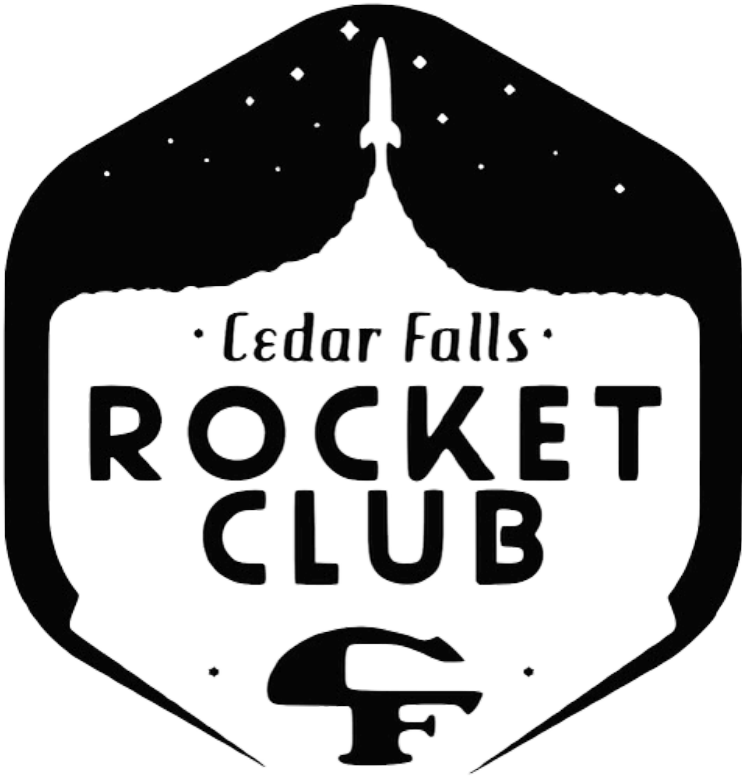


Project Hermóðr

Proposal

Cedar Falls High School

2701 27th Street, Cedar Falls, IA 50613
September 11th, 2024

Table of Contents

I) General Information

1.1 Adult Educator

- Ms. Autumn Umbarger autumn.umbarger@cfschools.org (641) 512-6741

1.2 Adult Mentor

- Mr. Zeb Nicholson zeb.nicholson@cfschools.org (319) 939-2169
    - NAR #: 96915, Level Two Certified

