



The Near-Space Balloon Competition Handbook

The North Dakota Space Grant Consortium provides middle and high schools in North Dakota with a student launch competition, which reinforces hands-on STEM education with a real-world, inquiry-based, and NASA-relevant research project.



NOTE TO THE EDUCATOR

Note to the Educator	2
NSBC Website	3
Introduction	4
What is High Altitude Ballooning?	5
Views from the Stratosphere	6
Aligning with Education Standards	7
Integrating Standards with Ballooning	8
All about Payloads	14
Proposal Submission Form	15
Choosing a Sensor	22
Designing and Constructing the Payload	23
Payload Schematics	24
Interfacing with Ground Systems	25
Student Roles	26
Weekly Timeline of Assignments	27
Mandatory Reporting	28
The Competition and Judging	29
Traveling to the Competition	31
Hotel Information	31
Reserving Hotel Rooms	32
Integration Night	33
Launch Day	34
Safety Precautions	36
Final Report	37
Post-Launch Assessment	38
NASA Media Release Forms - Minors	39
NASA Media Release Form - Adults	40
UND Safety Agreement Form - Minors	41
UND Travel Tips	42
W9 Tax Form	43
Contacts	44

NOTE TO THE EDUCATOR

Welcome to this year's Near-Space Balloon Competition (NSBC)! We thank you for taking the time and initiative to become the NSBC advisor and role model for your students. Because of you, your middle or high school students will be able to apply their in-class education towards a real-world scientific mission. How many out-of-school projects can say they've reached the edge of space? Students will see the blue sky transform into darkness while the breath-taking curvature of the earth appears. We all strive for the day when every single student can embrace science, technology, engineering, and math (STEM) with confidence.

The NSBC is a unique launch program that allows students to become *real* scientists, pursuing *real* scientific solutions. They will design and construct a payload that will fly to approximately 100,000 feet above sea level. That's above 99% of Earth's atmosphere! Numerous scientific investigations can be performed onboard a high altitude balloon, at every grade level. After liftoff, students will monitor the location of the balloon throughout its entire flight. They will use the same tracking systems as the NSBC graduate student chase team, watching its journey in real-time. When it lands back on Earth's surface, students will recover their data and use it to complete their final analyses. Their final report will reveal their conclusions and lessons learned, making them real space scientists!

Everyone working with the North Dakota Space Grant Consortium (NDSGC) and the University of North Dakota (UND) genuinely enjoys inspiring the next generation with space science activities. They have years of high altitude balloon experience and love using these great educational platforms to inspire others. Ballooning offers such a rare learning opportunity and we are excited to work with you and your students!

Sincerely,

The ND Space Grant Team,

Marissa Saad



NSBC Manager

NSBC Flight Director

NDSGC Coordinator

Caitlin Nolby



NSBC Manager

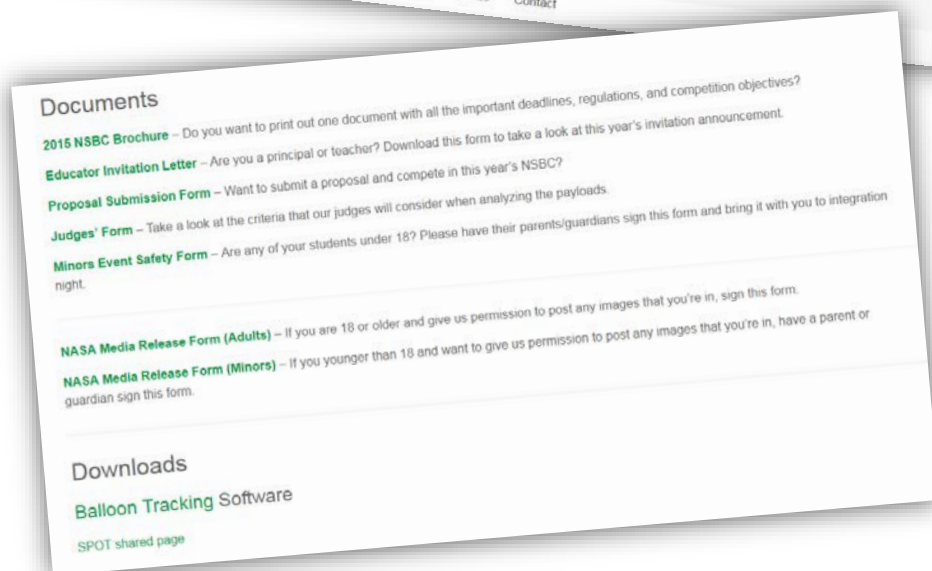
NDSGC Deputy Director



NSBC can be found on Facebook, Twitter (@NDSGC), and:

blogs.und.edu/nsbc

Visit this site for
schedule updates,
submission forms,
downloads, videos,
images, and other
material!



Everything you need
throughout the competition
can be found here!

Introduction

Since 1990, the **North Dakota Space Grant Consortium (NDSGC)** has been the premier NASA higher education program in the state by supporting diverse and effective programs that aim to establish a robust and evolving NASA infrastructure. These efforts have led to a variety of K-12 programs, such as high altitude ballooning competitions. NDSGC provides great avenues to involve females and underrepresented minorities in our NASA activities, as well as contributing to the STEM and technical workforce.

NDSGC Director: **Dr. Jim Casler**, casler@space.edu

NDSGC Deputy Director: **Caitlin Nolby**, cnolby@space.edu

NDSGC Coordinator: **Marissa Saad**, msaad@space.edu

The NDSGC established the **Near-Space Balloon Competition (NSBC)** in 2011, inviting middle and high school students from across the state to participate. The NSBC is a wonderful program that offers hands-on experience with teamwork, computer science, engineering, and technology. Students conduct their own space-based, NASA-relevant research onboard a helium-filled high altitude balloon. The experiments will ascend to nearly 19 miles, or 100,000 feet, above sea level.

Multidisciplinary subject matter, taken directly from your classroom textbook, can be integrated into a balloon launch. A single payload can study multiple subjects at the same time – a true innovative STEM platform. Are your students studying about the layers of the atmosphere? *Travel through them!* Are they learning about thermodynamics? *Experience it!*

Every student and educator from across North Dakota is encouraged to venture into the skies with us. The imagery received from near-space and the lessons learned will be so rewarding that you will want to share your experiences with colleagues, family, and friends.

WHAT IS HIGH ALTITUDE BALLOONING?

High Altitude Balloons, or Near-Space Balloons, are large weather balloons that carry scientific payloads up to the edge of space. Ballooning is an extremely fun and educational way to transport experiments, sensors, and cameras high into our atmosphere. For the NSBC, the North Dakota Space Grant Consortium (NDSGC) uses 1500-gram latex balloons, filled with helium. The experiments will ascend to nearly 100,000 feet (31km), or about 19 miles above sea level. The balloon will climb above 99% of Earth's atmosphere, providing us with breathtaking sights. This region of our atmosphere is called the near-space environment.



<http://goo.gl/35ISe1>

Our balloons travel within two atmospheric layers: the troposphere and stratosphere. Many different phenomena occur within these two regions, as well as the transitional area between these two, the tropopause. Students are able to investigate the temperature profile of our atmosphere – they can watch it decrease throughout the troposphere, remain constant within the tropopause, and increase in the stratosphere. They can also investigate properties of the ozone layer, located in the stratosphere. It is important to study the stratosphere: this area is too high for regular airplanes, yet too low for satellites. We're able to reach, float, and study the stratosphere from balloons!

As the balloon rises through the air, the atmospheric pressure drops and the latex balloon expands. At a certain point in the stratosphere, the balloon can no longer stretch and it bursts! As the payloads fall back to Earth, a parachute deploys, safely bringing them back to the ground. The entire balloon flight lasts about two hours – one and a half hours for the ascent and a half hour for the descent. Depending on how many payloads are on board, we strive to ascend approximately 1000 feet per minute, descend approximately 3000 feet per second, and venture about 60 nautical miles radially (usually due East).

In order to keep pilots safe, the Federal Aviation Association (FAA) governs balloon launches. The NDSGC files Notices to Airmen (NOTAMs) with the nearby airport (Grand Forks International Airport) and complies with all rules and regulations found in the FAA Regulations (FAR) 101.

