE are being used. If additional PPE is required, it is the safety officer's responsibility to obtain the additional equipment.
4. Safety glasses shall be worn when any member is using a tool that may possibility create fragments of a material (Dremmel tool, hammer, band saw, etc.)
5. Power tool use requires at least two members be present. All team members shall wear the appropriate PPE.
6. Safety is the responsibility of all team members. The safety officer shall make all team members aware of any hazards, but individual team members shall be responsible for following all regulations and guidelines set forth by the safety officer.

Motors and Black Powder

1. All explosive materials shall be kept in the appropriate storage magazine located off-site on the property of Gary Brandt, the Team Official.
2. All extra black powder, e-matches, igniters, and any unused ejection charges will be stored in the magazine.
3. Any explosives being handled during launch day will be monitored by the safety officer.

Launch Operations

1. Check lists for Ground Support, Preparation, and Launching shall be used.
2. The area surrounding the launch pod shall be cleared of all flammable materials, such as dry vegetation, for a radius of at least 50 feet. The launch control box will be located at least 100 feet for I & J motors, 200 feet for K motors and 300 feet for L motors from the launch stand.

3. The launch rail shall not be inclined greater than 30 degrees from the vertical position.
4. Once everyone is a safe distance from the launch stand, the Range Safety Officer (RSO) will permit the Launch Control Officer (LCO) to connect the launch control system to the power source.
5. The RSO shall contact the appropriate aviation agencies 5-10 minutes prior to launch for clearance to launch.
6. After the RSO has received clearance and agrees that conditions are safe for launch, the system will be checked for continuity and then armed by the LCO.
7. The LCO shall check for aircraft and any other potential hazards and then commence counting down from 5 seconds.
8. The LCO shall activate the launch system when the countdown reaches zero.

Environmental Safety at the Northwest Indian College Launch Complex

1. All hazardous materials, such as black powder and epoxy, brought onto the field must be removed.
2. All trash will be removed prior to leaving the launch complex.
3. Motor remains must be disposed of properly.
4. All rockets shall be recovered. If a rocket is lost, the team will work with the appropriate Tribal office for further assistance.
5. The launch complex will be left as clean, or cleaner than it was prior to launching.

3.22 Recognition of Federal, State, and Local Laws

The Northwest Indian College Space Center USLI team recognizes and adheres to all Tribal, state, federal, and local laws relating to the use of high power rockets. Each team member is required to sign a Range Safety Regulations (Appendix C) form acknowledging that they are aware of these laws and regulations. The signed forms are on file. All team members are briefed on safety hazards and risks that will be present at any build sessions or rocket launches. The RSO (or designee) shall conduct a safety meeting before any launch day. This meeting will include information about predicted risks, weather conditions, minimum distances from launch pad, and any changes in the launch waiver.

The RSO (or designee) shall contact the proper authorities at the appropriate times to activate the waiver for launching. Appendix F lists the time frame and contacts for waiver activation.

Each team member understands and fully complies with the following safety regulations. These regulations will be enforced by the Safety Officer.

- FAA- Federal Aviation Regulations 14 CFR, Subchapter F, Part 101, Subpart C
- NAR High Powered Rocketry Safety Code
- NFPA 1127 “Code for High Power Rocket Motors”

- NAR High Powered Safety Code
- CFR Title 27 “Commerce in Explosives”

3.23 Interaction with Rocket Motors

Motors will be purchased by either Bill Munds or one of the appropriately certified officers. After motors are received they will be placed in the team’s motor magazine which is located off-site on the property of the Team Official, Gary Brandt. This magazine is an ATF-approved Type 4 container. A second, smaller magazine box is an ATF-approved Type 3 container and will be used to transport motors to and from the launch.

In light of the recent ruling regarding APCP’s status as an explosive, the only federal regulations pertaining to the control of rocket motors are those regarding commercial transportation of motors (DOT) and NFPA regulations. The motors will be shipped directly from a vendor to a designated location in Huntsville prior to the launch. They will only be handled by our certified team members or our certified NAR mentor. Given we are not in commerce, travelling locally with them via car requires no special permits other than a NAR certification.

Arrangements for purchase, delivery, and storage of our motors for the USLI launch in April at Huntsville, AL will be performed by our NAR Mentor, Bill Munds. We plan to obtain a HPR reload from a local dealer in Huntsville. The motor will be kept in the possession of our mentor from the time of purchase until launch time.

4. Technical Design

4.1 Initial Considerations

The Northwest Indian College Space Center has a 5000 foot waiver located ten minutes from the college. The recovery area is in a flood plain that is dry from mid-May through mid-December and quite flooded the remaining months.

Safety, the recovery area conditions, and the science payload are the key determining factors in our rocket design. Safety depends upon a well-designed rocket that is large enough to house the science payload as well as the redundant recovery devices. Since our recovery area is flooded more than 50% of our project time, we need to design a system whose electronics are water tight and the rocket itself is water resistant. The payload will dictate which openings go where and the general shape of the rocket.

The payload will revolve around the NASA HQ’s Science Mission Directorate payload, which requires, at minimum, the following:

1. Atmospheric data during descent and after landing (for ten minutes)

    - Pressure
    - Temperature

- Relative Humidity
- Solar Irradiance
- Ultraviolet Radiation

2. Recorded data must be stored onboard and be transmitted wirelessly to the team's ground station at the time of completion of all surface operations
3. Photographs taken – two during descent and three after landing The photographs must have the sky oriented at the top of the image
4. Minimum separation of 2,500 feet, if the payload component separates from the rocket
5. GPS tracking in the payload section

The rocket should meet the following requirements or challenges:

- Reach as close to one mile (5,280 feet) as possible – (lower is better, scoring wise) and the rocket must not exceed 5,600 feet altitude
- Recovery systems should employ redundant altimeters with independent electronic systems
- The rocket must remain subsonic
- Dual deployment is required
- A PerfectFlite MAWD or ALT15 will be the official altimeter

A full listing of the rules and requirements can be found in the NASA University Student Launch Initiative handbook, which is available on our website http://blogs.nwic.edu/rocketteam.

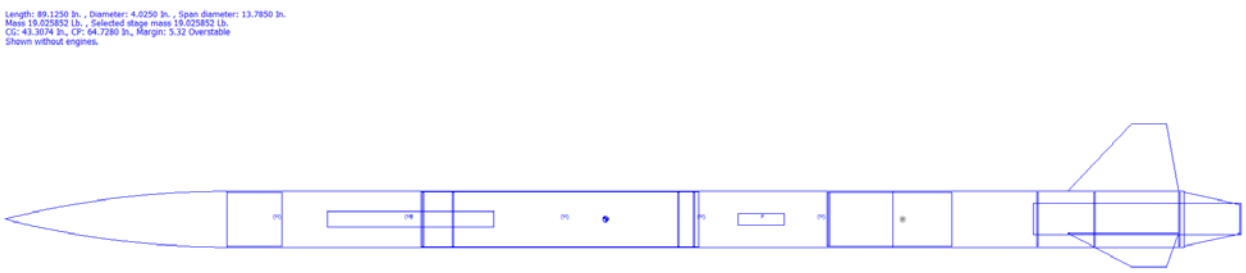
4.2 Projected Vehicle Design

Our proposed rocket will be constructed of G10 fiberglass with a 4 inch diameter and a length of about 96 inches. As mentioned previously, our recovery area for much of the winter and spring is flooded. Therefore our design will incorporate water tightness and water proofing so that our test flights will not be as restricted as they were last year. Initial design discussions and Rocksim planning has resulted in this preliminary design:

4.21 Dimensions and Design

Airframe: G10 Fiberglass
Rocket length: about 90 inches
Maximum diameter of the rocket: 4 inches
Nosecone type: Tangent ogive
Nosecone length: 16 inches
Fin span: 14 inches (G10 fiberglass)
Tail cone: 4 inches
Weight without motor or payload: 9-10 lbs
Parachute type: Circular
Main chute diameter: 72 inches

Drogue chute diameter: 20 inches
Motor: Commercially Available Solid Rocket Motor
Diameter: 54 mm
Aerotech or CTI K or L
Total Impulse: 2200 - 2800 N-s
Avionics Instrumentation: PerfectFlite MAWD



4.22 Motor Selection

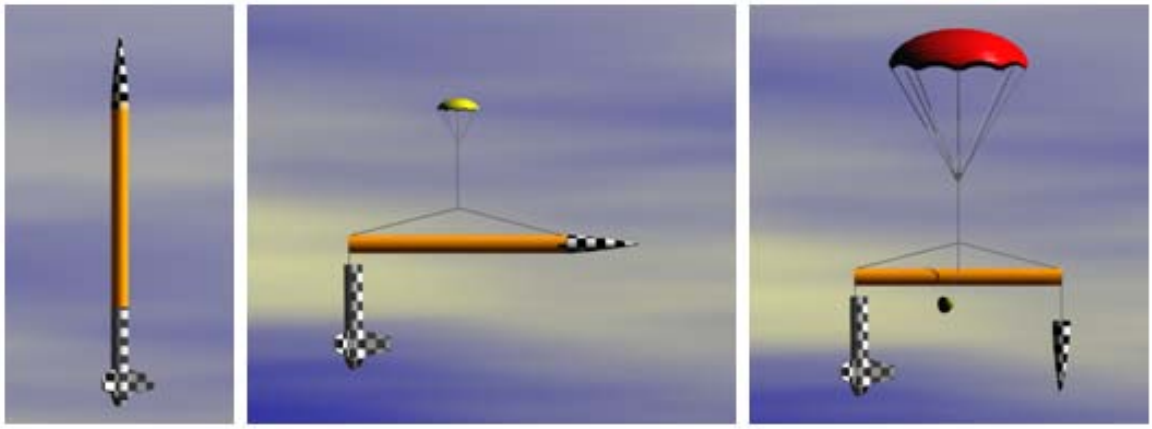
Motor sizes are being tested using Rocksim. We will be choosing from a range of impulses and will finalize our selection once the payload weight and the constructed rocket's weight are actually known. We will be "testing what we build" throughout the design cycle on our launch range so that we can match the Rocksim predictions with observed and measured data.

