2012-2013

Northwest Indian College Space Center USLI Proposal

Northwest Indian College Space Center

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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:	SkyHigh
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:	Thomas fsgtadz@gmail.com Nicole njefferson17@yahoo.com
SAFETY OFFICER:	Justin, NAR Level 1 nooksack_raiders@yahoo.com
NAR CONTACT:	Gary Brandt, NAR Level 2 gbrandt@nwic.edu
NAR SECTIONS	#730 NWIC-SC Northwest Indian College Space Center

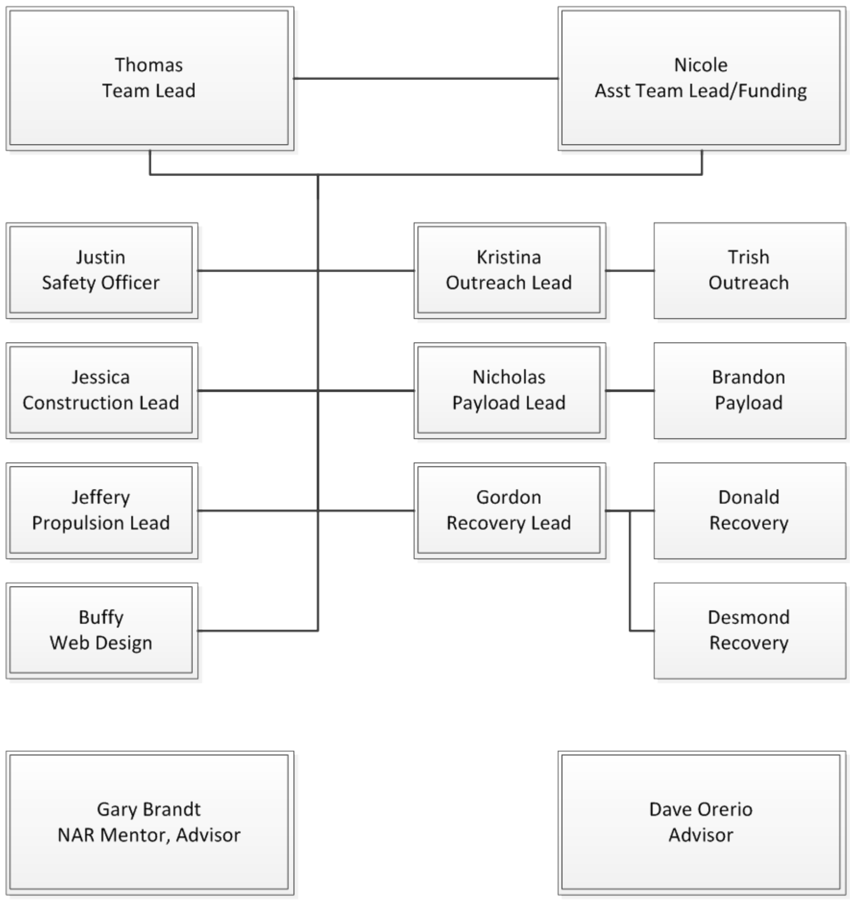
2011-2012 USLI TEAM MEMBERS AND RESPONSIBILITIES

Thomas	Team Lead and Airframe Lead, Direct Transfer Degree
Nicole*	Asst Team Lead, Direct Transfer Degree
Justin *	Safety Officer, Associate Technical Arts, Information Technology
Jessica*	Construction Lead, Direct Transfer Degree
Kristina*	Outreach Lead, Direct Transfer Degree
Nicolas*	Payload Lead, Direct Transfer Degree
Buffy	Web Design, Native Environmental Science
Gordon*	Recovery, Retired
Brandon	Payload, Direct Transfer Degree

Desmond	Recovery, undeclared
Donald	Construction, Associate Technical Arts, Information Technology
Trisha*	Outreach, Direct Transfer Degree

*NAR Level 1

Team Organization



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 has contributed greatly to previous year's success.

Team communication is via text messaging and email as well as face-to-face meetings.