VIEWS FROM THE STRATOSPHERE

The Sky's the Limit!

We ascend approximately **19 miles** or **100,000 feet** above sea level!

2013 Valley Middle School Launch



Up here, there's only **1/100th** of the pressure found at sea level – that means you're above **99%** of the atmosphere!

NSBC Spring 2015



2015 NSBC Launch



The blue sky disappears, revealing the dark void of space!

2013 Valley Middle School Launch



See the curvature of the Earth!

And the bursting of the balloon!

ALIGNING WITH EDUCATION STANDARDS

The Next-Generation Science Standards (NGSS) are the future educational standards for K-12 students in the United States. Critical thinking, communication skills, and hands-on learning will be emphasized. Students will participate in activities that provide crosscutting concepts, inquiry-based investigations, and the engineering design process.

Balloon launches provide an educational platform that covers everything emphasized by the NGSS. A group of students, collaborating together, could study a myriad of subjects with just one payload. This launch can easily be integrated into the pre-existing curriculum, reinforcing the in-class subject material.

The NSBC “relates to the interests and life experience of students” (NGSS Lead States. 2013. *Next Generation Science Standards: For States, By States*). With hard work and effort, students will answer their scientific questions using their own creative methods. Whether they are launching their own camera or custom-built Arduino circuit boards, they will be proud of their results.



2013 Eighth Grade Valley Middle School Launch



2015 NSBC Integration Night; Kindred team (left), Shiloh Christian (right)

INTEGRATING STANDARDS WITH BALLOONING

Science Standards

A high altitude balloon launch conveniently conforms to the majority of the NGSS performance expectations. Also found in the standards, the expectations:

“[B]lend the core ideas with scientific and engineering practices and crosscutting concepts to support students in developing useable knowledge to explain **real world phenomena** in the physical, biological, and earth and space sciences” and “focus on students developing understanding of several scientific practices. These include developing and using models, **planning and conducting investigations, analyzing and interpreting data, using mathematical and computational thinking, and constructing explanations**; and to use these practices to demonstrate understanding of the core ideas. Students are also expected to demonstrate understanding of several of engineering practices including **design and evaluation**”.

(NGSS, 2014)

Engineering Design

The NSBC launch reinforces the middle school engineering standards. It uses multidisciplinary opportunities to help students achieve all expectations. They will define a problem, develop possible solutions, and improve their design (NGSS, 2015). It states,


“[b]y the end of 8th grade students are expected to achieve all four performance expectations related to a single problem in order to understand the interrelated processes of engineering design”

(NGSS, 2015).

The NSBC uses real life investigations to support these science and engineering requirements. Students are expected to demonstrate an understanding of multiple practices, ideas, and concepts – all deriving from the STEM disciplines. The following highlighted expectations are just a few examples of how an NSBC launch can be integrated into the curriculum:

INTEGRATING STANDARDS WITH BALLOONING

Middle School Performance Expectations

Middle School NGSS Physical Science Standards	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	NSBC Applications
Matter and its Interactions				
<p><i>MS-PS1-3:</i> “Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.”</p>	<p><i>Using Models</i> “Obtaining, evaluating, and communicating information”</p>	<p><i>Properties of Matter</i> “Each pure substance has characteristic physical and chemical properties”</p> 	<p><i>Function</i> “Engineering advances have led to important discoveries in virtually every field of science”</p> <p>“The uses of technologies are driven by societal needs”</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p>Students gather their own data, analyze it, and share it in a final report.</p> </div>	<p>Astronauts on the International Space Station (ISS) depend on synthetic materials to survive. When they venture out on extravehicular activities (EVAs) or spacewalks, they depend on the synthetic materials in their space suits to protect them from micro-meteroids and keep them warm and insulated.</p>
<p><i>MS-PS1-4:</i> “Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed”</p>	<p><i>Using Models</i> “Developing, using, and revising models to describe, test, and predict more abstract phenomena”</p>	<p><i>Properties of Matter</i> “Gases...are made of molecules...that are moving about relative to each other”</p>	<p><i>Cause and Effect</i> “Cause and effect relationships may be used to predict phenomena in natural systems”</p>	<p>Balloons rise to approximately 100,000 feet – almost three times as high as commercial airplanes! With this advantage, students can study the temperature profile of the troposphere AND stratosphere.</p>
<p><i>MS-PS1-6:</i> “Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes”</p>	<p><i>Constructing Explanations and Designing Solutions</i> “Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets a specific design criteria and constraints”</p>	<p><i>Chemical Reactions</i> “Some reactions release energy, others store energy”</p> <p><i>Developing Possible Solutions</i> “A solution needs to be tested, then modified”</p>	<p><i>Energy and Matter</i> “The transfer of energy can be tracked as energy flows through a designed or natural system”</p>	<p>In the vacuum of space, thermal energy can not transfer. Satellites and spacecraft actually <i>overheat</i> instead of freeze, because there is no air to dissipate away the heat that the electronics produce!</p> <p>Students can investigate the properties of exothermic reactions – hand warmers – from an altitude of 100,000 feet!</p>

INTEGRATING STANDARDS WITH BALLOONING

Motion and Stability: Forces and Interactions				
Middle School NGSS Physical Science Standards	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	NSBC Applications
<i>MS-PS2-4: “Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects”</i>	<i>Engaging in Argument from Evidence</i> “Construct and present oral and written arguments supported by empirical evidence and scientific reasoning”	<i>Types of Interactions</i> “Gravitational forces are always attractive There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass”	<i>Systems and System Models</i> “Models can be used to represent systems and their interactions”	Does the balloon have an attractive force, like the Earth? How does something’s distance from the sun affect the gravitational force? Launch an accelerometer! Take a look at the descent rate!
<i>MS-PS2-4: “Construct and interpret graphical displays of data to describe the relationship of kinetic energy to the mass of an object and to the speed of an object”</i>	<i>Analyzing and Interpreting Data</i> “Extending quantitative analysis to investigations”	<i>Definitions of Energy</i> “Motion energy is properly called kinetic energy”	<i>Scale, Proportion, and Quantity</i> “Proportional relationships among different types of quantities”	KE lesson – ascent vs descent rates, with constant mass. Conduct a lesson on how to use and make graphs based off of NSBC data. Use tables, diagrams, or models. Investigate how speed is a ratio of distance traveled to time taken.
<i>MS-PS3-2: “Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in a system”</i>	<i>Developing and Using Models</i> “Develop a model to describe unobservable mechanisms”	<i>Definitions of Energy</i> “A system of objects may contain stored (PE) energy, depending on their relative positions”	<i>System Models</i> “Models can be used to represent systems and their interactions”	Use ballooning to emphasize relative amounts of gravitational potential energy through its ascent vs descent. Analyze the potential energy of the balloon – why does it pop when it expands? How does altitude affect the potential energy of our balloon? NSBC is similar to a roller coaster on Earth, but better!
<i>MS-PS3-3: “Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer”</i>	<i>Constructing Explanations</i> “Apply scientific ideas to design, construct, and test a design of an	<i>Conservation of Energy</i> “Temperature is a measure of the average kinetic energy of particles of matter	<i>Energy and Matter</i> “The transfer of energy can be tracked as energy flows through a designed or natural system”	Investigate different materials to see which ones maximize the transfer of thermal energy.

INTEGRATING STANDARDS WITH BALLOONING

	object, tool, process, or system”	Energy is spontaneously transferred out of hotter regions and into colder ones”		Test the insulation of your payload (ex. the styrofoam).
Engineering Design				
<i>MS-ETS1-1</i> : “Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions”	<i>Asking Questions and Defining Problems</i> “Define a design problem that can be solved through the development of an object, tool, or process”	<i>Defining and Delimiting Engineering Problems</i> “The more precisely a design task’s criteria and constraints can be defined, the more likely it is that the designed solution will be successful”	<i>Influence of STEM on Society and the Natural World</i> “The uses of technologies are driven by...the findings of scientific research”	After creating a hypothesis to a real-life problem and researching it, students can launch a self-designed experiment to near-space.
<i>MS-ETS1-2</i> : “Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem”	<i>Engaging in Argument from Evidence</i> “Evaluate competing design solutions based on jointly developed and agreed-upon design criteria”	<i>Developing Possible Solutions</i> “There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem”		Students will plan carefully, just like real NASA scientists. Students can research past experiments and revise the designs to improve the object, tool, or process.
<i>MS-ETS1-3</i> : “Analyze data from tests to determine similarities among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success”	<i>Analyzing and Interpreting Data</i> “Analyze and interpret data to determine similarities and differences in findings”	<i>Developing Possible Solutions</i> “Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors”		Use data from sensors to analyze and interpret near-space conditions! For example, launch a pressure and temperature sensor, compare the data sets, and determine similarities and differences.