Our preliminary target is a 54mm motor from AeroTech or, preferably, CTI. Also, we want to keep the G-forces reasonably low to reduce strain on the airframe and the science payload.

4.23 Recovery System

The recovery system will use dual-deployment, with dual initiation-redundancy for each deployment stage (drogue/main). The proposed parachute sizes are based on Rocksim predictions. The actual parachute characteristics will be refined following the final selection and the payload weight. The theoretical Rocksim calculations will be verified using one of the available parachute programs available via the Internet. Actual verification will be accomplished through flight testing and analysis of the altimeter data.

The team's preliminary design has the main airframe section horizontal during descent. This will keep the solar irradiance and UV instrumentation more closely aligned with the sun as well as orient the cameras properly during descent and landing. Subsequent testing of our ½ scale rocket will determine the feasibility of our design.



Just before Apogee	Drogue Deploy	Main Deploy

A Garmin Astro 200 with a DC20 dog collar will be our GPS tracking unit of choice. The DC20 will be housed in the nose cone to provide separation between it and the other electronics gear.

4.24 Projected Science Payload

The team's scientific payload has been selected to meet the requirements of the Science Mission Directorate's sponsored payload. The payload will be based around Arduino or BASIC Stamp microcontrollers. We will be dedicating a microcontroller, power supply and data logger for each sensor. Having a dedicated system for each sensor ensures that some data will be collected in the event of a single or multiple sensor malfunctions. A totally catastrophic failure is the only reason that we wouldn't be able to collect some meaningful data. The sensors will gather information regarding pressure, temperature, relative humidity, solar irradiance, and ultraviolet radiation. The data will be transmitted live during descent and while on the ground as per the mission requirements. Data will also be collected from these sensors and stored on USB drives for later evaluation.

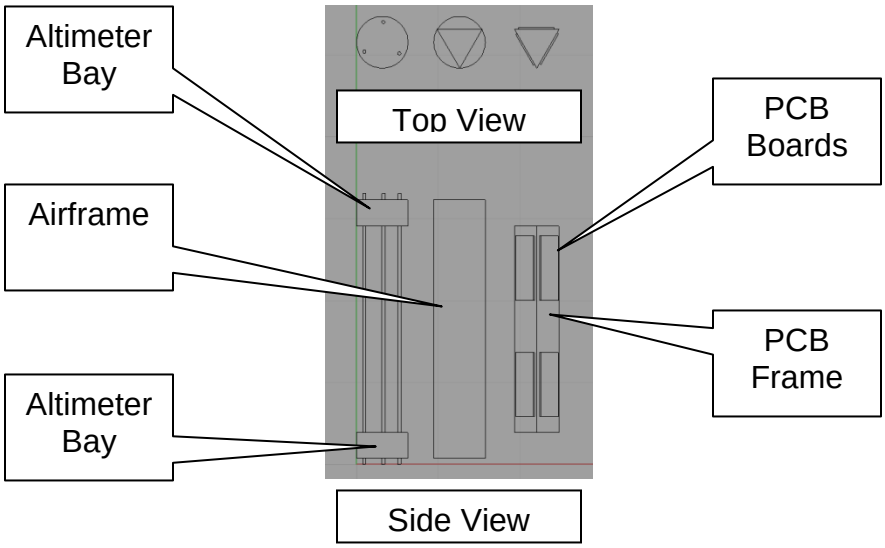
The Memory Stick Datalogger is a USB host bridge which creates a connection between a USB mass storage device, such as a Thumb Drive, to a microcontroller. The data can be transferred to a computer via the USB mass storage device.

As of now, we are still in the process of researching possible transmitters and receivers.

The science payload bay will be 20 inches long. A two inch section at either end will hold an altimeter for the redundant dual deploy system. The altimeter sections will be electrically isolated so that the altimeters will not be affected by the GPS, science payload, or the transmission device.

The middle 16 inches will contain the microcontrollers, the sensors and the transmitter. The four inch airframe will have up to six approximately 3.5" x 5.0" printed circuit boards. They will be mounted on three 3.5" x 15" x 3/32" G10 fiberglass panels that are

arranged vertically in an equilateral triangle configuration. This will allow for easy access to all of the science payload and transmitter electronics.



The airframe and science payload are designed to descend horizontally; therefore, there is a “top” to the airframe. The solar irradiance, UV detector, and the camera will be mounted on the “top” so that: 1) the sensors will be in an optimal position with regards to the sun; and, 2) the camera will be oriented properly with regards to the horizon.

4.25 Major Challenges and Solutions:

4.251 Rocket Challenges

Target Altitude - A critical requirement for the rocket will be to reach 5,280 feet above ground level. In order to achieve this altitude, the rocket will be designed and simulated with RockSim. This program will allow us to create an accurate model of the rocket from which calculations of the rocket‘s center of gravity, center of pressure, and overall stability can be made. This computer based approach will be used in conjunction with multiple test launches prior to the final launch day.

Test flights will allow us to adjust the coefficient of drag so that our simulation more correctly reflects actual flight data. We will then be able to make adjustment to the rocket’s mass to improve the probability of achieving the target altitude.

We will use a flexible ballast system that will allow the team to alter the mass of the rocket before launch. We will have a table that shows various wind speeds, launch rail angles and rocket mass so that we may adjust for nearly any weather condition. **However, the rocket will be designed so that the stability margin of the rocket will not fall below 1.5 calibers.**

Rocket Component Recovery **–** At landing, each independent or tethered sections of the launch vehicle shall have a maximum kinetic energy of 75 ft-lbf. And, all independent or tethered sections of the launch vehicle shall be designed to recover with 2,500 feet of the launch pad, assuming a 15 mph wind. The parachutes will be sized in accordance with range restrictions and kinetic energy requirements.

Recovery Reliability – We need to keep the rocket within the recovery area. Redundant dual deploy using separate altimeters, power sources, and charges will be used for the rocket's flight.

4.252 Science Payload Challenges

Locating a suitable transmitter and receiver – This is a new area for us which will require a great deal of research and locating "experts" to assist us.

Integrating the sensors, microcontrollers, and transmitting unit – Last year gave us a taste of the complexities with the science payload. We will build upon that knowledge to achieve the desired results.

5. Educational Engagement

By the end of September, letters will be sent to each of the thirteen public and private middle schools in Whatcom County. These letters are addressed to the science teachers and offer a three hour in-class opportunity for our team to visit and teach a unit on physics based upon rocketry. The letters will be followed up by phone calls and visits through November. We plan to coordinate with various teachers for activities from January through March, 2012.

Evaluation sheets will be requested from the teachers and students after each event. A summary of the results will be submitted with the Educational Engagement form.

6. Project Plan

Our project plan is very detailed to help us anticipate upcoming events. The timeline includes not only the required reporting dates, construction and testing timelines, but also a detailed section-by-section timeline for developing and writing the various reports. The timeline is in Appendix H.

The preliminary budget is listed below. Funding, as indicated, will come from several sources. Our plan is to do a great deal more toward soliciting funds and materials from outside the education and NASA communities. Appendix G illustrates our first steps in that direction. We are working with Lummi Nation Ventures, which is a small business/entrepreneur program. They are assisting us in developing a partnership/fund raising program. Also we are writing a NWIC Space Center history to be used in fund solicitations.