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. MSDSs are on hand for all materials in the workshop that require MSDSs. 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 workshop 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 30 months we have built 29 HPR rockets and have a total of 37 launches, 4 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 seven altimeters:

- 2 - RDAS-Tiny
- 2 - PerfectFlite MAWD
- 2 – PerfectFliteStratoLogger
- 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 Architectural and Transportation Barriers Compliance Board Electronic and Information Technology (EIT) Accessibility Standards (36 CFR Part 1194)
(http://ecfr.gpoaccess.gov/cgi/t/text/textidx?c=ecfr&tpl=/ecfrbrowse/Title36/36cfr1194_main_02.tpl)
Subpart B-Technical Standards
(http://www.section508.gov/index.cfm?FuseAction=Content&ID=12)

Subpart B-Technical Standards

- 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.

Gary Brandt, NAR L2 (2010) is our NAR mentor and a member of NAR Section 730, the Northwest Indian College Space Center. The assistant advisor is NAR Level 2 certified also.

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 mentorsTeam 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 30 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.

<u>3.21 Safety Rules and Regulations</u>

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. 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 Friday, September 28, 2012 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 Gary Brandt 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. 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 five 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 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 be an active aerial recovery system that will tow the rocket back to the launch area. Additional considerations:

- First Person View camera for flight monitoring
- GPS tracking
- Data recording cameras for post flight analysis

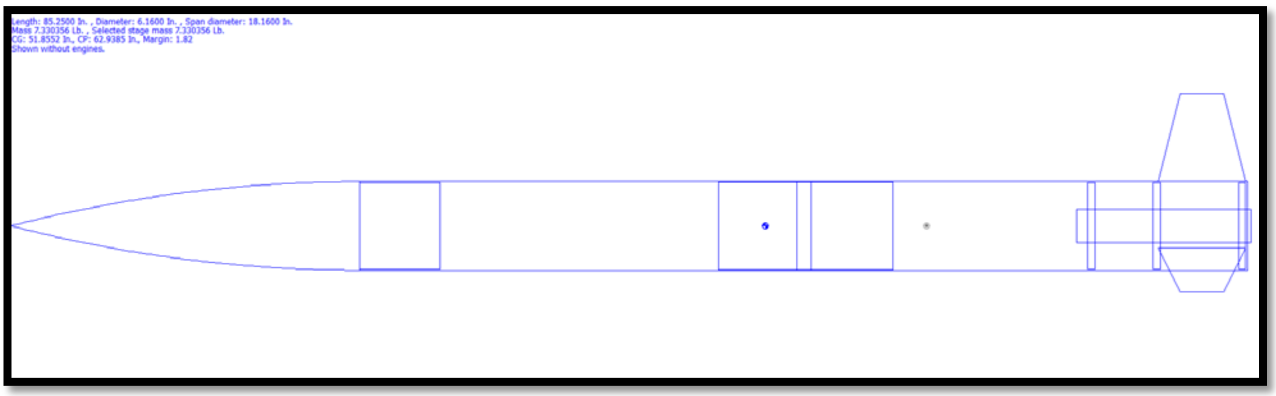
The rocket will meet the following requirements or challenges:

- 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 will employ redundant altimeters with independent electronic systems
- The rocket must remain subsonic
- Dual deployment is required
- A PerfectFlite StratoLogger will be the official altimeter
- Deploy a quadrotor vehicle that will tow the rocket back to the launch area

A full listing of the rules and requirements can be found in the NASA University Student Launch Initiative handbook, which will available on our website when construction is complete.

4.2 Projected Vehicle Design

Preliminary investigation has the rocket diameter at six inches with a length of 85 inches. The rocket airframe will be carbon fiber, the nosecone will be fiberglass and the fins will be G10 fiberglass. The fins will be mounted through-the-wall (TTW). Water integrity and minimal weight are two of the requirements for our rocket; carbon fiber and fiberglass satisfy both of those requirements. 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 have been in the past. Initial design discussions and Rocksim planning has resulted in this preliminary design:



4.21 Dimensions and Design

Airframe: Carbon Fiber

- Rocket length: about 85 inches
- Maximum diameter of the rocket: 6 inches
- Nosecone type: Tangent ogive
- Nosecone length: 24 inches
- Fin span: 18 inches (G10 fiberglass)
- Weight without motor or payload: 4 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 I, J, or K

Total Impulse: shall not exceed 5,120 Newton-seconds (L-class).