1.3 Student Team Leader

- Max Stokes 25maxsto@student.cfschools.org

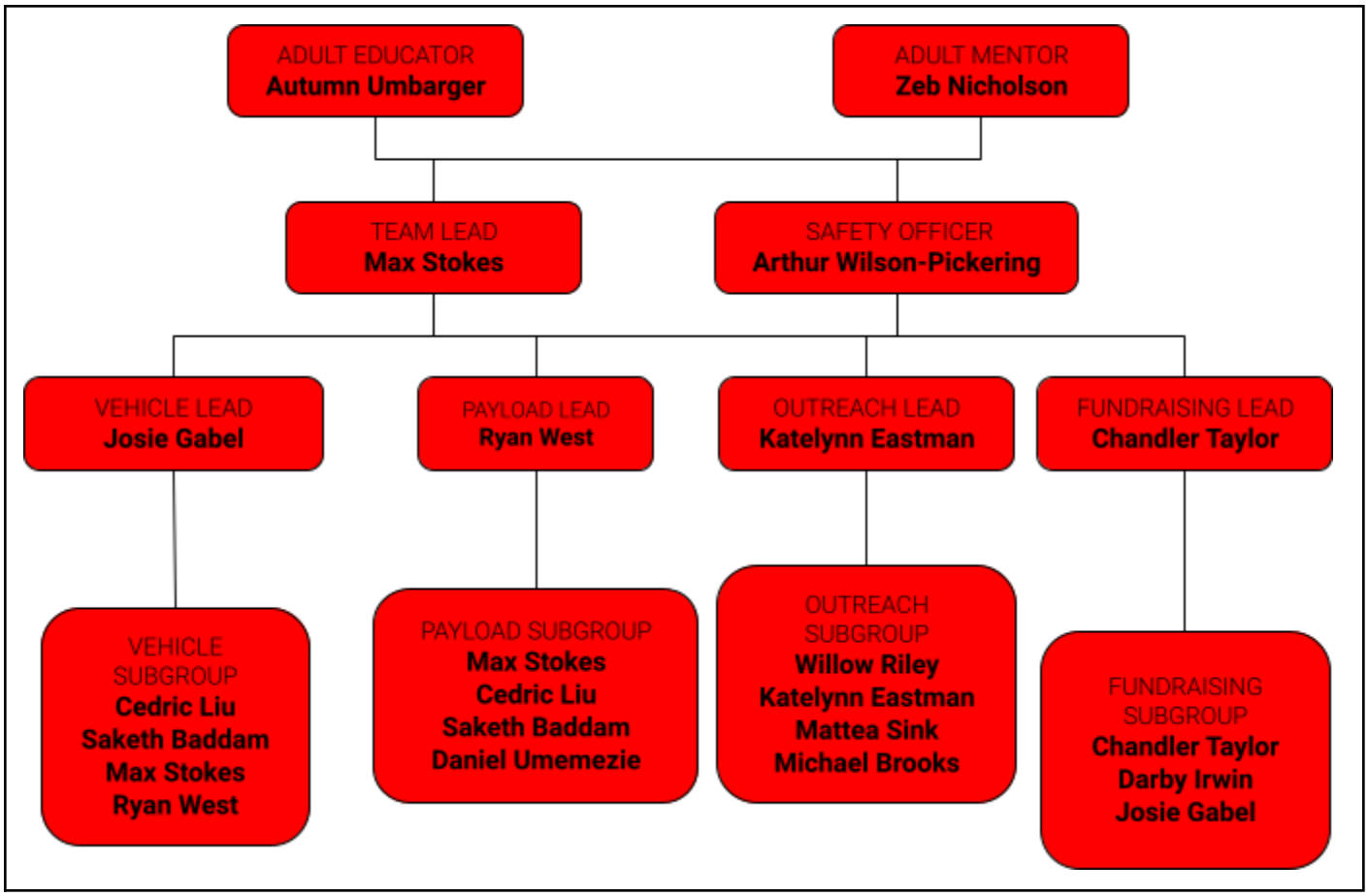
1.4 Student Safety Officer

- Arthur Wilson-Pickering 25artwil@student.cfschools.org

1.5 Team Members and Their Roles

- An approximate number of student participants who will be committed to the project and their proposed duties. Includes an outline of the project organization that identifies the key managers and technical personnel.

The CFHS Rocket Club Team currently has 14 students, one adult educator, and one mentor. The students consist of 6 females and 8 males; 6 seniors, 5 juniors, and 2 sophomores. The adult educator, Autumn Umbarger, is a teacher at Cedar Falls High School. She has a degree in All Science - Secondary Education and teaches Physics at Cedar Falls High School. She has been a co-coach for the Cedar Falls Rocket Club since the 2021-22. This year, the mentor, Zeb Nicholson, will supervise vehicle construction and oversee motor assembly, energetics, and any other area where help is needed. He has been a math and engineering teacher for 12 years and has spent the last nine years leading the rocketry team. Mr. Nicholson also has past mechanical engineering work experience. He has been with the team since its beginnings in 2014.
Four main subgroups make up the team: Payload Design and Construction, Vehicle Design and Construction, Outreach, and Fundraising. Each sub-group has a leader who is responsible for making sure that the group does quality work and meets deadlines. The Student Team Lead and Student Safety Officer, along with any adult mentors/educators, manage the whole team and ensure cooperation/coordination between sub-groups. These leaders are available to answer questions that the members of the various sub-groups may have.



1.6 NAR/TRA Section Affiliation

- The team will work with the Tripoli Minnesota Association, TRA Prefecture #45, for mentoring, reviewing designs and documentation, and launch assistance.