Qty	Description		Total Price
	Scale Model Rocket		
1	LOC Precision Vulcanite Kit	$69.95	$69.95
1	48" 54mm Airframe	$7.30	$7.30
3	Tube Couplers - 54mm	$2.05	$6.15
1	1/4" Plywood	$6.99	$6.99
1	CTI 38mm 3 grain motor casing	$35.60	$35.60
3	CTI H-100 reload	$28.76	$86.28
			$212.27

	Full Scale Rocket		
1	Performance Rocketry MadDog DD	$179.55	$179.55
1	4" G10 Airframe - 48"	$83.60	$83.60
1	4" Tail Cone	$28.50	$28.50
2	G10 Sheet, 3/32 x 12 x12	$13.30	$26.60
2	4" Coupler	$20.90	$41.80
1	1/4" Plywood	$6.99	$6.99
1	G10 Sheet, 1/8 x 12 x12	$17.10	$17.10
			$384.14

	Motors for Full Scale Rocket		
2	CTI 54mm 6 grain reload	$134.06	$268.12
1	CTI 54 mm 6 grain motor casing	$89.10	$89.10
2	CTI 54mm 5 grain reload	$119.66	$239.32
1	RMS-54/1706 MOTOR	$190.00	$190.00
			$786.54

	Miscellaneous Parts		
1	Misc Construction Supplies - paint, glue	$100.00	$100.00
1	Misc hardware - bolts, nuts, links	$100.00	$100.00
			$200.00

	Recovery System		
1	Recovery materials, nomex, nylon, kevlar	$60.00	$60.00
1	Black Powder	$40.00	$40.00
1	78" Parachute	$79.95	$79.95
1	28" Parachute	$16.75	$16.75
1	RDAS-Tiny altimeter	$300.00	$300.00
2	MAWD Altimeter	$99.95	$199.90
			$696.60

	Payload and Tracking System		
1	GPS Unit	$295.00	$295.00
1	Payload camera	$9.95	$9.95
1	Science Payload	$2,100.00	$2,100.00
			$2,404.95

		Total	**$4,684.50**

Travel			
			$0.00
12	Huntsville Travel	$575.00	$6,900.00
4	Huntsville Lodging	$200.00	$800.00
			$7,700.00

Project Income			
	NASA SMD		$3,000.00
	Outreach		$3,000.00
	Washington State Space Grant		$2,000.00
	Tribal Support		$5,000.00
			$13,000.00

Budget Summary	
Scale Rocket	$212.27
Competition Rocket	$384.14
Propulsion	$786.54
Construction Supplies	$200.00
Recovery	$696.60
Electronics & Payload	$2,404.95
	$4,684.50

Travel & Lodging	$7,700.00

Total Expenses	**$12,384.50**

Project Income	
	$13,000.00

7. Second Year/Returning Team

7.1 Sustainability

The Northwest Indian College Space Center is one of the community's cornerstones for introducing science to people of all ages. Because of this, we have partnerships with the College's Foundation, with the Lummi Nation Community Outreach program and with Washington's Native Youth Enrichment Program. Since May 2011, we have done outreach for three HeadStart groups, one conference, and one summer science program.

http://www.nasa.gov/audience/foreducators/postsecondary/features/inexperience-stop-flying.html is an article about the 2010-11 REZRiders. We also appear nearly monthly in the Tribal newspaper, "Squol Quol". Here is web link for June's article:

http://web.me.com/lummicommunications/Lummi_Communications/Squol_Quol/Entries/2011/6/3_June_2011_SQ_(2_sections)_files/JUNE%20SQ%201%28web%29.pdf The article is on pages 8 and 9.

We have been featured several times on the Washington Space Grant Consortium's Facebook page.

The positive publicity certainly aids in recruiting for the team as does the positive "gossip" that naturally occurs in a small community. Our team has a very positive reputation and is seen as major influence on students and very good press for the community.

7.2 Similar Rocket Project

Slightly less than 50% of the current team are returnees from last year. Since our last year's rocket did not perform successfully and since the new requirements for transmitting the data from the vehicle to a ground station will challenge the entire team, we are planning on asking to do the Science Mission Directorate (SMD) project again. We will be constructing a fresh design for the vehicle, the recovery system, and the science payload.

Appendix A – Key Team Member Résumés

William Munds
3481 Victory Dr SW, Port Orchard, WA 98367
206-335-0196, appusher@q.com
NAR 83502 L2 - Washington Aerospace Club # 578

OBJECTIVE:	Share my experience and enthusiasm of rocket design with the members of Northwest Indian College Students.
QUALIFIED BY:	NAR membership since 2005 Washington Aerospace membership since 2005 NAR L1, L2 certifications May 2005 Owner of rocketry vending business since January 2005 38 Years in the construction field
EXPERIENCE:	
2007 to present:	Team Mentor to Northwest Indian College Space Center REZRiders USLI team. Working closely with TARC teams from Colville High School, Ingraham High School, Kentwood High School to get them started with the fundamentals. I am also working with Earth and Space Sciences at University of Washington. After certifying NAR Level 2, in May 2007, I broke 10,313 feet with a 62" long 3" airframe and a K700W that incorporated a Gwiz 800 Deluxe altimeter that was designed for dual deployment.
2005 to present:	I opened Puget Sound Propulsion as an onsite rocketry vendor, supplying reloads and hardware to Club fliers, TARC Teams, University Structural Engineering Aerospace Teams. The Company started with reloads and hardware and has grown it's inventory to include a wide variety of inventory. PSP continues to support education of the related sciences involving rocketry.
1972 to present:	I am a Journey Level Drywall finisher working mostly in the commercial smooth wall area of the trade. I have worked as support personnel in company warehouses organizing tool and material inventories. I have worked as a Crew Leader to accomplish segments of the larger project. I have held the position of Foreman that was responsible for accessing labor and material needs for tenant improvement jobs. Also, I have held positions of Field Supervisor overseeing labor and material for up to 5 separate jobs with up to 15 employees.
1984 – 1987	I held a Maintenance Supervisor position with and assistant for 2 properties, 115 units and 230 units. I scheduled and was involved in apartment turnover, kept a repair parts inventory, maintained relevant equipment, maintained and repaired swimming pools and hot tubs, worked with local inspectors regarding health codes for swimming pools and hot tubs, completed training and acquired certificates to hold the position. While working with Lincoln Properties in Bellevue, WA, was awarded Maintenance Supervisor of the 3rd Qtr in 1986.

Gary L. Brandt

2630 Walnut St
Bellingham, WA 98225
360-734-0383
gary@macy-brandt.com

CREDENTIALS

California & Idaho Secondary Teaching Credential, endorsements in science, math, earth science, agricultural science
California & Idaho Elementary Teaching Credential

PROFESSIONAL TRAINING & EDUCATION

2009 Adobe Certified Technician
2001 Microsoft Certified Professional training in Windows 2000 field
1996-99 Western Washington University, Bellingham, WA, MEd Adult Education/Instructional Technology
1993 IBM RS/6000 and Unix training through IBM educational services
1990-93 System and College Administrator training for Datatel Colleague integrated software
1988-89 IBM System Manager and programming courses for IBM System 36
1980-83 Graduate work in education, University of Idaho
1979 Computer programming languages and applications courses
1977 California State University, San Bernardino, elementary credential, M.A. work in reading and work toward reading specialist credential
1974-76 University of California, Riverside, secondary credential, M.A. work, reading
1973-74 University of California, Riverside, computer programming and statistics
1971-75 University of California, Riverside Extension, Human Services
1963-68 University of California, Los Angeles, B.S., geology

WORK EXPERIENCE

Bellingham, Washington

2001- *Faculty*, Northwest Indian College, Information Technology, Robotics, Web Design, Electronics Programs
2001-08 *Network Administrator & MIS*, Nooksack Indian Tribe
1997-00 *Technical Solutions Provider*, MediaSeek Technologies, Inc.
1997, 98 *Lecturer*, Western Washington University, Computer Science 101 and CS 110 lab TA
1996-99 *Instructo*r, Whatcom Community College Community Ed Program, computer operations
1996-08 *Gary L. Brandt Consulting*
1989-96 *Director*, Computer Center, Northwest Indian College
1989-96 *Computer Instructor*, Northwest Indian College
1989-94 *Director*, MIS development under United States Department of Education Title III grant
1989-96 *Graphics consultant and programmer*, Distance Learning Center, Northwest Indian College
1990-92 *Registrar*, Northwest Indian College

Coeur d'Alene, Idaho

1984-89 *Director*, Technology Department, School District #271
1984-87 *Director*, Project CABLE, United States Department of Education Secretary's Discretionary Grant to Improve Education through Technology
1984-87 *Assistant Director*, READ:S Lighthouse Project, United States Department of Education National Diffusion Network Developer Demonstrator grant
1984-89 *Director*, Chapter 2 ECIA, School District #271
1983-84 *Coordinator*, Project CABLE, United States Department of Education Secretary's Discretionary Grant to Improve Education through Technology
1983-89 *Technical consultant and programmer*, Project READ:S and READ:S Lighthouse Project, United States Department of Education National Diffusion Network Developer Demonstrator grant

1982-87 *Computer programming instructor*, North Idaho College
1979-89 *Computer inservice instructor*, School District #271
1978-83 *Teacher*, fifth grade, Ramsey Elementary School

California

1975-78 *Teacher*, fifth grade, Lake Arrowhead Elementary, Rim of the World Unified School District
1975-78 *Teacher*, remedial reading/math inter-session Program, Rim of the World Unified School District
1974-75 *Student teacher*, Alessandro Jr. High School (Moreno Unified), agricultural science, earth science, math (7-8), Moreno Valley High School (Moreno Unified), general math (9-12)
1973 *Tutor/teacher*, Upward Bound Project, Riverside

OTHER EXPERIENCE

1996-08 *Owner*, Gary L. Brandt Consulting
1984-89 *Member*, Idaho State Department of Education Technology Advisory Committee
1982-87 *Vice-President*, Micro-Serve, Inc., microcomputer system analyst, programmer, and consultant
1971-73 *Education Officer, Instructor, and Counselor*, Human Relations, Drug Abuse Prevention and Education, United States Marine Corps
1968-73 *Naval Aviator*, United States Marine Corps

DAVID W.C. OREIRO
3265 Lummi Shore Road
Bellingham, WA 98226
(360) 3937546 cell
(360) 392-4249 work

EDUCATION: Med Student Personnel Administration, WWU 1995
BS Environmental Planning & Policy, WWU 1976

EXPERIENCE: Northwest Indian College, Vice President for Administration & Facilities current 4 years, and current Interim Director for National Indian Center Marine Research and Education, 21 years at the college in administrative and supervisory positions including Dean of Students & Soar Director, Math & Science Department Director, Registrar, Admissions and Recruitment Director, and Extension Office Co-coordinator.