INTEGRATING STANDARDS WITH BALLOONING


High School Performance Expectations

Motion and Stability: Forces and Interactions

High School NGSS Physical Science Standards	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	Applications
<i>HS-PS2-2: “Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system”</i>	<i>Using Math and Computational Thinking</i> “Use mathematical representations of phenomena to describe explanations”	<i>Forces and Motion</i> “If a system interacts with objects outside itself, the total momentum of the system can change”	<i>Systems and system models</i> “when investigating a system, the boundaries and initial conditions of the system need to be defined”	Students will create graphs from the NSBC flight data. They will think quantitatively when reporting their results.
<i>HS-PS2-3: “Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision”</i>	<i>Constructing Explanations and Designing Solutions</i> “Apply scientific ideas to solve a design problem, taking into account possible unanticipated effects”	<i>Forces and Motion</i> “If a system interacts with objects outside itself, the total momentum of the system can change”	<i>Cause and Effect</i> “Systems can be designed to cause a desired effect”	Have you ever protected an object after it plummets back to Earth, travelling 3,000 ft/min, from 100,000 feet? Design an enclosure that will protect an egg, a lightbulb, or another fragile object.
Motion and Stability: Forces and Interactions				
<i>HS-PS3-3: “Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy”</i>	<i>Constructing Explanations and Designing Solutions</i> “Design, evaluate, and refine a solution to a complex real-world problem, based on scientific knowledge”	<i>Definitions of Energy</i> “Energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy”	<i>Energy and Matter</i> Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system.	Creative students could design their own device, such as a wind turbine (it gets windy during our ascent!) or a solar panel that will power a device.
<i>HS-PS4-2: “Evaluate questions about the advantages of using a digital transmission and storage of information”</i>	<i>Asking Questions and Defining Problems</i> Evaluate questions that challenge the	<i>Wave properties</i> “Information can be digitized; in this form, it can be stored reliably in computer memory	<i>Stability and change</i> “Systems can be designed for greater or lesser stability”	Students will track and plot the balloon in real-time, using trajectory data sent by an onboard radio. Is this method always reliable? What happens



INTEGRATING STANDARDS WITH BALLOONING

	premise(s) of an argument, the interpretation of a data set, or the suitability of a design.	and sent over long distances as a series of wave pulses”		if clouds interfere, the signal is lost, or our ground station computers fail? What happens if this was a life-or-death scenario, with astronauts relying on our transmissions? Our first-hand experience will allow the students to evaluate digital transmission.
<i>HS-PS4-5: “Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy”</i>	<i>Obtaining, Evaluating, and Communicating Information</i> “Communicate technical information in multiple formats”	<i>Energy in Chemical Processes</i> “Solar cells are human-made devices that likewise capture the sun’s energy and produce electrical energy”	<i>Cause and Effect</i> “Systems can be designed to cause a desired effect”	Launch a solar panel and analyze the data! Instead of an in-class experiment, get hands-on at 100,000 feet! Where else can you travel through the ozone layer, testing solar panels above 99% of the atmosphere?
<i>HS-PS4-6: “Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering”</i>	<i>Constructing Explanations and Designing Solutions</i> “Design a solution to a complex real-world problem, based on scientific knowledge, and tradeoff considerations”	<i>Optimizing the Design Solution</i> “Criteria may need to be broken down into simpler ones that can be approached systematically”		Design a solution to a scientific problem, such as remote sensing for a space exploration mission! Consider designing a rover that needs to analyze its landing site! What would you look for and what would you avoid – rivers, trees, or farms? Another mission could be a seed germination test. After launching tomato seeds, plant them on Earth, and against a control group, see if a near-space trip has any effects.

ALL ABOUT PAYLOADS

Students will design their own payloads, or small containers, that protect, insulate, and transport the experiments. For the NSBC launch, payloads must:

- Be smaller than 2' x 2' x 2'
- Weigh less than 1.5 pounds
- Contain no live animals
- Contain no projectiles, gliders, or remote operated free-flyers
- Contain no explosives

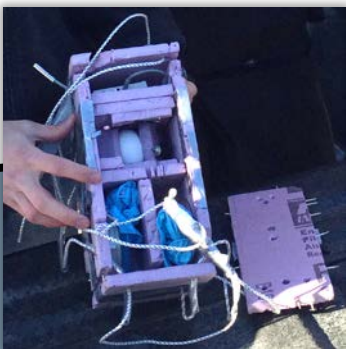
Turbulent winds, cold temperatures, and air resistance all affect your experiments. Styrofoam containers are a popular choice of material. They are lightweight, durable, and insulating. Some examples are shown below.

When designing your payload, it is important to consider:

- **Do you need to build compartments?** Compartments provide support and separation from other experiments. They can also support the weight of a camera or categorize specific scientific trials.
- **Do you have the most efficient size?** It is best to design the payload to be as aerodynamic as possible. In the past, NSBC students have created spheres, cubes, triangular pyramids, and rectangular prisms.
- **What color is your exterior?** There is no color requirement for NSBC, but a bright color increases its visibility and aids in recovery.



2013 Valley Middle School Launch



2015 Bismarck Team

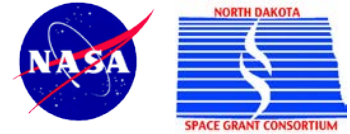


2013 Eighth Grade Valley Middle School Launch



2015 Kindred NSBC Team

2016 Near Space Balloon Competition (NSBC) Proposal Submission Form



The North Dakota Space Grant Consortium (NDSGC) and the University of North Dakota (UND) will be holding the sixth annual Near Space Balloon Competition in the fall of 2016. We invite all interested North Dakota 6th-12th grade students to submit a payload proposal using this form. Please submit completed proposal forms by **September 30, 2016** by email or mail to:

balloons@ndspacegrant.org

or

North Dakota Space Grant Consortium
Clifford Hall Room 513
4149 University Avenue Stop 9008
Grand Forks, ND 58202-9008

Teams will be notified of their proposal's acceptance by **October 7, 2016**. Accepted teams will be reimbursed up to \$250 for supplies and additional travel funds will be provided for your team to attend and participate in the balloon launch.

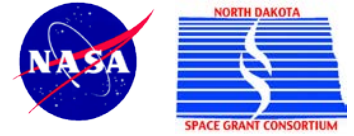
For more details, visit blogs.und.edu/nsbc.

Tentative Schedule of Events

September 30, 2016	Proposals Due
October 7, 2016	Teams Notified of Acceptance
October 17, 2016 – October 21, 2016	Web meeting for accepted proposals (Individual Teams)
November 14-18, 2016	Midterm progress report web meeting (All Teams)
November 18, 2016	Pre-launch orientation meeting @ UND
November 19, 2016	Launch Day
<i>December 3, 2017</i>	<i>Back-up Launch Date</i>

If you have any questions please contact Marissa Saad or Mike Cook by email at balloons@ndspacegrant.org.

2016 Near Space Balloon Competition (NSBC) Proposal Submission Form



I. Proposal Form Instructions

1. Please fill in all applicable fields completely to ensure full consideration of your proposal.
2. You may attach additional documents and information at the end of the form.
3. Submit completed form by **September 30, 2016** by email or mail to:

balloons@ndspacegrant.org

or

North Dakota Space Grant Consortium
Clifford Hall Room 513
4149 University Avenue Stop 9008
Grand Forks, ND 58202-9008

II. Payload Guidelines

We encourage you to be creative when designing your payload. However, we must enforce the following design limitations, in order to comply with FAA safety regulations.

1. The fully completed payload **MUST** be 1.5 pounds or lighter.
2. Payloads may not exceed 2 ft x 2 ft x 2 ft.
3. Please do not launch animals! (Plants are allowed).
4. If you wish to use any radio equipment, please contact us.
5. Please do not incorporate anything that may explode, has a projectile, or could accidentally contact another payload.