Avionics Instrumentation: PerfectFlite StratoLogger

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 CTI. Also, we want to keep the G-forces reasonably low to reduce strain on the airframe and the science payload. Several motors fit our initial requirements. They are Cesaroni Technology Incorporated I100, J210, and K160.

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 drogue will be deployed at apogee and the main deployed at 500 feet. The backup altimeters will be delayed by 1 second and have a slightly larger charge to both ensure that the parachutes are deployed and that the airframe will not be over pressurized with simultaneous black powder discharges. The recovery harness will be ½" tubular nylon and the parachutes will be sized so that the ground impact will be 75 ft/lbs or less.

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 rocket will carry a quadrotor vehicle that will become a tow tug after the rocket achieves apogee and deploys its drogue parachute. The quadrotor will be autonomous with Radio Control (RC) backup. A typical sequence of events will be as follows:

1. Program and arm quadrotor vehicle (QV)
2. Launch
3. Powered phase
4. Coast phase
5. Apogee
6. Event that deploys drogue parachute
7. QV released
8. QV unfolds
9. QV motors start
10. GPS orients QV to home base near launch site
11. QV tows rocket to position over launch site and hovers at 500 feet
12. QV motors stop (rocket supported by drogue parachute)

13. Main parachute event
14. Main parachute lowers rocket and QV to ground
15. Recover vehicles

We have four RC quadrotors that we are experimenting with; learning to fly, calculating lifting capacities, working with a First Person View (FPV) camera, and programming its autonomous flight operations. We are currently sizing motors, batteries, and rocket components to determine an optimal configuration for this project's QV.

QV Project Sequence

1. Identify motor/battery/propeller combination that can life and maneuver with rocket vehicle
2. Obtain components
3. Construct QV
4. Install FPV camera
5. Test fly QV with RC control
6. Install autopilot system
7. Program GPS and test fly
8. Test fly with RC control while lifting and towing rocket equivalent weight
9. Test fly with autopilot system while lifting and towing rocket equivalent weight
10. Ground test QV release and deployment
11. Low altitude test flight in rocket
12. High altitude test flight in rocket

4.241 Payload Suitability for Team's Experience Level
This project is an engineering and programming challenge for our team. We are going to combine our rocket building skills with an interesting engineering project. As none of the team members are engineers, this will be an exciting adventure.

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 section 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

- to keep the pieces connected, separated from each other and not get entangled.
- programming autonomous actions of position location and return to base and altitude operations
- folding and unfolding, or some sort of efficient storage of the QV in the rocket
- successful QV deployment and activation
- manual override in case of some need that requires ground control of the QV and the rocket system.

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, 2013.

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 the required reporting dates, construction and testing timelines. 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.

Qty	Description		Total Price
	Scale Model Rocket		
1	LOC Precision Vulcanite Kit	$74.95	$74.95
2	Tube Couplers - 4"	$7.54	$15.08
1	1/4" Plywood	$6.99	$6.99
4	CTI G79	$26.99	$107.96
			$204.98

	Full Scale Rocket		
1	6" x 90" Carbon Fiber Airframe	$499.00	$499.00
1	6" x 12" Carbon Fiber Coupler	$94.60	$94.60
1	6" x 24" Fiberglass Nose Cone	$83.50	$83.50
2	G10 Sheet, 3/32 x 12 x12	$13.30	$26.60
1	1/4" Plywood	$6.99	$6.99
2	G10 Sheet, 1/8 x 12 x12	$17.10	$34.20
			$744.89

	Motors for Full Scale Rocket		
4	CTI 54mm 2 grain reload	$72.95	$291.80
1	CTI 54 mm 2 grain motor casing	$51.65	$51.65
			$343.45

	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	60" Parachute	$79.95	$79.95
1	18" Parachute	$16.75	$16.75
1	RDAS-Tiny altimeter	$300.00	$300.00
2	StratoLogger Altimeter	$99.95	$199.90
			$696.60

	Payload and Tracking System		
1	GPS Unit	$295.00	$295.00
1	FPV Camera	$195.00	$195.00
1	Science Payload	$2,300.00	$2,300.00
1	Arduino Uno	$19.95	
1	Arduino Pro Mini	$29.95	
1	Adafruit Data Logger	$29.95	
			$2,790.00
		Total	**$4,979.92**