- Oversee Campus Master Planning and facilities development and construction
- Supervise Instructional Technology, Maintenance and Construction departments
- Implementing NOAA –NICMERE Memorandum of Agreement
- Administrative and Leadership Team member for Institutional Capacity Building
- Co-Chair for Self-Study Accreditation Review Process for Bachelor of Science Degree

Planning Director, Lummi Indian Business Council, 12 years in Economic, Community, and Land Use planning activities for the Lummi Nation.

- Development of the Lummi Nation Overall Economic Plan
- Implement Infrastructure plans for community development
- Coordinated all environmental, land use, forestry, solid waste, coastal zone planning
- Instituted land consolidation and acquisition programs to increase tribal land base

Commercial Fisherman in Puget Sound, 10 years.

ACTIVITIES: WWU – Huxley Advisory Board current 2 years.
Rocketry: Tripoli membership 12761 & Nat'l Assoc. of Rocketry NAR: 91812 SR

YakaiYastai Gorman
3344 Southgate Road, Bellingham, WA, 98226
(360)758-2577
kgorman674@gmail.com

EMPLOYMENT HISTORY

Northwest High School - Teacher's Assistant 2009-2010
Shiprock, NM

- Copy and collate all projects of being a teacher's assistant
- Successfully complete all jobs by time requested
- Assisted with daily homework grading and instruction

Canyon De Chelly National Monument – Interpretation Department 2010 summer
Chinle, AZ

- Accurately filed and delivered mail to all company departments
- Assisted with customers with info on Canyon De Chelly National Monument
- Assisted customers with info about guided tours into Canyon De Chelly

Preserving the Tradition Youth Camp – Cultural Advisor 2008 - current
Steamboat, AZ

- Taught youth about cultural importance
- Taught youth about cultural stories, arrowhead making, traditional songs, corn grinding, etc

EDUCATION

Diploma 2010
Northwest High School, Shiprock, NM

Direct Transfers Degree – AA
2011 - current
Northwest Indian College, Bellingham, WA

Appendix B – Federal Aviation Regulations

14 CFR, SUBCHAPTER F, PART 101, SUBPART C – AMATEUR ROCKETS

http://ecfr.gpoaccess.gov/cgi/t/text/textidx?c=ecfr&sid=82dd72bce386d91e7783234fa0181c3f&rgn=div5&view=text&node=14:2.0.1.3.15&idno=14#14:2.0.1.3.15.3

Subpart C— Amateur Rockets

§ 101.21 Applicability.

(a) This subpart applies to operating unmanned rockets. However, a person operating an unmanned rocket within a restricted area must comply with §101.25(b)(7)(ii) and with any additional limitations imposed by the using or controlling agency.

(b) A person operating an unmanned rocket other than an amateur rocket as defined in §1.1 of this chapter must comply with 14 CFR Chapter III.

§ 101.22 Definitions.

The following definitions apply to this subpart:

(a) *Class 1—Model Rocket* means an amateur rocket that:

(1) Uses no more than 125 grams (4.4 ounces) of propellant;

(2) Uses a slow-burning propellant;

(3) Is made of paper, wood, or breakable plastic;

(4) Contains no substantial metal parts; and

(5) Weighs no more than 1,500 grams (53 ounces), including the propellant.

(b) *Class 2—High-Power Rocket* means an amateur rocket other than a model rocket that is propelled by a motor or motors having a combined total impulse of 40,960 Newton-seconds (9,208 pound-seconds) or less.

(c) *Class 3—Advanced High-Power Rocket* means an amateur rocket other than a model rocket or high-power rocket.

§ 101.23 General operating limitations.

(a) You must operate an amateur rocket in such a manner that it:

(1) Is launched on a suborbital trajectory;

(2) When launched, must not cross into the territory of a foreign country unless an agreement is in place between the United States and the country of concern;

(3) Is unmanned; and

(4) Does not create a hazard to persons, property, or other aircraft.

(b) The FAA may specify additional operating limitations necessary to ensure that air traffic is not adversely affected, and public safety is not jeopardized.

§ 101.25 Operating limitations for Class 2-High Power Rockets and Class 3-Advanced High Power Rockets.

When operating *Class 2-High Power Rockets or Class 3-Advanced High Power* Rockets, you must comply with the General Operating Limitations of §101.23. In addition, you must not operate *Class 2-High Power Rockets or Class 3-Advanced High Power* Rockets—

(a) At any altitude where clouds or obscuring phenomena of more than five-tenths coverage prevails;

(b) At any altitude where the horizontal visibility is less than five miles;

(c) Into any cloud;

(d) Between sunset and sunrise without prior authorization from the FAA;

(e) Within 9.26 kilometers (5 nautical miles) of any airport boundary without prior authorization from the FAA;

(f) In controlled airspace without prior authorization from the FAA;

(g) Unless you observe the greater of the following separation distances from any person or property that is not associated with the operations:

(1) Not less than one-quarter the maximum expected altitude;

(2) 457 meters (1,500 ft.);

(h) Unless a person at least eighteen years old is present, is charged with ensuring the safety of the operation, and has final approval authority for initiating high-power rocket flight; and

(i) Unless reasonable precautions are provided to report and control a fire caused by rocket activities.

[74 FR 38092, July 31, 2009, as amended by Amdt. 101–8, 74 FR 47435, Sept. 16, 2009]

§ 101.27 ATC notification for all launches.

No person may operate an unmanned rocket other than a Class 1—Model Rocket unless that person gives the following information to the FAA ATC facility nearest to the place of intended operation no less than 24 hours before and no more than three days before beginning the operation:

(a) The name and address of the operator; except when there are multiple participants at a single event, the name and address of the person so designated as the event launch coordinator, whose duties include coordination of the required launch data estimates and coordinating the launch event;

(b) Date and time the activity will begin;

(c) Radius of the affected area on the ground in nautical miles;

(d) Location of the center of the affected area in latitude and longitude coordinates;

(e) Highest affected altitude;

(f) Duration of the activity;

(g) Any other pertinent information requested by the ATC facility.

§ 101.29 Information requirements.

(a) *Class 2—High-Power Rockets* . When a Class 2—High-Power Rocket requires a certificate of waiver or authorization, the person planning the operation must provide the information below on each type of rocket to the FAA at least 45 days before the proposed operation. The FAA may request additional information if necessary to ensure the proposed operations can be safely conducted. The information shall include for each type of Class 2 rocket expected to be flown:

(1) Estimated number of rockets,

(2) Type of propulsion (liquid or solid), fuel(s) and oxidizer(s),

(3) Description of the launcher(s) planned to be used, including any airborne platform(s),

(4) Description of recovery system,

(5) Highest altitude, above ground level, expected to be reached,

(6) Launch site latitude, longitude, and elevation, and

(7) Any additional safety procedures that will be followed.

(b) *Class 3—Advanced High-Power Rockets* . When a Class 3—Advanced High-Power Rocket requires a certificate of waiver or authorization the person planning the operation must provide the information below for each type of rocket to the FAA at least 45 days before the proposed operation. The FAA may request additional information if necessary to ensure the proposed operations can be safely conducted. The information shall include for each type of Class 3 rocket expected to be flown:

(1) The information requirements of paragraph (a) of this section,

(2) Maximum possible range,

(3) The dynamic stability characteristics for the entire flight profile,

(4) A description of all major rocket systems, including structural, pneumatic, propellant, propulsion, ignition, electrical, avionics, recovery, wind-weighting, flight control, and tracking,

(5) A description of other support equipment necessary for a safe operation,

(6) The planned flight profile and sequence of events,

(7) All nominal impact areas, including those for any spent motors and other discarded hardware, within three standard deviations of the mean impact point,

(8) Launch commit criteria,

(9) Countdown procedures, and

(10) Mishap procedures.

[Doc. No. FAA–2007–27390, 73 FR 73781, Dec. 4, 2008, as amended at Doc. No. FAA–2007–27390, 74 FR 31843, July 6, 2009]

Appendix C – Range Safety Regulations

I , _____, have fully read and fully understand the following regulations relating to operating high powered rockets:

1. The National Association of Rocketry High Powered Rocketry Safety Code
2. The National Fire Protection Association (NFPA) 1127: “Code for High Powered Rocket Motors".
3. The Federal Aviation Regulations 14 CFR, Subchapter F Subpart C “Amateur Rockets”.