2016 Near Space Balloon Competition (NSBC) Proposal Submission Form



Team Information

School: _____

Faculty Mentor Name: _____

Contact Email: _____

Phone: _____

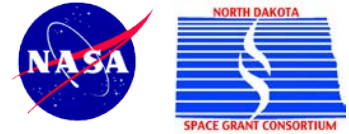
Mailing Address:

Team Name: _____

(Attention teachers: if your NSBC team is your entire class, you may add more than 20)

Team Member	Grade	Team Member (continued)	Grade
1.		11.	
2.		12.	
3.		13.	
4.		14.	
5.		15.	
6.		16.	
7.		17.	
8.		18.	
9.		19.	
10.		20.	

2016 Near Space Balloon Competition (NSBC) Proposal Submission Form



III. NSBC 2015 Mission Objective

A. Heliophysics, or the study of the Sun.

How does the Sun support life on Earth? What effects does the Sun have on planets, like Earth? How do solar panels relate to the Sun? What is solar wind? How do electricity and magnetism relate to the Sun? Do the ozone layer and ultraviolet light have a relationship? These are just a few of the questions you may decide to investigate during the 2016 Near-Space Balloon Competition. This year, NSBC will focus on heliophysics, or the study of the **Sun**.

While studying heliophysics during NSBC, we will celebrate the **Total Solar Eclipse of 2017**. But first, what is an eclipse?

On August 21, 2017, the Sun, Moon, and Earth will form a straight line. The Moon will transit in front of the Sun, making midday appear to be midnight! The Moon's shadow will pass over the coast of Oregon, travel across the Midwest, and exit through South Carolina, where it continues across the Atlantic Ocean. Select few cities will experience totality. Here in North Dakota, you'll still experience a partial solar eclipse. Get ready for this once-in-a-lifetime experience!

The North Dakota Space Grant Ballooning Team will be travelling to Idaho during the total solar eclipse. We will be launching a 2,000-gram balloon to view the eclipse from 100,000 feet in the air! We'll be able to see the Moon's shadow travel across Earth's surface, as well as the disappearance of the Sun! We will take the **grand prize winner's** payload and launch it on our balloon, during the total eclipse (*check out the Prizes tab on our website!*). Knowing that your payload may fly during a total solar eclipse, think of what you may want to study on August 21, 2017! Our NSBC launch could be your *control* flight to compare it to the eclipse flight!

To learn some quick facts about the Sun and the upcoming eclipse, check out the following websites:

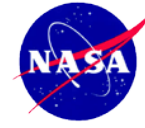
Fun Facts about the Sun: <http://goo.gl/5xNb8K>

Heliophysics Vocabulary: <http://goo.gl/7Xxjwx>

Interactive map of the Eclipse: <http://goo.gl/WkXU>

25 Facts about the 2017 Eclipse: <http://goo.gl/aqz17x>

2016 Near Space Balloon Competition (NSBC) Proposal Submission Form

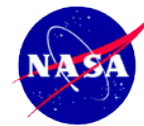


IV. Payload Details

A. Payload Analysis

1. Describe the objective(s) for your payload.
2. What is your hypothesis for the experiment?
3. Describe how the experiment will meet your objective(s).
4. What is the control group for your experiment?
5. How will you record the data?
6. Describe how your payload objectives may be affected if you're selected for launch during the total solar eclipse. What scientific outcomes do you predict?

2016 Near Space Balloon Competition (NSBC) Proposal Submission Form



B. Please provide a material list and rough budget for your payload:

Materials	Quantity	Cost

C. Please provide a sketch or schematic of your proposed payload. (Attachments are acceptable.)

Note: Submitted designs must indicate where the balloon string will run through payloads. Teams must attach clear vinyl **tubing** (found at Menards, Lowe's, etc.) in this designated spot. UND launch teams will later pass the string through this tubing. Consider how your payload will oscillate and rotate during flight, when suspended with the string.

If you would like more information about preparing your payload with tubing, please email balloons@ndspacegrant.org or refer to your **NSBC Handbook (page 17)**.

CHOOSING A SENSOR

Costs: The NDSGC will financially support each team with **\$250.00** for payload materials, sensors, and other equipment. Teams will purchase the supplies themselves, save the receipts, and send them into the Space Grant team for reimbursement.

The big question is: **what sensor should your students use?**

Before selecting the hardware, make sure your students know what they want to study. Are they interested in the temperature or pressure profile? Do they have a solid hypothesis? Do they know what end results they hope the balloon flight produces?

Purchasing a sensor should be the last step in a well-thought out process.

Check out some noteworthy data loggers, used by past NSBC teams and other student activities!

SparkFun

www.learn.sparkfun.com – Educator’s Discount Offered!

Onset Data Loggers

www.onsetcomp.com

HOBO Data Loggers

www.onsetcomp.com and Amazon.com

NeuLog Sensors

www.neulog.com and Amazon.com!

DESIGNING AND CONSTRUCTING THE PAYLOAD

Here are some helpful tips for when students start to design and build their payload:

Make the payload as compact as possible; extra space is impractical when flying!



2014 Northwood NSBC team constructing their spherical payload



Hot Glue vs Strapping Tape

Hot glue is handy, but not guaranteed to hold up against the frigid temperatures at altitude (-80°F). The glue may shatter if something impacts it. In addition to using glue, strapping tape is recommended. It has striated fiberglass filaments embedded within it to add strength. These filaments are hard to accidentally tear, unless you're cutting it with scissors. Make sure anything valuable on the outside of your payload has more than one attachment method.

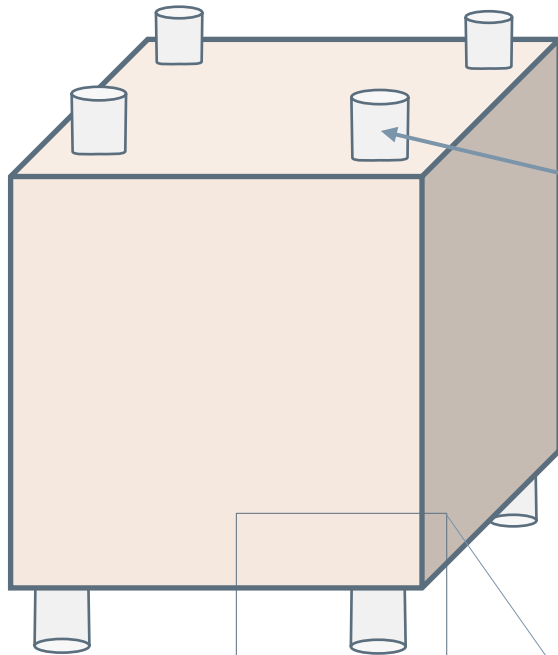


2015 Kindred NSBC Team's Payload

All cubed payloads must have four designated entry points to secure the string (as seen in Image 2). During a flight, the payloads experience turbulent swaying, which can deteriorate the Styrofoam around the string. The tubes do not have to pass continuously through the payload, but need to be present anywhere the string passes through the perimeter of the payload. All other designs (spheres, pyramids) may have one or two entry points lined with vinyl tubing. More information is included on the following page.

PAYLOAD SCHEMATICS

Follow the following procedure when designing your payloads. Any deviations must be specified, explained, and cleared with NDSGC within the proposal phase. We encourage creativity, while maintaining the safest configurations for all teams. Styrofoam, acting as the container, is preferred, but not mandatory. Styrofoam is light, strong, and insulating.

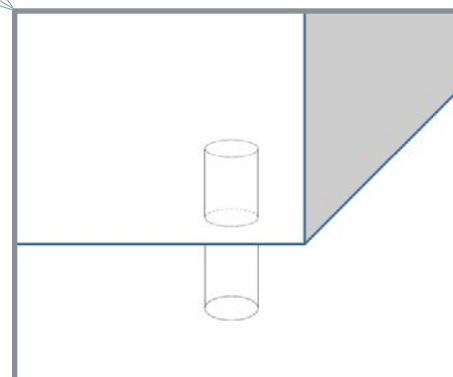


Payloads **must** have access points on the vertical axis so the string can pass through.