Travel			
8	Huntsville Travel	$983.00	$7,864.00
4	Huntsville Lodging	$453.00	$1,812.00
			$9,676.00

Project Income			
	Outreach		$4,000.00
	Washington State Space Grant		$5,000.00
	Tribal Support		$10,000.00
			$19,000.00

Budget Summary	
Scale Rocket	$204.98
Competition Rocket	$744.89
Propulsion	$343.45
Construction Supplies	$200.00
Recovery	$696.60
Electronics & Payload	$2,790.00
	$4,979.92

Travel & Lodging	$9,676.00

Project Income	
	$19,000.00

6.1 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.

Public Relations

- We are published near monthly in the Lummi Nation paper, "Squol Quol".
- We've also been recognized by the "Tribal College Journal".

http://indiancountrytodaymedianetwork.com/2012/02/07/at-northwest-indian-college-its-rocket-science-as-students-apply-learning-to-competing-96150

- And in an article in 2012 February's "Indian Country Today"

http://www.tribalcollegejournal.org/archives/7918

- And we have a NASA webpage devoted to us (currently in the process of adding this year's accomplishments).

http://www.nasa.gov/audience/foreducators/postsecondary/features/inexperience-stop-flying.html

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

This 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 as well as for Northwest Indian College.

Appendix A – Key Team Member Résumés

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

2012- Intern mentor, NASA Ames Research Facility, Aeromechanics Branch
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 *Instructor*, 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

Thomas Doyle
1355 East Axton Road
Bellingham, WA 98226

Education:
Meridian High. Earning a High school diploma.
Northwest Indian College. Present studies in Computer Science.

Personal Education:
Aeronautics and rocket engineering, computer building/customization, general visual BASIC programming as well as HTML format, computer parts replacement and installing, 3D drafting and design using Rhino 3D

Employment History:
Juvenile-odd jobs:
- Food delivery person at Washington State Fair.
- Domestic home cleaning-family.
- Farm work-other that relatives,
- Computer related internship at NWIC

Willetto Sheep Ranch.

Sheepherder/personal assistant
Duties included but not limited to: shepherding, coyotes and wild dogs abatement, grocery shopping, kitchen prep/dish-washing, cooking. Initial Set-up of Internet services including: cable splicing and extension.

Supervisor, Delphine Brenner- (719) 502-9957
Reason for leaving: Return to college.

From June 21st through August 16 2012,

Student care for Lummi Nation school, Youth worker
Duties included but not limited to: Conflict resolution, entertainer, basic food prep, Kitchen prep, and janitorial duties

Reason for leaving: End of term

Skills/interests:
Martial arts background, black-belt and former competitor
Firearms skills and a gun safety certification
Computers and other things technology related

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

<table>
<tr><th>Date</th><th>Time</th><th>Initials</th><th>Agency</th><th>Phone</th><th>Timing</th></tr>
<tr><td></td><td></td><td></td><td>NOTAM</td><td>877-487-6867</td><td>24-72 hrs</td></tr>
<tr><td></td><td></td><td></td><td>BLI ATC</td><td>360-734-2745</td><td>24-48 hrs</td></tr>
<tr><td></td><td></td><td></td><td>Vancouver ACC</td><td>604-586-4560</td><td>24-48 hrs</td></tr>
<tr><td></td><td></td><td></td><td>BLI ATC</td><td>360-734-2745</td><td>30-45 min</td></tr>
<tr><td></td><td></td><td></td><td>Vancouver ACC</td><td>604-586-4560</td><td>5-10 min</td></tr>
<tr><td></td><td></td><td></td><td>NOTAM</td><td>877-487-6867</td><td rowspan="3">Operations Concluded</td></tr>
<tr><td></td><td></td><td></td><td>BLI ATC</td><td>360-734-2745</td></tr>
<tr><td></td><td></td><td></td><td>Vancouver ACC</td><td>604-586-4560</td></tr>
</table>

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."
PL, student and rocket team member

2011-12 USLI Team

History

The NWIC Space Center started in the fall of 2009 starting with pressurized water and air soda 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, whereupon they placed 2nd.