Also, I understand that the Range Safety Officer has the right to deny any rocket from launch. Before launch I will check with the RSO about:

1. Safety inspection of my rocket
2. Checking the stability of my rocket (center of pressure and center of gravity locations).
3. Weather conditions at the launch pad and predicted altitude
4. Electronics such as altimeters, timers, flight computers, etc.
5. Best recovery options including: Descent rates, launch pad inclination, etc.

Safety is the number one priority for the NWIC Space Center. I hereby reaffirm my commitment to keeping myself, my teammates, launch participants, and the environment safe from risk, harm, and damage.

Signed:

_____

Appendix D – Material Safety Data Sheets

A printed copy of each of the below MSDS are located in a conspicuous place in the team's workplace. The material Safety Data Sheets for all hazardous materials the team will be utilizing are located on the team website, blogs.nwic.edu/rocketteam. As we encounter new materials, the website and workspace will be updated accordingly.

Acetone
Ammonium-perchlorate
Epoxy Mixture
JB Weld 5 Minute Epoxy
Krylon-Cherry Red
Wood Dust
Isopropyl Alcohol
Aerotech Motors
Black Powder
Fiberglass
Krylon-Black
Krylon- Grey Primer
Super Glue
Rosin Core Solder

Appendix E - NAR High Powered Safety Code & Minimum Distance Table

High Power Rocket Safety Code

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 1500 feet 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

Appendix F – FAA Launch Activation

Date	Time	Initials	Agency	Phone	Timing
			NOTAM	877-487-6867	24-72 hrs
			BLI ATC	360-734-2745	24-48 hrs
			Vancouver ACC	604-586-4560	24-48 hrs
			BLI ATC	360-734-2745	30-45 min
			Vancouver ACC	604-586-4560	5-10 min
			NOTAM	**877-487-6867**	**Operations Concluded**
			BLI ATC	**360-734-2745**	
			Vancouver ACC	**604-586-4560**	

Appendix G – Fund Raising Brochure

"Indeed, the whole process was empowering because it's made me realize that we're capable of anything we set our minds to and can aspire to our true passions and interests in life."
Trisha, student and rocket team member

2011 First Nations Team

A BIG First Place Win

The team later competed in the 2011 First Nations Launch competition. For the First Nations competition, the students had to do much of the same work but also had to give a live presentation. The students were prepared for it by their USLI experience. The students ended up placing first in the First Nations Launch competition within the Tribal College ranking.

The rocket is 8' long and carries multiple science experiments. We predicted at 3,300 foot altitude and the actual measured altitude was 3,030 feet. This earned us first place in the altitude prediction portion of the competition.

360-392-4318

gbrandt@nwic.edu
http://blogs.nwic.edu/spacecenter

"Old Glories" ascending at NASA Advanced Rocketry Workshop, Las Cruces, NM – 7/23/11

Northwest Indian College Space Center

We believe that doing things is the quickest way to learning. Doing new things is the quickest way to expand one's horizons which can help make dreams a reality.

Gary L. Brandt
Faculty Advisor

2010-11USLI Team

The NWIC Space Center started in the fall of 2009 based upon pressurized water and air soda pop bottle rockets.

By January 2010 the rocketeers had progressed to high powered rockets in response to a First Nations Launch to be held in April 2010, where they placed 2nd.

Emboldened by the 2nd place finish, the team submitted a proposal to NASA's University Student Launch project. The NWIC Space Center's team, REZRiders proposal was accepted, along with 32 engineering and technical universities such as MIT, Vanderbilt, Purdue and the like.

REZRiders placed 17th.

2011-2012

The returning team members and new team members want to compete in the 2011-2012 NASA USLI and First Nations Launch programs. They've spent part of their summer vacation time preparing the USLI proposal. There is, unfortunately, a new roadblock.

Our main source of funds has been NASA. However, this year the funding from NASA's Science Mission Directorate has been reduced from $5000 to $3000 per team. The Washington State Space Grant is facing a 44% reduction. This means a great deal of fundraising.

Why We Do This

First off, it's fun! Secondly, it is a wonderful way to learn physics, math, engineering, electronics, you know, the stuff that makes rocket scientists. The NWIC Space Center has created many opportunities for students to learn "hard science" subjects, teamwork, project planning and design.

Our students have learned that they can talk and work with students from really big universities and colleges on an equal footing.

We have representatives from eight different tribes and team member ages from 17 to 77. Both last year's and this year's teams have a 50-50 gender split.

"I learned how to work with the team members and so much rocket information that's too long I won't list."
Mariya, student and rocket team member

USLI Team at Marshall Space Center, Huntsville, Alabama

Our Needs

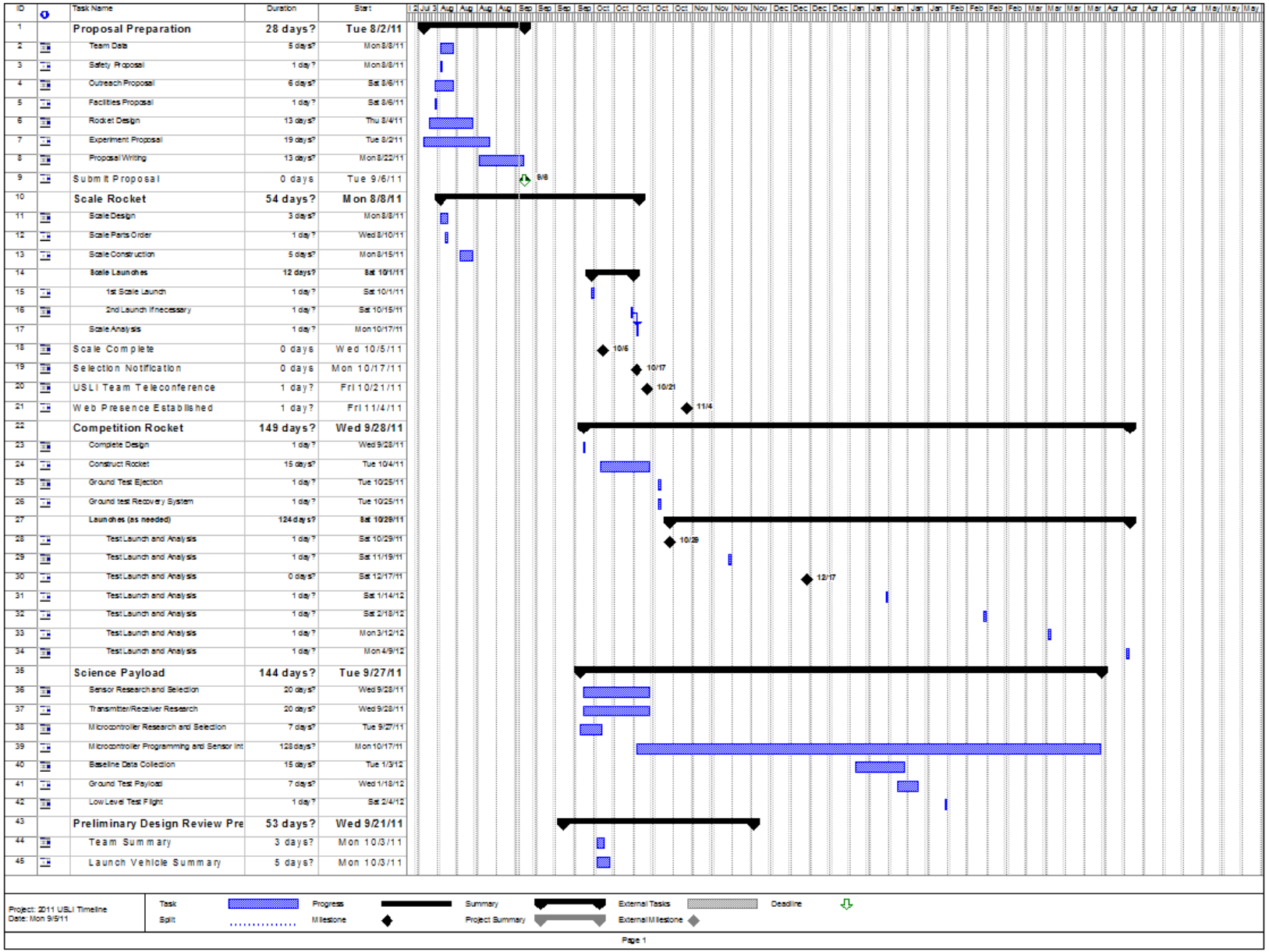
- Money for the rockets.
- Money for the science payload.
- Money for the rocket motors.
- Money for travel.

How You Can Help!