Clear vinyl **tubing** is mandatory – this protects the Styrofoam container from the oscillation of the balloon train and the degrading action of the string. This procedure applies to spheres and pyramids, as well (although they may have fewer entry points).

Tubing can be found at any local hardware store, such as Lowes or Menards. Diameters that are at least 0.25 inches is recommended.

The tubing does not have to travel entirely **through** the payload. One- or two-inch portions are acceptable, on every entry point.

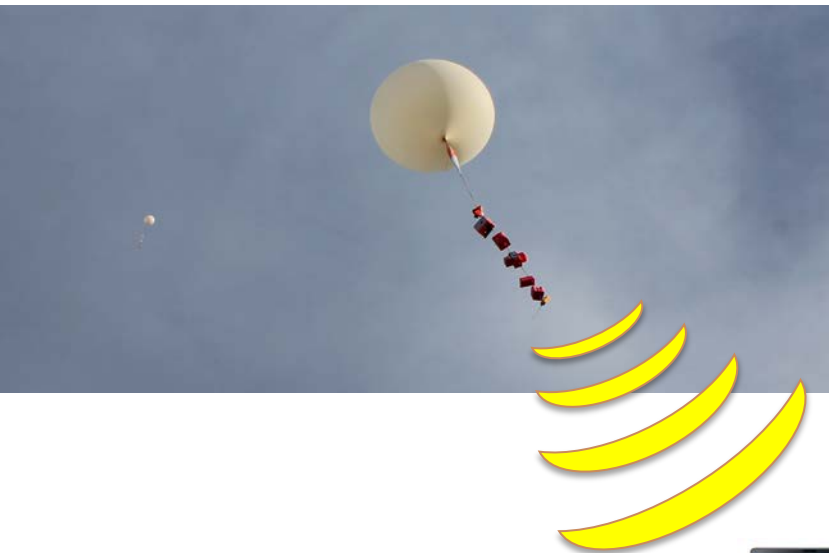


INTERFACING WITH GROUND SYSTEMS

Interfacing with Ground Systems

NDSGC uses two main methods to track the balloon:

1



Our primary method is a HAM radio. A transmitter onboard the balloon will transmit its location, altitude, and velocity every 15 seconds. The tracking team will use computers to plot the coordinates on a map. All student chase teams will be able to see these coordinates.



2

The secondary tracking system is a SPOT tracker. This is a typical GPS device commonly used by hikers and mountaineers. This unit transmits its location to a satellite, which plots the coordinates on a map online. Anyone with internet access can see the balloon's flightpath.



Type this in to track the SPOT devices!

<http://goo.gl/QqJK2K>

STUDENT ROLES

Student Roles

What will your students actually *do*?

Research

Each team must select a scientific problem, propose an experiment designed to answer that problem, and develop a hypothesis for their project's outcome.



<http://goo.gl/GcB0a0>

Students will present this researched space knowledge at integration night (how does your experiment apply to space?) and in the final report.

See "integration night presentation guidelines" for more information.

Design



2013 Northwood student designing their pyramid payload

Students will submit a sketch of their proposed payload, including size dimensions. This can be produced by hand or electronically, as long as it is detailed and legible. Payload designs should highlight the science experiment inside and be as compact as possible.

Construction



2013 Valley Middle School constructing their payload

Students interested in building their experiment's container, or payload, can participate with the construction. Commonly used materials include Styrofoam, zip ties, hot glue, strapping tape, duct tape, Velcro, and vinyl tubing.

Launch and Chase



2013 Valley Middle School at the landing site

Are all of your students attending the launch? Participating students will follow the main UND tracking vehicle, chasing after the balloon. They will be able to visualize and plot the balloon's location on a map throughout the entire mission.

Analysis

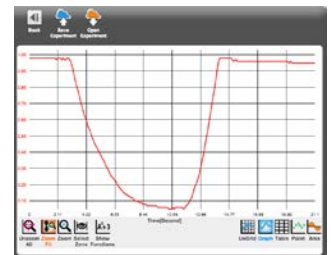


2013 NSBC post-flight biological experiment

After the payloads are recovered, students will analyze their science data, imagery, or engineering experiments. Students will have approximately one month after the launch to complete all analyses.

Information can be compiled into graphs or tables – images are helpful, too!

Final Report



2013 NSBC post-flight pressure data

The final report is a concise document displaying what the students learned. In this section, they will state their problem, hypothesis, methodology, results and analysis, and final conclusions (was their hypothesis correct? Why or why not?).

WEEKLY TIMELINE OF ASSIGNMENTS

ACTION ITEM*	DATE
Proposals Due	October 3, 2016
Acceptance Letters Announced	October 10, 2016
Individual Team Web Meetings	October 17-21, 2016
Web Logistics Meeting (All teams)	November 6, 2016
Integration Night	November 18, 2016
Launch Day	November 19, 2016
(Backup Launch Day)	December 3, 2016
Final Reports Due	December 19, 2016
(Backup Report Date)	January 6, 2016
Judges Ceremony	TBD January 2017

*All dates are subject to change depending on weather, technical delays, and NSBC project managers' decisions.



MANDATORY REPORTING

PROPOSAL SUBMISSION

When: Last week of September

Student teams will submit a proposal where they will explain their science objectives. They will research the problem, form a hypothesis, and list their required materials. A proposal submission form can be found on the NSBC website (blogs.und.edu/nsbc). Teams will be notified if their proposal has been accepted by the first week of October.

PRELIMINARY MEETING

When: Second week of October

Duration: 30 mins



All teams will participate in the preliminary meeting, held via a videoconference. Each team will select a date and time that is most convenient for them. Web capabilities include Skype, FaceTime, Google Hangouts, Connect Pro, and any other preferred method.

This opportunity allows students to meet the NSBC coordination team and ask any engineering or science questions. Coordinators will assess each team's direction and intentions, offering assistance and guidance.

CRITICAL DESIGN REVIEW

When: Third week of November

Duration: 30 mins



Student teams will meet with the NSBC coordinators via web conference one last time, before integration night. The students will provide their payload's final weight and dimensions. Any immediate design or performance issues will be addressed and all additional questions will be answered. Because this is the last discussion meeting before the teams embark to UND for the launch, coordinators will discuss travel and integration night logistics.

Communication will be ongoing throughout the competition. The NSBC coordination team members are not judges and can be contacted throughout the entire competition.

THE COMPETITION AND JUDGING

Judging

Student NSBC teams will be judged on a standard set of criteria, which can be found on the following page. There are five categories: 1) the quality of the proposal, 2) the actual payload, 3) the student presentation at integration night, 4) the team dynamics during the launch, and 5) the quality of the final report. Teams can earn a total of 125 points.

The grand prize winner will earn the opportunity to participate in a NDSGC sponsored STEM-activity (ex. Gateway to Science Center, Fargo Air Museum, etc.) or a trip to the John D. Odegard School of Aerospace Sciences at the University of North Dakota. The trip to UND includes a tour of the **Aviation facilities (including a high altitude chamber)**, a tour of the **Human Space Flight Laboratory (space suits and spacecraft simulators)**, a tour of the **UND Observatory**, and a tour of **real meteorites and fossils (you can hold them!)**. Also, depending on the activities scheduled for the spring, some teams may be invited to participate in unique programs. The 2015 NSBC first place team from Kindred was able to interview Astronaut Tim Kopra, while he orbited overhead on the International Space Station! These vary year to year.



The judging ceremony for the *first* NSBC in 2011 - it was originally called the ND High Altitude Balloon Student Payload Competition!