Emboldened by the 2nd place finish, the team submitted a proposal to NASA's University Student Launch project. The NWCI 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.

Accomplishments

2010 – First Nations Launch: 2nd
2011 – NASA USLI: 17/32
2011 – First Nations Launch: 1st
2012 – NASA USLI: 12/41
2012 – First Nations Launch: 1st

2012 NWIC Space Center Students

- Four Students at NASA Summer Internships
- One Student was a mentor for the Washington Aerospace Scholars Summer workshop at the Museum of Flight in Seattle
- One student was the Lummi campus student co-speaker for NWIC graduation ceremonies

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

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.

2012-2013

The returning team members and new team members want to compete in the 2012-2013 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 $0 per team. The Washington State Space Grant is facing a 44% reduction. This means a great deal of fund raising.

We Need Your Help!

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 78. 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

2012 First Nations Launch Winning Team

Our Needs

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

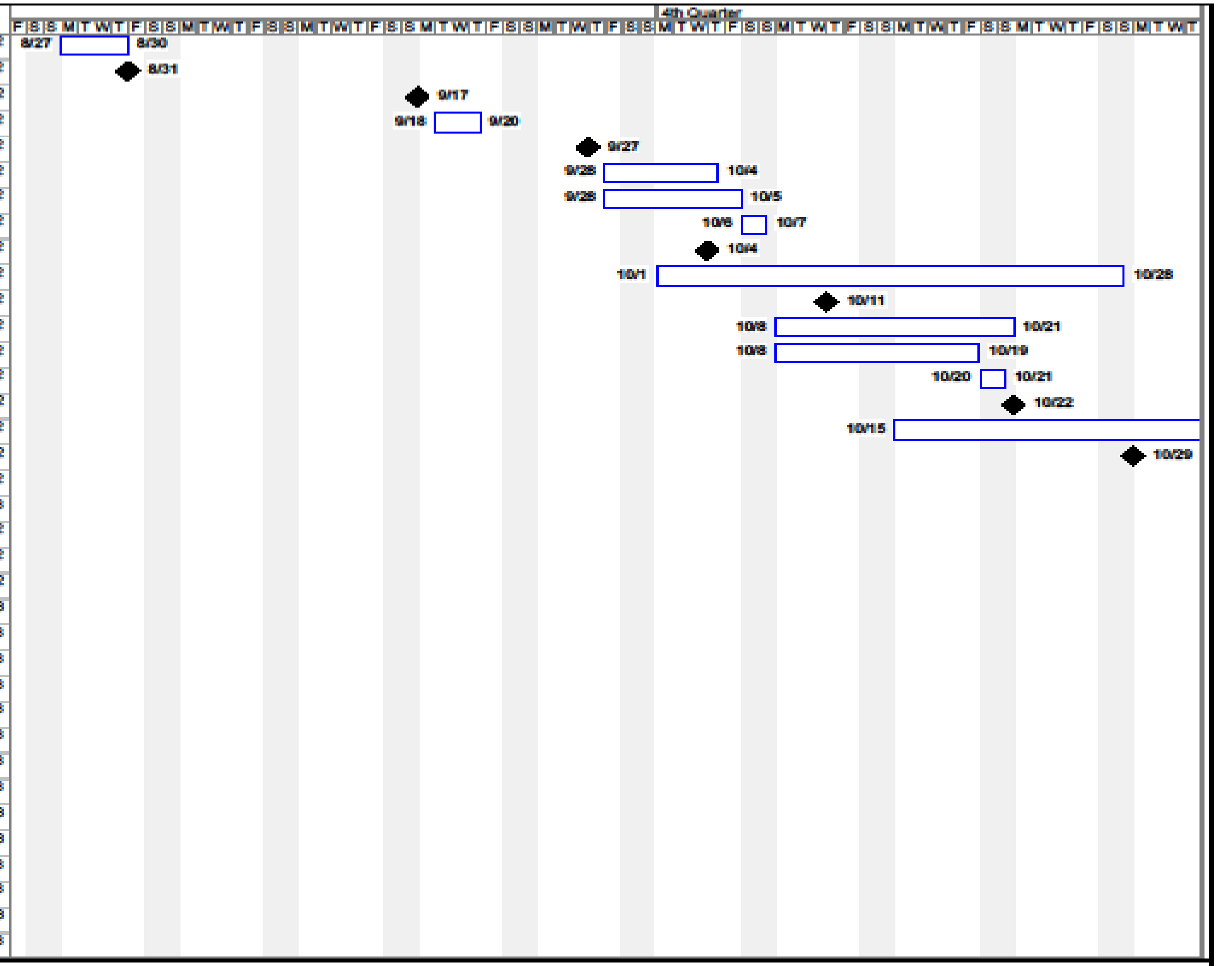
How You Can Help!