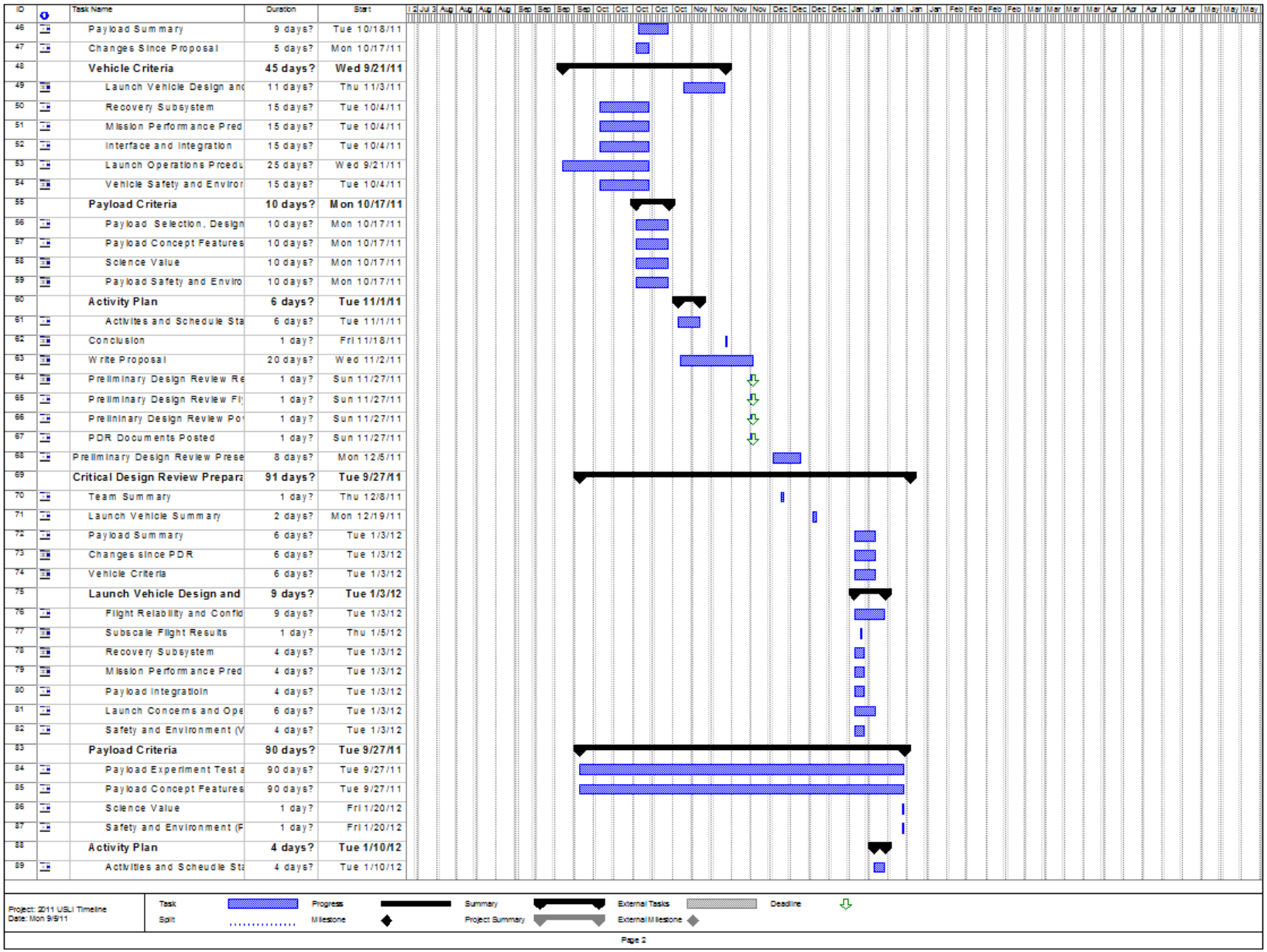
- Help us with our fundraising.
- Donate money to the Northwest Indian College Foundation earmarked for the Space Center
- Donate materials, hardware, time, etc. that we can use for our projects.

"I want to commend your team for being so organized. Each student took so much pride in their rocket and it was so rewarding to see them all launch perfectly." Dr. R. Yingst, Director, Wisconsin Space Grant Consortium

Appendix H – Timeline



ID	Task Name	Duration	Start
1	**Proposal Preparation**	**28 days?**	**Tue 8/2/11**
2	Team Data	5 days?	Mon 8/8/11
3	Safety Proposal	1 day?	Mon 8/8/11
4	Outreach Proposal	6 days?	Sat 8/6/11
5	Facilities Proposal	1 day?	Sat 8/6/11
6	Rocket Design	13 days?	Thu 8/4/11
7	Experiment Proposal	19 days?	Tue 8/2/11
8	Proposal Writing	13 days?	Mon 8/22/11
9	Submit Proposal	0 days	Tue 9/6/11
10	**Scale Rocket**	**54 days?**	**Mon 8/8/11**
11	Scale Design	3 days?	Mon 8/8/11
12	Scale Parts Order	1 day?	Wed 8/10/11
13	Scale Construction	5 days?	Mon 8/15/11
14	**Scale Launches**	**12 days?**	**Sat 10/1/11**
15	1st Scale Launch	1 day?	Sat 10/1/11
16	2nd Launch if necessary	1 day?	Sat 10/15/11
17	Scale Analysis	1 day?	Mon 10/17/11
18	Scale Complete	0 days	Wed 10/5/11
19	Selection Notification	0 days	Mon 10/17/11
20	USLI Team Teleconference	1 day?	Fri 10/21/11
21	Web Presence Established	1 day?	Fri 11/4/11
22	**Competition Rocket**	**149 days?**	**Wed 9/28/11**
23	Complete Design	1 day?	Wed 9/28/11
24	Construct Rocket	15 days?	Tue 10/4/11
25	Ground Test Ejection	1 day?	Tue 10/25/11
26	Ground test Recovery System	1 day?	Tue 10/25/11
27	**Launches (as needed)**	**124 days?**	**Sat 10/29/11**
28	Test Launch and Analysis	1 day?	Sat 10/29/11
29	Test Launch and Analysis	1 day?	Sat 11/19/11
30	Test Launch and Analysis	0 days?	Sat 12/17/11
31	Test Launch and Analysis	1 day?	Sat 1/14/12
32	Test Launch and Analysis	1 day?	Sat 2/18/12
33	Test Launch and Analysis	1 day?	Mon 3/12/12
34	Test Launch and Analysis	1 day?	Mon 4/9/12
35	**Science Payload**	**144 days?**	**Tue 9/27/11**
36	Sensor Research and Selection	20 days?	Wed 9/28/11
37	Transmitter/Receiver Research	20 days?	Wed 9/28/11
38	Microcontroller Research and Selection	7 days?	Tue 9/27/11
39	Microcontroller Programming and Sensor Int	128 days?	Mon 10/17/11
40	Baseline Data Collection	15 days?	Tue 1/3/12
41	Ground Test Payload	7 days?	Wed 1/18/12
42	Low Level Test Flight	1 day?	Sat 2/4/12
43	**Preliminary Design Review Pre**	**53 days?**	**Wed 9/21/11**
44	Team Summary	3 days?	Mon 10/3/11
45	Launch Vehicle Summary	5 days?	Mon 10/3/11