Human Space Flight Lab



Simulators



Observatory

THE COMPETITION AND JUDGING

Category	2016 NSBC Judging Form	Points range from low (1) to high (5)	Points	5	4	3	2	1
Proposal								
	Clear statement of their objectives and a hypothesis	5						
	<i>Control</i> and <i>variables</i> clearly listed and explained	5						
	Originality of research idea	5						
	The proposal shows the team researched the Sun	5						
	Sufficient preliminary design	5						
	Explanation of how their research will be applicable during an Eclipse Launch	5						
	Subtotal	30						
Payload								
	Follows all size and material guidelines	5						
	Payload design best supports the science within	5						
	Good workmanship, noticeable effort and time put in	5						
	Aerodynamic, compact design with no wasted space	5						
	Subtotal	20						
Presentation								
	Understanding of their payload	5						
	Understanding of the science (and the Sun)	5						
	Articulated contribution by each team member	5						
	Team spirit and unity	5						
	Subtotal	20						
Launch Day								
	Sportsmanship (Did they assist other teams? Willing to share post-flight data?)	5						
	Demonstration of critical thinking, problem solving, and decision making	5						
	Team communication, work ethic, and attitude	5						
	Subtotal	15						
Final Report								
	Explanations and Analysis of their data	5						
	Overall presentation of the final report (neatness of data and figures)	5						
	Accurate grammar, spelling, citations	5						
	Report has all components (procedures, materials, analysis, conclusions)	5						
	Did the team appropriate their funds efficiently?	5						
	Did they explain how their experiment is applicable during a total solar eclipse?	5						
	Report shows substantial research of the Sun	5						
	Subtotal	35						
	Total Available Points	120						

The NSBC judges will use this form!

TRAVELING TO THE COMPETITION

<https://goo.gl/maps/Nt36WtgM5Qx>



42nd St.

Hilton Hotel

Skalicky Hall

Ryan Hall

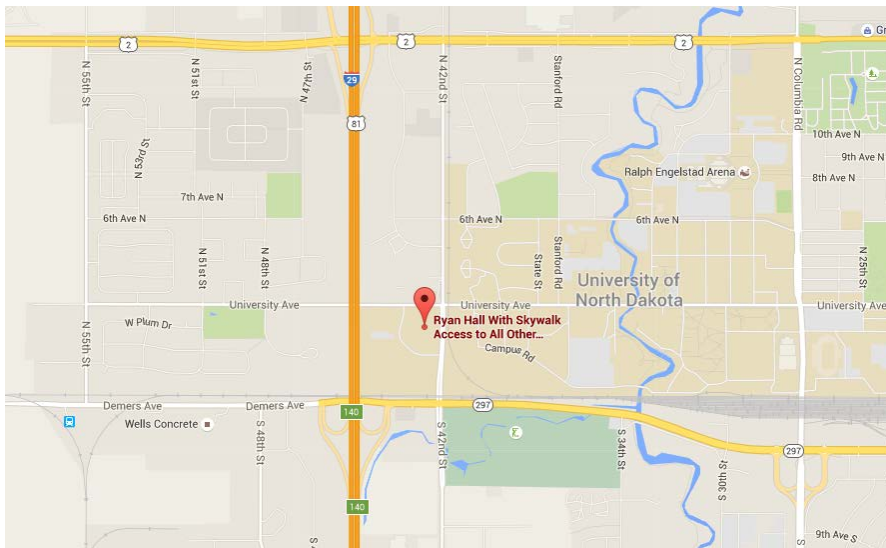
To Clifford Hall

Skalicky Hall, Room 211
4300 James Ray Drive
Grand Forks, ND 58202

Hilton Hotel
4301 James Ray Drive
Grand Forks, ND 58203

Hotel Information

Directions from I-29: Take **exit 140**. Turn right onto Demers Ave, turn left onto S 42nd St, and turn left onto James Ray Drive.



<https://goo.gl/OvxwRz>

Hilton Hotel
Phone Number
(701) 775 - 6000



Hilton Garden Inn

Parking can be found at the Hilton Hotel (for free), or in visitor parking behind Skalicky Hall. An indoor walkway connects all the buildings shown above.

RESERVING HOTEL ROOMS

How to Reserve your Hotel Rooms
All teams will stay at the Hilton Garden Inn Hotel – this comes at no cost to your team.

Each team must report the number of rooms you require to the NDSGC team by the critical design review (see “Mandatory Reports” section) web-meeting.

Teams should not call, reserve, or pay for their own rooms.

Hilton Hotel

Non-smoking

Business Center

Indoor Pool

Fitness Room

Complimentary Wi-Fi

Full Service Restaurant

Participants will be reimbursed for meals not provided by the NDSGC, using the state-rate per diem.

Hotel Hours

Check-in: 3:00 pm

Check-out: 12:00 pm

We will not be able to locate the payloads and return back to Grand Forks in time for check-out. Please take all your belongings with you when we chase the balloon.

Please see the “Travel Tips” section for additional reimbursement information.

INTEGRATION NIGHT

2015 NSBC

What is Integration Night?

On the Thursday evening before the launch, all student teams will meet on the UND campus, in Skalicky Hall, Room 211.

Teachers and students may need to be prepared to leave early from school to make the 4 pm meeting time.

At integration night, payloads will be inspected for launch. Judges will observe and interview teams, the weights and dimensions of each payload will be taken, and teams will be given the go- or no-go for launch.



After looking at the weather forecast, NSBC coordinators will email all teams by **Wednesday at 3:00pm** to inform them if they should depart for UND.

NSBC Coordinators will deliver a short introductory presentation, including the background of balloons, the scientific objectives of the mission objectives, and the logistics and safety procedures for the morning launch.

Student Presentations

Requirements:

- Why their research is relevant to the NSBC main objective (Mars, Moon, etc.)
- Their scientific and engineering objectives
- Their hypotheses, controls, and variables
- Their motivation for the design
- Any obstacles faced with the construction

To conclude, members of the UND launch team will string up all student payloads and connect them to the parachute. **Payloads must have the vinyl tubing in place before integration night.** (See “Payload Schematics” section for tubing instructions).

LAUNCH DAY

Where:

Outside Ryan Hall's garage (see image)

4301 James Ray Drive

Located between Skalicky Hall and Clifford Hall

(In the event Skalicky Hall's doors are locked, teams will be able to leave the Hilton Hotel and walk eastward towards 42nd Street and north towards Ryan Hall, arriving at the parking area, which is the entrance to Ryan's garage.)



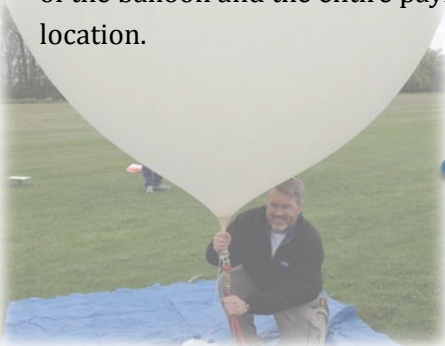
<https://goo.gl/30F2a6>

Everyone will meet in the garage and finalize their sensors and cameras and secure their containers. Make sure NASA stickers and contact information are clearly visible on the outside of the payloads.

If your team is launching a **camera** (or anything with a limited battery lifespan) and you are able to access it without opening up your payload, then your team members should wait as long as possible to turn it on. Filling up a balloon takes almost a half hour. Turn on cameras **after** the balloon is filled and the launch team arrives to the exact launch location.

FILLING THE BALLOON:

The balloon will be filled with helium, until the lift of the balloon is at least two pounds lighter than the total weight of the payload chain. The diameter of the balloon will expand approximately five to eight feet in diameter. Then, the string of payloads will be tied to the neck of the balloon and the entire payload train will be carried and walked to the appropriate launch location.



It can be very cold during the launch. Remember to bring warm winter gear: hats, gloves, jackets, etc.!

LAUNCH DAY

Launch Operations for Student Teams:

8:00 AM

- Meet at Ryan Garage
- Finalize all payloads
 - Ensure your tracking system is operational
- Walk payload train to the launch site (east of the Hilton Hotel)



2013 NDSGC Balloon Launch

9:00 AM

- Launch balloon
- All teams assemble in the appropriate chase vehicle
- Main chase vehicle leads the caravan, student teams follow behind

Payload Send-off

The student holding your team's payload should be prepared for a variety of lift-offs. Depending on the wind and release of the balloon, the payload train may gradually lift out of the students' hands, or violently burst upwards. It is a good precaution to have the students stretch out their arms and hold the payload as far away from their face as possible.



2011 Balloon Launch

Upon payload recovery:

Only the designated payload recovery specialist, wearing reflective gear, will venture out to retrieve the balloon (after gaining landowner's permission). Students must remain by the cars and await the return of their experiments.

At this time, students should document all the time-sensitive information and image their payload before any outside variables affect their data.



2013 NSBC Recovery

It may be helpful to bring snacks for the minimum 2-hour chase!