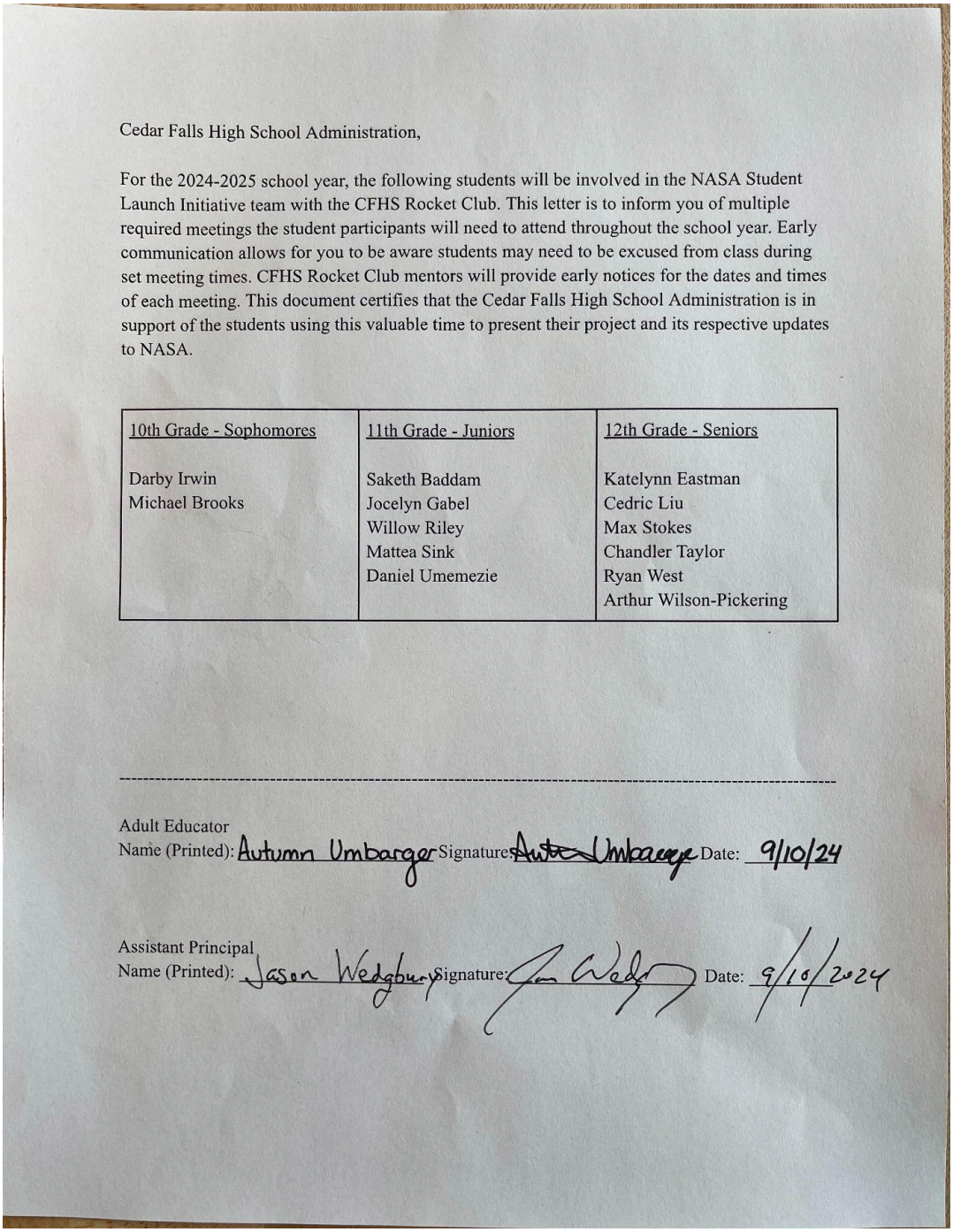
1.7 Project Proposal Time Log

- The team has spent a total of 67 hours brainstorming, developing, designing, and producing this proposal in the span of 12 days. The team held multiple meetings during school hours and after-school hours. These hours recorded have been divided across the team's four subgroups. These groups have focused on their respective parts of the proposal while also working together to create a project that the team as a whole is motivated and enthusiastic to work on throughout this school year.

1.8 Available Time Slots for Design Review Presentations

- Monday 12:00-1:00 pm and Tuesday through Friday 11:00-12:00 pm OR 12:00-1:00 pm

1.9 Letter of Administrative Support



Cedar Falls High School Administration,

For the 2024-2025 school year, the following students will be involved in the NASA Student Launch Initiative team with the CFHS Rocket Club. This letter is to inform you of multiple required meetings the student participants will need to attend throughout the school year. Early communication allows for you to be aware students may need to be excused from class during set meeting times. CFHS Rocket Club mentors will provide early notices for the dates and times of each meeting. This document certifies that the Cedar Falls High School Administration is in support of the students using this valuable time to present their project and its respective updates to NASA.