ID
Task Name
Duration
Start
46 Payload Summary 9 days? Tue 10/18/11
47 Changes Since Proposal 5 days? Mon 10/17/11
48 Vehicle Criteria 45 days? Wed 9/21/11
49 Launch Vehicle Design and 11 days? Thu 11/3/11
50 Recovery Subsystem 15 days? Tue 10/4/11
51 Mission Performance Pred 15 days? Tue 10/4/11
52 Interface and Integration 15 days? Tue 10/4/11
53 Launch Operations Procedu 25 days? Wed 9/21/11
54 Vehicle Safety and Enviror 15 days? Tue 10/4/11
55 Payload Criteria 10 days? Mon 10/17/11
56 Payload Selection, Design 10 days? Mon 10/17/11
57 Payload Concept Features 10 days? Mon 10/17/11
58 Science Value 10 days? Mon 10/17/11
59 Payload Safety and Enviro 10 days? Mon 10/17/11
60 Activity Plan 6 days? Tue 11/1/11
61 Activites and Schedule Sta 6 days? Tue 11/1/11
62 Conclusion 1 day? Fri 11/18/11
63 Write Proposal 20 days? Wed 11/2/11
64 Preliminary Design Review Re 1 day? Sun 11/27/11
65 Preliminary Design Review Fl 1 day? Sun 11/27/11
66 Preliminary Design Review Po 1 day? Sun 11/27/11
67 PDR Documents Posted 1 day? Sun 11/27/11
68 Preliminary Design Review Prese 8 days? Mon 12/5/11
69 Critical Design Review Prepara 91 days? Tue 9/27/11
70 Team Summary 1 day? Thu 12/8/11
71 Launch Vehicle Summary 2 days? Mon 12/19/11
72 Payload Summary 6 days? Tue 1/3/12
73 Changes since PDR 6 days? Tue 1/3/12
74 Vehicle Criteria 6 days? Tue 1/3/12
75 Launch Vehicle Design and 9 days? Tue 1/3/12
76 Flight Reliability and Confid 9 days? Tue 1/3/12
77 Subscale Flight Results 1 day? Thu 1/5/12
78 Recovery Subsystem 4 days? Tue 1/3/12
79 Mission Performance Pred 4 days? Tue 1/3/12
80 Payload Integratioln 4 days? Tue 1/3/12
81 Launch Concerns and Ope 6 days? Tue 1/3/12
82 Safety and Environment (V 4 days? Tue 1/3/12
83 Payload Criteria 90 days? Tue 9/27/11
84 Payload Experiment Test a 90 days? Tue 9/27/11
85 Payload Concept Features 90 days? Tue 9/27/11
86 Science Value 1 day? Fri 1/20/12
87 Safety and Environment (F 1 day? Fri 1/20/12
88 Activity Plan 4 days? Tue 1/10/12
89 Activities and Scheudle Sta 4 days? Tue 1/10/12
Project: 2011 USLI Timeline
Date: Mon 9/5/11
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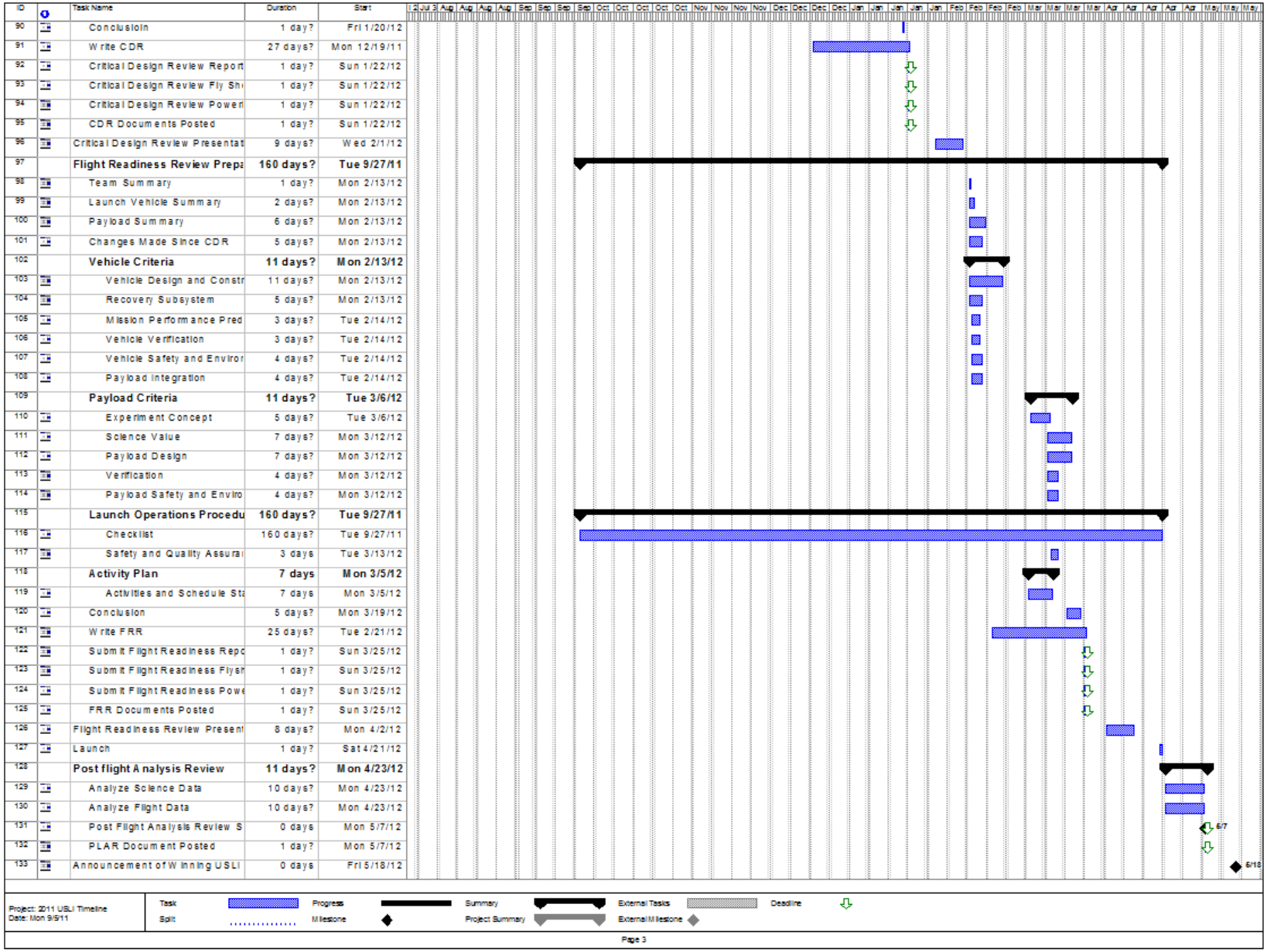
ID
Task Name
Duration
Start
90 Conclusioln 1 day? Fri 1/20/12
91 Write CDR 27 days? Mon 12/19/11
92 Critical Design Review Report 1 day? Sun 1/22/12
93 Critical Design Review Fly Sh 1 day? Sun 1/22/12
94 Critical Design Review Power 1 day? Sun 1/22/12
95 CDR Documents Posted 1 day? Sun 1/22/12
96 Critical Design Review Presentat 9 days? Wed 2/1/12
97 Flight Readiness Review Prepa 160 days? Tue 9/27/11
98 Team Summary 1 day? Mon 2/13/12
99 Launch Vehicle Summary 2 days? Mon 2/13/12
100 Payload Summary 6 days? Mon 2/13/12
101 Changes Made Since CDR 5 days? Mon 2/13/12
102 Vehicle Criteria 11 days? Mon 2/13/12
103 Vehicle Design and Constr 11 days? Mon 2/13/12
104 Recovery Subsystem 5 days? Mon 2/13/12
105 Mission Performance Pred 3 days? Tue 2/14/12
106 Vehicle Verification 3 days? Tue 2/14/12
107 Vehicle Safety and Enviror 4 days? Tue 2/14/12
108 Payload Integration 4 days? Tue 2/14/12
109 Payload Criteria 11 days? Tue 3/6/12
110 Experiment Concept 5 days? Tue 3/6/12
111 Science Value 7 days? Mon 3/12/12
112 Payload Design 7 days? Mon 3/12/12
113 Verification 4 days? Mon 3/12/12
114 Payload Safety and Enviro 4 days? Mon 3/12/12
115 Launch Operations Procedu 160 days? Tue 9/27/11
116 Checklist 160 days? Tue 9/27/11
117 Safety and Quality Assura 3 days Tue 3/13/12
118 Activity Plan 7 days Mon 3/5/12
119 Activities and Schedule Sta 7 days Mon 3/5/12
120 Conclusion 5 days? Mon 3/19/12
121 Write FRR 25 days? Tue 2/21/12
122 Submit Flight Readiness Repo 1 day? Sun 3/25/12
123 Submit Flight Readiness Flysh 1 day? Sun 3/25/12
124 Submit Flight Readiness Powe 1 day? Sun 3/25/12
125 FRR Documents Posted 1 day? Sun 3/25/12
126 Flight Readiness Review Present 8 days? Mon 4/2/12
127 Launch 1 day? Sat 4/21/12
128 Post flight Analysis Review 11 days? Mon 4/23/12
129 Analyze Science Data 10 days? Mon 4/23/12
130 Analyze Flight Data 10 days? Mon 4/23/12
131 Post Flight Analysis Review S 0 days Mon 5/7/12
132 PLAR Document Posted 1 day? Mon 5/7/12
133 Announcement of Winning USLI 0 days Fri 5/18/12
6/7
6/18
Project: 2011 USLI Timeline
Date: Mon 9/5/11
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Here is a more readable version of the Gantt Chart

2011 USLI Timeline

Project Start Date: Thu 7/28/11
Project Finish Date: Fri 5/18/12

Task Table

ID	Task Name	Start Date	Finish Date
1	**Proposal Preparation**	Tue 8/2/11	Tue 9/6/11
2	Team Data	Mon 8/8/11	Fri 8/12/11
3	Safety Proposal	Mon 8/8/11	Mon 8/8/11
4	Outreach Proposal	Sat 8/6/11	Fri 8/12/11
5	Facilities Proposal	Sat 8/6/11	Sat 8/6/11
6	Rocket Design	Thu 8/4/11	Fri 8/19/11
7	Experiment Proposal	Tue 8/2/11	Thu 8/25/11
8	Proposal Writing	Mon 8/22/11	Tue 9/6/11
9	Submit Proposal	Tue 9/6/11	Tue 9/6/11
10	**Scale Rocket**	Mon 8/8/11	Mon 10/17/11
11	Scale Design	Mon 8/8/11	Wed 8/10/11
12	Scale Parts Order	Wed 8/10/11	Wed 8/10/11
13	Scale Construction	Mon 8/15/11	Fri 8/19/11
14	**Scale Launches**	Sat 10/1/11	Sat 10/15/11
15	1st Scale Launch	Sat 10/1/11	Sat 10/1/11
16	2nd Launch if necessary	Sat 10/15/11	Sat 10/15/11
17	Scale Analysis	Mon 10/17/11	Mon 10/17/11
18	Scale Complete	Wed 10/5/11	Wed 10/5/11
19	Selection Notification	Mon 10/17/11	Mon 10/17/11
20	USLI Team Teleconference	Fri 10/21/11	Fri 10/21/11
21	Web Presence Established	Fri 11/4/11	Fri 11/4/11
22	**Competition Rocket**	Wed 9/28/11	Mon 4/9/12
23	Complete Design	Wed 9/28/11	Wed 9/28/11
24	Construct Rocket	Tue 10/4/11	Fri 10/21/11
25	Ground Test Ejection	Tue 10/25/11	Tue 10/25/11
26	Ground test Recovery System	Tue 10/25/11	Tue 10/25/11
27	**Launches (as needed)**	Sat 10/29/11	Mon 4/9/12
28	Test Launch and Analysis	Sat 10/29/11	Sat 10/29/11
29	Test Launch and Analysis	Sat 11/19/11	Sat 11/19/11