Rules and Regulations

Ballooning is a fun and relatively safe activity, but some safety procedures are in place so that everything runs smoothly. There will be numerous participants and spectators around Ryan Hall's garage, filling site, and launch site. Please take caution when navigating around sensitive filling apparatus.

Please read these carefully.

1. **Do not stand behind the helium tanks.** Helium, an inert gas, is much safer than hydrogen – but when it is compressed in a cylinder, it could potentially turn into an uncontrolled projectile.
2. Do not stand near or on the **filing tubes**, regulator, or other launch site equipment.
3. **Students may not ride in a state vehicle.** Everyone will have pre-designated vehicle assignments.
4. Students cannot venture out on **private land** to retrieve the payloads. If the payloads fall on someone's land, the NDSGC payload retrieval specialists will transport it to the road, where students will be able to analyze their experiments.
5. Please leave all **drones**, other remote controlled objects, and hover boards at home.



2013 NDSGC Balloon Launch

What should you *include*?

Introduction

Include a quick background on the mission destination (Mars, Moon, etc.) and highlight your mission objectives. What was your motivation for the experiment – would your design assist future human exploration? What are your variables and controls?

Materials List

What materials, tools, or objects did you use to construct your payload? Why did you select your equipment over other options?

Procedure

If someone was trying to reproduce your payload design and functionality, how would they do it? What timeline would they follow?

Results

Include your balloon-borne data. Display and explain your graphs, tables, and images.

Conclusion

Discuss your experiment - was your hypothesis true? What did you learn? What do you hope to accomplish if you fly during the total solar eclipse?

If your experiment did not perform as expected, discuss what changes and alterations you could make for a future launch. Remember, if something broke or failed, that's part of the learning process – it happens to NASA scientists, too!

If someone else was replicating your experiment, what advice would you give them?

POST-LAUNCH ASSESSMENT

Dear Educators and Students,

On behalf of the North Dakota Space Grant Consortium and the University of North Dakota, thank you for your participation in this year's Near Space Balloon Competition.

As a valued participant, your opinions are important to us and we invite you to please fill out this short survey. This year's survey will be distributed to teams, online. You will receive a survey link during NSBC's integration night.

Completion of this survey is voluntary and all questions are optional. Your responses will remain anonymous and will in no way influence the judging of your payload or affect your standing in competitions present and forthcoming. Please answer all questions truthfully and as completely as possible.

If you have any questions or concerns, or if you require clarification on any of the survey questions please contact us at balloons@ndspacegrant.org.



NASA MEDIA RELEASE FORMS - MINORS



Media Release for Parent and Minor

I, _____, am the parent/guardian/legal representative of

(Please print your name)

_____ and do hereby give permission

(Please print name of child)

for the above-named minor child (hereinafter "Minor") to be photographed and/or videotaped by NASA or its representatives. I understand and agree that the photographs and/or videotapes containing the image and/or voice of the Minor may be used in the production of instructional and/or promotional materials produced by or on behalf of NASA (hereinafter the "Program") and that such materials may be distributed or broadcast to the public and displayed publicly. I also understand that my permission to use the photographs and videotapes is for an unlimited duration and that neither I nor the Minor will receive any compensation for granting this permission or for the use, if any, by NASA of the Minor's image and/or voice.

I acknowledge that NASA has no obligation to use the Minor's image or voice in connection with the Program.

I hereby unconditionally release NASA and its representatives from any and all claims and demands arising out of the activities authorized under the terms of this agreement.

By signing below, I represent that I am at least 18 years of age and am the parent/guardian/legal representative of the above-named Minor. I have read the foregoing agreement and am familiar with all of the terms and conditions thereof and I consent to its execution by the Minor. I agree that neither I nor the Minor will revoke or disaffirm the this agreement at any time.

Signature of Parent/Guardian/Legal Representative of Minor: _____

Relationship to Minor: _____ Date: _____

Name and Location of Event: _____ Near-Space Balloon Competition at the University of North Dakota

Signature of Minor: _____

NASA MEDIA RELEASE FORM - ADULTS



NASA Media Release for Adults (Do Not Use for Minors)

I, _____ do hereby give permission to be
(Please print name your name)

interviewed, photographed, and/or videotaped by NASA or its representatives in connection with a NASA production.

I understand and agree that the text, photographs, and/or videotapes thereof containing my name, likeness, and voice, including transcripts thereof, may be used in the production of instructional, promotional materials, and for other purposes that NASA deems appropriate and that such materials may be distributed to the public and displayed publicly one or more times and in different formats, including but not limited to, websites, cablecasting, broadcasting, and other forms of transmission to the public. I also understand that this permission to use the text, photographs, videotapes, and name in such material is not limited in time and that I will not receive any compensation for granting this permission.

I understand that NASA has no obligation to use my name, likeness, or voice in the materials it produces, but if NASA so decides to use them, I acknowledge that it may edit such materials. I hereby waive the right to inspect or approve any such use, either in advance or following distribution or display.

I hereby unconditionally release NASA and its representatives from any and all claims and demands arising out of the activities authorized under the terms of this agreement.

By signing below, I represent that I am of legal age, have full legal capacity, and agree that I will not revoke or deny this agreement at any time.

I have read the foregoing and fully understand its contents.

Accepted by:

Signature: _____ Date: _____

Name and Location of Event: Near-Space Balloon Competition at the University of North Dakota

Address: 4149 University Drive Stop #9008, Clifford Hall Rm 513, Grand Forks, ND 58202

Telephone: 701-777-4161

Email Address: _____

UND SAFETY AGREEMENT FORM - MINORS

UND Safety Agreement Form - Minors



PARENT'S OR GUARDIAN'S AGREEMENT OF WAIVER OF LIABILITY, INDEMNIFICATION, AND MEDICAL RELEASE

To be signed by adults if the participant is under 18 years of age.

Acknowledgment and Assumption of Risk

The undersigned parent and/or legal guardian does hereby acknowledge that he/she is aware of the dangers and the risks to the participant's person and property involved in participating in:

I understand that this activity involves certain risks for physical injury, including, but not limited to:

The undersigned parent and/or legal guardian and participant understand that this activity involves certain risks for physical injury to the participant. We also understand that there are potential risks of which may presently be unknown. Because of the dangers of participating in this activity, the undersigned parent and/or legal guardian and participant recognize the importance and the participant agrees to fully comply with the applicable laws, policies, rules and regulations, and any supervisor's instructions regarding participation in this activity.

The undersigned parent and/or legal guardian and participant understand that the University of North Dakota does not insure participants in the above-described activity, that any coverage would be through personal insurance, and the University of North Dakota has no responsibility or liability for injury resulting from this activity.

The undersigned parent and/or legal guardian acknowledges that the participant voluntarily elects to participate in this activity with knowledge of the danger involved, and hereby agrees to accept and assume any and all risks of property damage, personal injury, or death.

Waiver of Liability and Indemnification:

In consideration for being allowed to voluntarily participate in the above-referenced event, on behalf of myself, the participant, his/her personal representatives, heirs, next of kin, successors and assigns, the undersigned parent and/or legal guardian forever:

a. waives, releases, and discharges the University of North Dakota and its agencies, officers, and employees from any and all liability for the participant's death, disability, personal injury, property damages, property theft or claims of any nature which may hereafter accrue to the participant, and the participant's estate as a direct or indirect result of participation in the activity or event; and

b. agree to defend, indemnify, and hold harmless the University of North Dakota, its agencies, officers and employees, from and against any and all claims of any nature including all costs, expenses and attorneys' fees, which in any manner result from participant's actions during this activity or event.

Consent is given for the participant to receive medical treatment, which may be deemed advisable in the event of injury, accident or illness during this activity or event. This release, indemnification, and waiver shall be construed broadly to provide a release, indemnification, and waiver to the maximum extent permissible under applicable law.

I, the undersigned parent and/or legal guardian, affirm that I am freely signing this agreement. **I have read this form and fully understand that by signing this form I am giving up legal rights and/or remedies which may otherwise be available to myself, the minor participant regarding any losses the participant may sustain as a result of participation in the activity. I agree that if any portion is held invalid, the remainder will continue in full legal force and effect.**

READ BEFORE SIGNING

Name of Minor: _____ Age of Minor: _____

Signature of Parent/Guardian: _____ Date _____

Printed Name of Parent/Guardian: _____ Date _____

Witness: _____ Date _____

(To be retained by originating department)

Student/Non-employee Travel Expense Worksheet Tips and Info

When planning or submitting your travel expenses to UND, please follow the tips below.