10th Grade - Sophomores	11th Grade - Juniors	12th Grade - Seniors
Darby Irwin	Saketh Baddam	Katelynn Eastman
Michael Brooks	Jocelyn Gabel	Cedric Liu
	Willow Riley	Max Stokes
	Mattea Sink	Chandler Taylor
	Daniel Umemezie	Ryan West
		Arthur Wilson-Pickering

Adult Educator
Name (Printed): Autumn Umbarger Signature: Autumn Umbarger Date: 9/10/24

Assistant Principal
Name (Printed): Jason Wedgbury Signature: Jason Wedgbury Date: 9/10/2024

II) Facilities/Equipment

2.1 Available Facilities & Equipment

- Description of facilities and hours of accessibility, necessary personnel, equipment, and supplies that are required to design and build the vehicle and payload. Includes what is on hand and what will need to be acquired.

Facilities
The Cedar Falls Rocket Club is primarily based in the Engineering Room (Rm. 1801) at Cedar Falls High School. Team meetings will be held twice per week to work on NASA SLI and other projects. This also will be the location for storage of the vehicle and payload.
The Industrial Tech classrooms at the new Cedar Falls High School will be used for much of the construction of the subscale and full-scale vehicles and the payload. The IT classrooms are located near the engineering classroom and include power tools such as saws, drills, sanders, etc.
The new Cedar Falls High School also has a Makerspace that will be available for the team to use as well for the construction of the vehicle and payload.
The local Cedar Falls Public Library will be used as a meeting place and workspace outside of the school day
The University of Northern Iowa's Rod Library, located nearby, may be used as a meeting place. It is open later in the evening and offers reserved meeting rooms.
The open practice fields at the University of Northern Iowa are located near the high school. These fields are used by the team for low-power and mid-power launches, outreach events, and the subscale launch (when permissible).
If the subscale launch cannot be completed at the soccer fields due to motor class, altitude, or unavailability of the site, the ISOAR (Tripoli Iowa Club) launch site in Ft. Dodge, IA will be used.
The Tripoli Minnesota launch site in North Branch, MN is the expected site for launching the team's full-scale vehicle.
If the need arises due to nowhere else being available, multiple team members are willing to meet at their houses.

Equipment
The Cedar Falls Engineering Rooms (Rm. 1801 & 1802) provide access to a CNC and router, 3D printer, foam cutter, drill press, band saw, laser cutter, and other common hand tools.

The Rocket Club also has its own hand tools, various power tools, and two 3D printers - a Dremel DigiLab 3D printer, and a Bamboo Lab X1-Carbon printer.
The team has access to the simulation programs Rocksim and OpenRocket, which will be used in the design of the launch vehicle. Onshape and Autodesk Inventor CAD software will be used by the team to model and design the vehicle and payload. The school district provides students with Chromebooks capable of running Onshape, but there is a classroom set of laptops that have Inventor installed on them as well. The laptops in the team's meeting room will have OpenRocket and RockSim available for use too.

Any and all use of power or hand tools, and any machinery by team members will be under the supervision of the team's Adult Educator or Team Mentor. The team believes that the equipment we have access to will be sufficient to complete the process of manufacturing the vehicle and payload. If the team finds that we need additional equipment or machinery, we have access to local resources including the Cedar Valley Maker Space. Any launch that the team participates in will be attended by The Adult Mentor and Educator along with the team's Safety Officer. They will ensure that safety plans are clear and followed, along with verifying that NAR safety codes are followed. Before the team attends or participates in a launch or enters a facility, the team Safety Officer will cover the safety expectations that all team members will follow.

3) Safety

The Federal Aviation Administration (FAA) [www.faa.gov] has specific laws governing the use of airspace. A demonstration of the understanding and intent to abide by the applicable federal laws (especially as related to the use of airspace at the launch sites and the use of combustible/flammable material), safety codes, guidelines, and procedures for building, testing, and flying large model rockets is crucial. The procedures and safety regulations of the NAR [www.nar.org/safety-information/] shall be used for flight design and operations. The NAR/TRA mentor and Safety Officer shall oversee launch operations and motor handling.