30	Test Launch and Analysis	Sat 12/17/11	Sat 12/17/11
31	Test Launch and Analysis	Sat 1/14/12	Sat 1/14/12
32	Test Launch and Analysis	Sat 2/18/12	Sat 2/18/12
33	Test Launch and Analysis	Mon 3/12/12	Mon 3/12/12
34	Test Launch and Analysis	Mon 4/9/12	Mon 4/9/12
35	**Science Payload**	Tue 9/27/11	Fri 3/30/12
36	Sensor Research and Selection	Wed 9/28/11	Fri 10/21/11
37	Transmitter/Receiver Research	Wed 9/28/11	Fri 10/21/11
38	Microcontroller Research and Selection	Tue 9/27/11	Tue 10/4/11
39	Microcontroller Programming and Sensor Integration	Mon 10/17/11	Fri 3/30/12
40	Baseline Data Collection	Tue 1/3/12	Fri 1/20/12
41	Ground Test Payload	Wed 1/18/12	Wed 1/25/12
42	Low Level Test Flight	Sat 2/4/12	Sat 2/4/12
43	**Preliminary Design Review Preparation**	Wed 9/21/11	Sun 11/27/11
44	Team Summary	Mon 10/3/11	Wed 10/5/11
45	Launch Vehicle Summary	Mon 10/3/11	Fri 10/7/11
46	Payload Summary	Tue 10/18/11	Fri 10/28/11
47	Changes Since Proposal	Mon 10/17/11	Fri 10/21/11
48	**Vehicle Criteria**	Wed 9/21/11	Thu 11/17/11
49	Launch Vehicle Design and Verification	Thu 11/3/11	Thu 11/17/11
50	Recovery Subsystem	Tue 10/4/11	Fri 10/21/11
51	Mission Performance Predictions	Tue 10/4/11	Fri 10/21/11
52	Interface and Integration	Tue 10/4/11	Fri 10/21/11
53	Launch Operations Procedures	Wed 9/21/11	Fri 10/21/11
54	Vehicle Safety and Environment	Tue 10/4/11	Fri 10/21/11
55	**Payload Criteria**	Mon 10/17/11	Fri 10/28/11
56	Payload Selection, Design, and Verification	Mon 10/17/11	Fri 10/28/11
57	Payload Concept Features and Definition	Mon 10/17/11	Fri 10/28/11
58	Science Value	Mon 10/17/11	Fri 10/28/11
59	Payload Safety and Environment	Mon 10/17/11	Fri 10/28/11
60	**Activity Plan**	Tue 11/1/11	Tue 11/8/11
61	Activities and Schedule Status	Tue 11/1/11	Tue 11/8/11
62	Conclusion	Fri 11/18/11	Fri 11/18/11
63	Write Proposal	Wed 11/2/11	Sun 11/27/11
64	Preliminary Design Review Report Due	Sun 11/27/11	Sun 11/27/11
65	Preliminary Design Review Fly Sheet Due	Sun 11/27/11	Sun 11/27/11
66	Preliminary Design Review PowerPoint Due	Sun 11/27/11	Sun 11/27/11

67	PDR Documents Posted	Sun 11/27/11	Sun 11/27/11
68	Preliminary Design Review Presentation	Mon 12/5/11	Wed 12/14/11
69	**Critical Design Review Preparation**	Tue 9/27/11	Sun 1/22/12
70	Team Summary	Thu 12/8/11	Thu 12/8/11
71	Launch Vehicle Summary	Mon 12/19/11	Tue 12/20/11
72	Payload Summary	Tue 1/3/12	Tue 1/10/12
73	Changes since PDR	Tue 1/3/12	Tue 1/10/12
74	Vehicle Criteria	Tue 1/3/12	Tue 1/10/12
75	**Launch Vehicle Design and Verification**	Tue 1/3/12	Fri 1/13/12
76	Flight Reliability and Confidence	Tue 1/3/12	Fri 1/13/12
77	Subscale Flight Results	Thu 1/5/12	Thu 1/5/12
78	Recovery Subsystem	Tue 1/3/12	Fri 1/6/12
79	Mission Performance Predictions	Tue 1/3/12	Fri 1/6/12
80	Payload Integration	Tue 1/3/12	Fri 1/6/12
81	Launch Concerns and Operation Procedures	Tue 1/3/12	Tue 1/10/12
82	Safety and Environment (Vehicle)	Tue 1/3/12	Fri 1/6/12
83	**Payload Criteria**	Tue 9/27/11	Fri 1/20/12
84	Payload Experiment Test and Design	Tue 9/27/11	Fri 1/20/12
85	Payload Concept Features and Definition	Tue 9/27/11	Fri 1/20/12
86	Science Value	Fri 1/20/12	Fri 1/20/12
87	Safety and Environment (Payload)	Fri 1/20/12	Fri 1/20/12
88	**Activity Plan**	Tue 1/10/12	Fri 1/13/12
89	Activities and Schedule Status	Tue 1/10/12	Fri 1/13/12
90	Conclusion	Fri 1/20/12	Fri 1/20/12
91	Write CDR	Mon 12/19/11	Sun 1/22/12
92	Critical Design Review Report Due	Sun 1/22/12	Sun 1/22/12
93	Critical Design Review Fly Sheet Due	Sun 1/22/12	Sun 1/22/12
94	Critical Design Review PowerPoint Due	Sun 1/22/12	Sun 1/22/12
95	CDR Documents Posted	Sun 1/22/12	Sun 1/22/12
96	Critical Design Review Presentation	Wed 2/1/12	Fri 2/10/12
97	**Flight Readiness Review Preparation**	Tue 9/27/11	Sat 4/21/12
98	Team Summary	Mon 2/13/12	Mon 2/13/12
99	Launch Vehicle Summary	Mon 2/13/12	Tue 2/14/12
100	Payload Summary	Mon 2/13/12	Sat 2/18/12
101	Changes Made Since CDR	Mon 2/13/12	Fri 2/17/12
102	**Vehicle Criteria**	Mon 2/13/12	Fri 2/24/12
103	Vehicle Design and Construction	Mon 2/13/12	Fri 2/24/12

104	Recovery Subsystem	Mon 2/13/12	Fri 2/17/12
105	Mission Performance Predictions	Tue 2/14/12	Thu 2/16/12
106	Vehicle Verification	Tue 2/14/12	Thu 2/16/12
107	Vehicle Safety and Environment	Tue 2/14/12	Fri 2/17/12
108	Payload Integration	Tue 2/14/12	Fri 2/17/12
109	**Payload Criteria**	Tue 3/6/12	Tue 3/20/12
110	Experiment Concept	Tue 3/6/12	Mon 3/12/12
111	Science Value	Mon 3/12/12	Tue 3/20/12
112	Payload Design	Mon 3/12/12	Tue 3/20/12
113	Verification	Mon 3/12/12	Thu 3/15/12
114	Payload Safety and Environment	Mon 3/12/12	Thu 3/15/12
115	**Launch Operations Procedures**	Tue 9/27/11	Sat 4/21/12
116	Checklist	Tue 9/27/11	Sat 4/21/12
117	Safety and Quality Assurance	Tue 3/13/12	Thu 3/15/12
118	**Activity Plan**	Mon 3/5/12	Tue 3/13/12
119	Activities and Schedule Status	Mon 3/5/12	Tue 3/13/12
120	Conclusion	Mon 3/19/12	Fri 3/23/12
121	Write FRR	Tue 2/21/12	Sun 3/25/12
122	Submit Flight Readiness Report	Sun 3/25/12	Sun 3/25/12
123	Submit Flight Readiness Flysheet	Sun 3/25/12	Sun 3/25/12
124	Submit Flight Readiness PowerPoint	Sun 3/25/12	Sun 3/25/12
125	FRR Documents Posted	Sun 3/25/12	Sun 3/25/12
126	Flight Readiness Review Presentation	Mon 4/2/12	Wed 4/11/12
127	Launch	Sat 4/21/12	Sat 4/21/12
128	**Post flight Analysis Review**	Mon 4/23/12	Mon 5/7/12
129	Analyze Science Data	Mon 4/23/12	Sun 5/6/12
130	Analyze Flight Data	Mon 4/23/12	Sun 5/6/12
131	Post Flight Analysis Review Submitted	Mon 5/7/12	Mon 5/7/12
132	PLAR Document Posted	Mon 5/7/12	Mon 5/7/12
133	Announcement of Winning USLI Team	Fri 5/18/12	Fri 5/18/12