- 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	Start	Finish
1	Prepare Proposal	Mon 8/27/12	Thu 8/30/12
2	Proposal Due	Fri 8/31/12	Fri 8/31/12
3	Fall Quarter Starts	Mon 9/17/12	Mon 9/17/12
4	Initial Rocket Design	Tue 9/18/12	Thu 9/20/12
5	Acceptance Notification	Thu 9/27/12	Thu 9/27/12
6	Quadcopter Research	Fri 9/28/12	Thu 10/4/12
7	Construct Scale Rocket	Fri 9/28/12	Fri 10/5/12
8	Launch Scale Rocket	Sat 10/6/12	Sun 10/7/12
9	Team Teleconference	Thu 10/4/12	Thu 10/4/12
10	Prepare PDR	Mon 10/1/12	Sun 10/28/12
11	PDR Q&A	Thu 10/11/12	Thu 10/11/12
12	Construct Web Site	Mon 10/8/12	Sun 10/21/12
13	Construct Competition Rocket	Mon 10/8/12	Fri 10/19/12
14	Test Flight #1	Sat 10/20/12	Sun 10/21/12
15	Web Site Due	Mon 10/22/12	Mon 10/22/12
16	Quadcopter Research & Constr	Mon 10/15/12	Tue 11/27/12
17	PDR, PPT, Flysheet Posted 08(	Mon 10/29/12	Mon 10/29/12
18	PDR Presentation	Tue 11/13/12	Tue 11/13/12
19	CDR Preparation	Thu 11/15/12	Sun 1/13/13
20	Test Flight #2	Sat 12/1/12	Sun 12/2/12
21	Test Flight #3	Sat 12/8/12	Sun 12/9/12
22	CDR Q&A	Mon 12/3/12	Mon 12/3/12
23	CDR, PPT, Flysheet Posted 08(	Mon 1/14/13	Mon 1/14/13
24	CDR Presentation	Wed 1/30/13	Wed 1/30/13
25	FRR Preparatoiin	Thu 1/31/13	Sun 3/17/13
26	Test Flight #4	Sat 1/12/13	Sun 1/13/13
27	Test Flight #5	Sat 1/19/13	Sun 1/20/13
28	Test Flight #6	Sat 1/26/13	Sun 1/27/13
29	Test Flight #7	Sat 2/9/13	Sun 2/10/13
30	Test Flight #8	Sat 2/16/13	Sun 2/17/13
31	FRR Q&A	Mon 2/11/13	Mon 2/11/13
32	FRR, PPT, Flysheet Posted 08(	Mon 3/18/13	Mon 3/18/13
33	FRR Presentation	Wed 4/3/13	Wed 4/3/13
34	Launch	Wed 4/17/13	Sun 4/21/13
35	PLAR Posted, 0800	Mon 5/6/13	Mon 5/6/13
36	Winner!!	Fri 5/17/13	Fri 5/17/13



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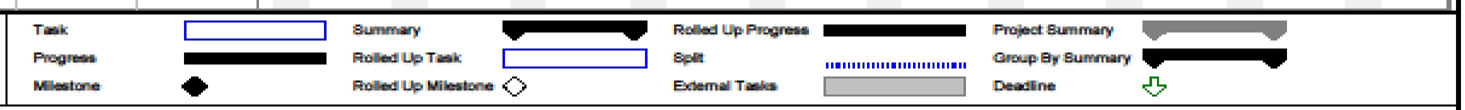
Date: Fri 8/24/12