3.1 Safety Plan

- A written safety plan addressing the safety of the materials used, facilities involved, and students responsible for ensuring that the plan is followed. A risk assessment is included for all these aspects in addition to proposed mitigations. Identification of risks to the successful completion of the project is also included.

All CFHS Rocket Club members will be sufficiently briefed on any hazardous materials and how to handle and work with them according to OSHA safety and information data sheets. These data sheets will be available and visible in any facility that contains these hazardous materials. A Risk Assessment will be included in Appendix II. Before using a facility, members will be briefed on the rules and emergency procedures. The Safety Officer, Team Leads, and Adult Educator/Mentor will observe members, making sure their behavior is appropriate and PPE is being used throughout the project. Any unintentional safety violations will also be observed. Injury forms will be filled out in the case of any injury, minor or severe, in an attempt to prevent the same injury from happening again.

3.2 Procedures for NAR/TRA Personnel, Hazard Recognition, and Material Handling

- A description of the procedures for NAR/TRA personnel to perform. Ensuring compliance with NAR High Power Safety Code Requirements, and the performance of all hazardous materials handling and hazardous operations.

Our Adult Mentor, Zeb Nicholson, who is NAR Level 2 Certified, will handle any hazardous materials, including motors while complying with NAR High Power Safety Code requirements. The Safety Officer, Adult Mentor, and Range Safety officer will make sure these rules are followed, to ensure the safety of spectators and participants. Our Safety Officer, Arthur Wilson-Pickering, will only use/handle equipment within the scope of his qualifications

The Team Safety Officer will provide safety presentations at the beginning of each meeting to inform team members of the processes and potential dangers associated with the use of hazardous materials and equipment. Students will be informed about potential risks and how to handle them in the event that they arise through the use of Material Safety Data Sheets and caution statements. Students will have access to and be required to use personal protective equipment (PPE) when handling hazardous materials and equipment. Regarding hazardous operations and materials, all safety standards and requirements shall be enforced by the Adult Mentor and Safety Officer.

3.3 Student Accident Recognition and Avoidance

- A description of the plan for briefing students on hazard recognition and accident avoidance as well as for conducting pre-launch briefings.

The Student Safety Officer will brief all team members participating in the construction or launch events on any possible hazards that relate to the activity and measures to avoid them. Also in the safety briefing, there will be relevant instructions on the safe operation of machinery being used. Before any event in which potentially hazardous tools or materials will be used, instructions will be given on how to handle them safely. Personal Protective

Equipment will always be required and available to members who need to be kept safe while working with/on potentially harmful materials or machinery.

3.4 Description of Safety Plans and Procedures

- A description of the methods to include necessary caution statements in plans, procedures, and other working documents, including the use of proper Personal Protective Equipment (PPE).

Every team member has agreed to and has signed the Safety Agreement. All members of the team have read and acknowledged the safety risks that come with being present at launch and construction events. The Safety Agreement can be found in Appendix 4. Further documents will contain caution statements that will warn team members of any possible hazards related to construction or launches. Personal Protective Equipment (PPE) will be worn by all members at all times when needed. Established safety rules will be followed at their respective facilities. The Adult Mentor/Educator or Safety Officer has the right to remove any individual from the site/facility if they do not follow established rules and procedures.

3.5 Plan to Comply with Laws

- The plan for complying with federal, state, and local laws regarding unmanned vehicle launches and motor handling. Specifically regarding the use of airspace, Federal Aviation Regulations 14 CFR, Subchapter F, part 101, Subpart C; Amateur Rockets, Code of Federal Regulation 27 Part 55: Commerce in Explosives; and fire prevention, NFPA 1127 “Code for High Power Rocket Motors.”

Along with team safety, following all applicable federal, state, and local laws is of utmost importance. Consequently, the Safety Agreement (Appendix 4) was developed to confirm that members have studied the necessary safety regulations and are aware of all relevant safety laws and hazards. Appendix 3 contains the presentations that will be provided to the team on safety laws and compliance.
Before attending the launch, all applicable local, state, and federal laws will be complied with. NAR/TRA representatives will confirm that all launches have the required documentation and have legal consent. Regarding airspace, FAR 14 CFR, Subchapter F, Part 101, Subpart C; Amateur Rockets, Code of Federal Regulation 27 part 55: Commerce in Explosives; and fire prevention, NFPA 1127 “Code for High Power Rocket Motors,” will be explicitly followed.