Planning your travel:

- Current per diem rates for meals for students and non-employees is **\$46 per day** for travel in North Dakota. That rate is \$35 for state employees. Other city rates are provided on request. Receipts are not necessary.
- If non-employees purchase food for other students, they may **submit receipts to the North Dakota Space Grant Consortium** for reimbursement.
- Current mileage rate in ND is 54 cents per mile for using a personal vehicle for travel.
- If renting a bus or van for travel outside the state of ND, educators should follow their school district's policies for rentals with companies that have secured a group plan with them. These plans typically include liability and comprehensive insurance coverage and at a much lower daily rental rate. **If you use a vehicle rented outside of these group plans, UND will NOT cover additional vehicle rental charges such as navigation systems, any type of insurance coverage such as liability or comprehensive insurance.** Typically, if you own a car, your policy should cover rental car accident and liability insurance if reserved in your name. Check with your insurance carrier to verify that you are covered.
- Your submitted hotel receipt should show a zero balance and **proof of payment**. If it does not, you will be required to obtain one, or provide a credit card statement showing proof of payment.

Submitting your travel expense worksheet:

- Check the box for ND State Employee, Non-employee, or student. Only UND students check the student box. Other students are considered non-employees. All state employees should check the ND State Employee box---this includes all state universities and colleges.
- Travelers should **only** complete the top 1/3 up to "Expenses to be Reimbursed" and sign the form at the bottom. Office staff will complete the expense section using receipts and details you provide.
- Sharing of hotel rooms by students is allowable and must be indicated on the hotel receipt by the person submitting the expense. Please indicate the names of each person in a room.
- Receipts are required for all expenses including, but not limited to gas, parking, highway tolls, hotel, registration fees, car rental, airline tickets, airline luggage fees, etc. Meal receipts are not required as you are reimbursed on a standard per diem rate as provided above.
- If you are missing a receipt, a missing receipt form will need to be signed.

Request for Taxpayer Identification Number and Certification

Give Form to the
 requester. Do not
 send to the IRS.

Print or type See Specific Instructions on page 2.	Name (as shown on your income tax return)	
	Business name/disregarded entity name, if different from above	
	Check appropriate box for federal tax classification: <input type="checkbox"/> Individual/sole proprietor <input type="checkbox"/> C Corporation <input type="checkbox"/> S Corporation <input type="checkbox"/> Partnership <input type="checkbox"/> Trust/estate <input type="checkbox"/> Limited liability company. Enter the tax classification (C=C corporation, S=S corporation, P=partnership) ▶ _____ <input type="checkbox"/> Other (see instructions) ▶ _____	Exemptions (see instructions): Exempt payee code (if any) _____ Exemption from FATCA reporting code (if any) _____
	Address (number, street, and apt. or suite no.)	Requester's name and address (optional)
	City, state, and ZIP code	University of North Dakota Accounting Services 264 Centennial Drive Stop 8356 Grand Forks ND 58202-8356
List account number(s) here (optional)		

Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on the "Name" line to avoid backup withholding. For individuals, this is your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the Part I instructions on page 3. For other entities, it is your employer identification number (EIN). If you do not have a number, see *How to get a TIN* on page 3.

Social security number												
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="border: 1px solid black; width: 25px; height: 20px;"></td> <td style="border: 1px solid black; width: 25px; height: 20px;"></td> <td style="border: 1px solid black; width: 25px; height: 20px;"></td> <td style="border: 1px solid black; width: 25px; height: 20px;"></td> <td style="border: 1px solid black; width: 25px; height: 20px;"></td> <td style="border: 1px solid black; width: 25px; height: 20px;"></td> <td style="border: 1px solid black; width: 25px; height: 20px;"></td> <td style="border: 1px solid black; width: 25px; height: 20px;"></td> <td style="border: 1px solid black; width: 25px; height: 20px;"></td> <td style="border: 1px solid black; width: 25px; height: 20px;"></td> <td style="border: 1px solid black; width: 25px; height: 20px;"></td> <td style="border: 1px solid black; width: 25px; height: 20px;"></td> </tr> </table>												

Note. If the account is in more than one name, see the chart on page 4 for guidelines on whose number to enter.

Employer identification number												
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="border: 1px solid black; width: 25px; height: 20px;"></td> <td style="border: 1px solid black; width: 25px; height: 20px;"></td> <td style="border: 1px solid black; width: 25px; height: 20px;"></td> <td style="border: 1px solid black; width: 25px; height: 20px;"></td> <td style="border: 1px solid black; width: 25px; height: 20px;"></td> <td style="border: 1px solid black; width: 25px; height: 20px;"></td> <td style="border: 1px solid black; width: 25px; height: 20px;"></td> <td style="border: 1px solid black; width: 25px; height: 20px;"></td> <td style="border: 1px solid black; width: 25px; height: 20px;"></td> <td style="border: 1px solid black; width: 25px; height: 20px;"></td> <td style="border: 1px solid black; width: 25px; height: 20px;"></td> <td style="border: 1px solid black; width: 25px; height: 20px;"></td> </tr> </table>												

Part II Certification

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me), and
2. I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding, and
3. I am a U.S. citizen or other U.S. person (defined below), and
4. The FATCA code(s) entered on this form (if any) indicating that I am exempt from FATCA reporting is correct.

Certification instructions. You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the certification, but you must provide your correct TIN. See the instructions on page 3.

Sign Here	Signature of U.S. person ▶	Date ▶
------------------	----------------------------	--------

General Instructions

Section references are to the Internal Revenue Code unless otherwise noted.

Future developments. The IRS has created a page on IRS.gov for information about Form W-9, at www.irs.gov/w9. Information about any future developments affecting Form W-9 (such as legislation enacted after we release it) will be posted on that page.

Purpose of Form

A person who is required to file an information return with the IRS must obtain your correct taxpayer identification number (TIN) to report, for example, income paid to you, payments made to you in settlement of payment card and third party network transactions, real estate transactions, mortgage interest you paid, acquisition or abandonment of secured property, cancellation of debt, or contributions you made to an IRA.

Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN to the person requesting it (the requester) and, when applicable, to:

1. Certify that the TIN you are giving is correct (or you are waiting for a number to be issued),
2. Certify that you are not subject to backup withholding, or
3. Claim exemption from backup withholding if you are a U.S. exempt payee. If applicable, you are also certifying that as a U.S. person, your allocable share of any partnership income from a U.S. trade or business is not subject to the

withholding tax on foreign partners' share of effectively connected income, and

4. Certify that FATCA code(s) entered on this form (if any) indicating that you are exempt from the FATCA reporting, is correct.

Note. If you are a U.S. person and a requester gives you a form other than Form W-9 to request your TIN, you must use the requester's form if it is substantially similar to this Form W-9.

Definition of a U.S. person. For federal tax purposes, you are considered a U.S. person if you are:

- An individual who is a U.S. citizen or U.S. resident alien,
- A partnership, corporation, company, or association created or organized in the United States or under the laws of the United States,
- An estate (other than a foreign estate), or
- A domestic trust (as defined in Regulations section 301.7701-7).

Special rules for partnerships. Partnerships that conduct a trade or business in the United States are generally required to pay a withholding tax under section 1446 on any foreign partners' share of effectively connected taxable income from such business. Further, in certain cases where a Form W-9 has not been received, the rules under section 1446 require a partnership to presume that a partner is a foreign person, and pay the section 1446 withholding tax. Therefore, if you are a U.S. person that is a partner in a partnership conducting a trade or business in the United States, provide Form W-9 to the partnership to establish your U.S. status and avoid section 1446 withholding on your share of partnership income.

CONTACTS

Thank You, Good Luck, and Have Fun!



NSBC Website

NSBC Website: blogs.und.edu/nsbc

NSBC Email: balloons@ndspacegrant.org

Facebook: North Dakota Near-Space Balloon Competition (NSBC)

<https://goo.gl/2pwmnM>



Facebook

Marissa Saad

mraad@space.edu

W: 701-777-4161

C: 617-462-0610

Caitlin Nolby

cnolby@space.edu

W: 701-777-4856

C: 763-843-6479