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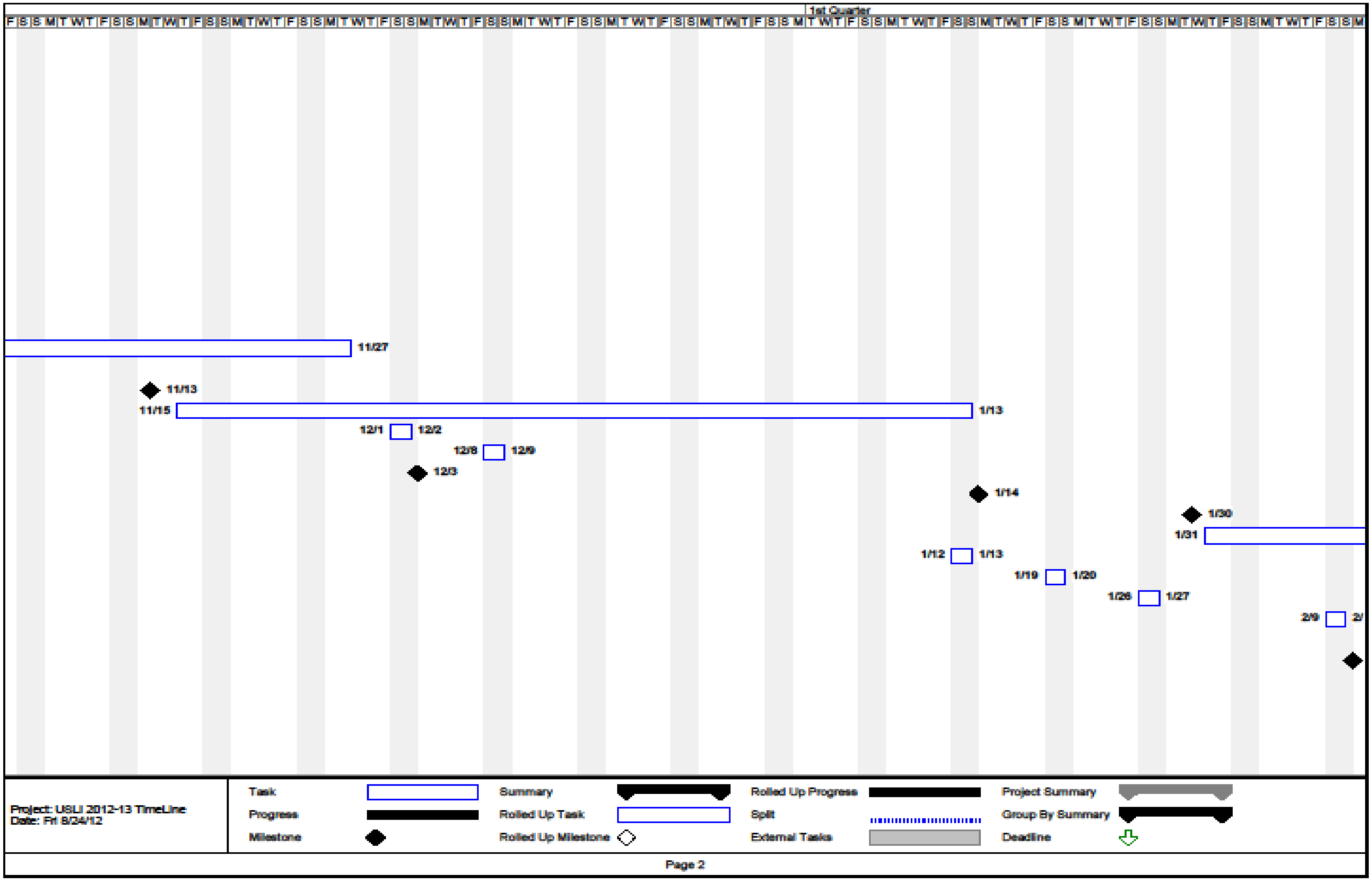
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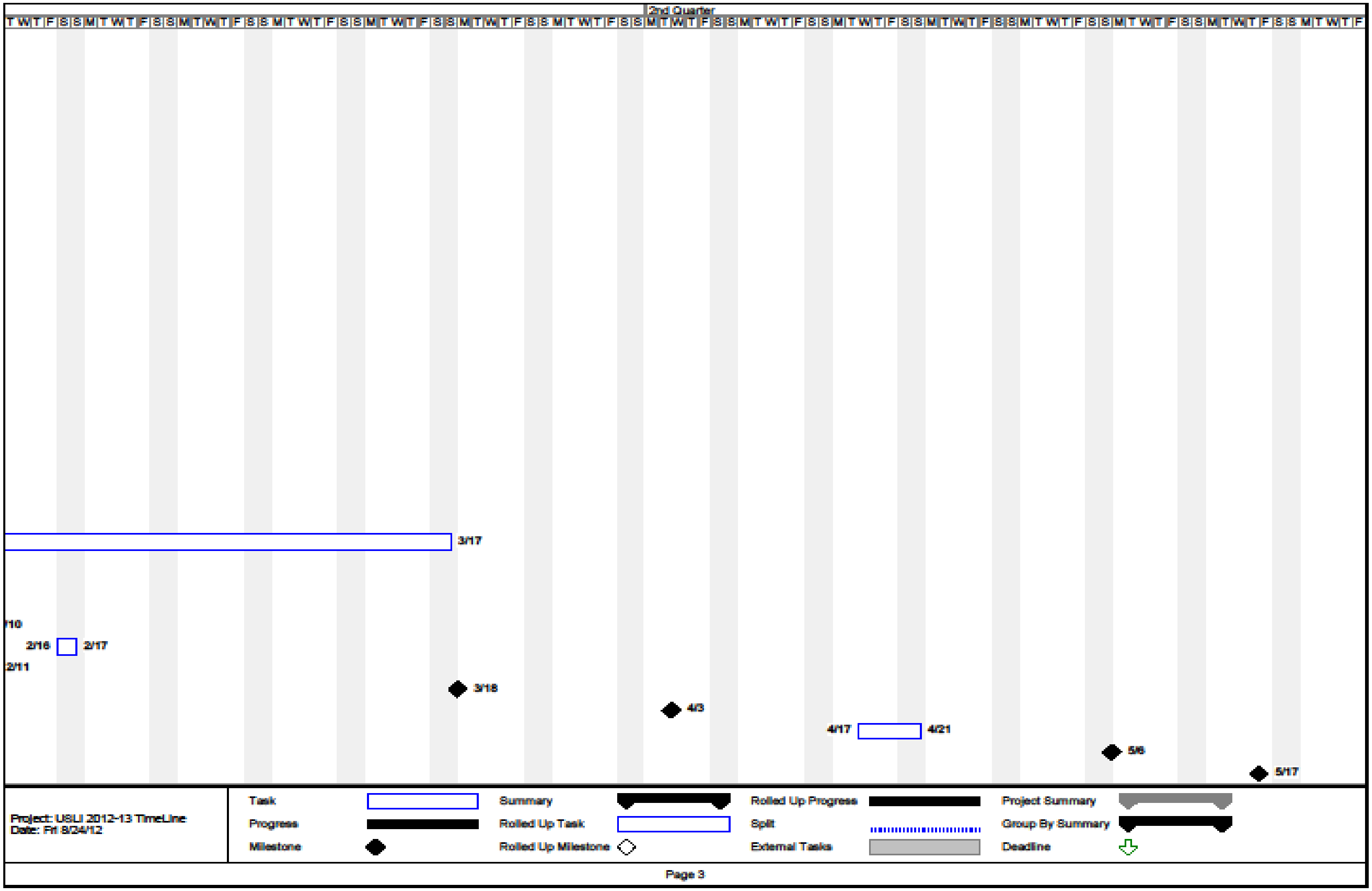
11/13
11/15
1/13
12/1
12/2
12/8
12/9
12/3
1/14
1/30
1/31
1/12
1/13
1/19
1/20
1/26
1/27
2/9
Project: USLI 2012-13 TimeLine
Date: Fri 8/24/12
Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress
Split
External Tasks
Project Summary
Group By Summary
Deadline
Page 2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3/17
/10
2/16
2/17
2/11
3/18
4/3
4/17
4/21
5/6
5/17
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Date: Fri 8/24/12
Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress
Split
External Tasks
Project Summary
Group By Summary
Deadline
Page 3