The number one priority is safety at all times, but especially at launch events. Team members will be sufficiently informed of the rules and regulations regarding airspace, high-powered motors, and any other related regulations for the launch of high or low-powered vehicles. The

Safety Officer will be monitoring rules from the NAR/TRA along with procedures for the specific launch/launch site. Adult Mentors and Educators will also be at every launch, monitoring and advising the team in the case of non-compliant, disruptive, or unsafe behavior.

3.6 Motor and Energetic Device Safety Plan

- The plan for NAR/TRA mentor purchase, storage, transportation, and use of vehicle motors and energetic devices

Our NAR Level 2 Certified Team Mentor Zeb Nicholson will be in charge of placing the vehicle's motor orders through "Off We Go Rocketry." He will be in charge of handling, storing, and transporting these motors. Zeb Nicholson will claim the launch vehicle as mandated by certification protocols. Regulations about storage and transportation demand that the motor be kept apart from the vehicle while it's being transported to the launch site. The motor will be assembled into the launch vehicle by Zeb Nicholson. Team members or mentors possessing the necessary credentials will take care of any additional instances involving the purchase, delivery, and storage of energetic devices.

3.7 Written Statement

- A written statement that all team members understand and will abide by, for the following safety regulations.
    I. Range safety inspections will be conducted on each vehicle before it is flown. Each team member shall comply with the determination of the safety inspection or may be removed from the program.
    II. The Range Safety Officer has the final say on all vehicle safety issues. Therefore, the Range Safety Officer has the right to deny the launch of any vehicle for safety reasons.
    III. The team mentor is ultimately responsible for the safe flight and recovery of the team's vehicle. Therefore, a team will not fly a vehicle until the mentor has reviewed the design, examined the build, and is satisfied the vehicle meets established amateur rocketry design and safety guidelines.
    IV. Any team that does not comply with the safety requirements will not be allowed to launch their vehicle.

All club members have signed or will have signed the Safety Agreement (see Appendix 4) by the PDR deadline (October 28). This Safety Agreement requires all members to follow all safety regulations required by the NAR, FAA, NASA Student Launch Handbook, and other

various state/federal laws/organizations. When signed, members were informed that failure to abide by these expectations would result in their termination from the team. Members were also instructed to follow the Range Safety Officer's directions, and that the team mentor is responsible for looking over and ensuring the design, build quality, and safety of the vehicle.

IV) Technical Design

4.1 General Vehicle, Material, and Construction Designs

- General dimensions, preliminary material selection, material justification, and construction methods

The vehicle will have an inside body tube diameter of 5 inches and a height of 108 inches. The fins will have an approximate semi-span of 4.5-inches and a root length of 14-inches. A trapezoidal fin shape will be used and mounted starting one inch from the bottom of the vehicle in order to reduce the changes of the fins making first contact with the ground and breaking upon landing. Without the motor, the weight of the vehicle is estimated to be approximately 21 pounds. The primary material for the vehicle will be fiberglass. Any structural fiberglass elements will be a minimum of 0.125 inches thick. Certain payload-specific components may be 3D printed out of ABS or PLA plastic. RocketPoxy will be used wherever a high-strength adhesive bond is necessary, and plastic rivets and shear pins will be used as necessary to connect/separate the different sections of the vehicle.

Fiberglass is the best choice for vehicle body material due to its high corrosion resistance, excellent heat resistance, and impressive dimensional stability. Corrosive materials such as rocket propellant may often come into contact with the booster segment of the vehicle, such as the fins and body. Using fiberglass helps mitigate concerns of vehicle failure due to corrosion because of its restraint nature, which helps to limit the damage that could occur both structurally and functionally. Additionally, the solid rocket motors used on this vehicle will produce significant heat as a byproduct of thrust production. This is another reason why fiberglass is optimal as the material for our vehicle's body because fiberglass is known to withstand high temperatures while still retaining its shape and durability. Given its remarkable weight-to-strength ratio, fiberglass will allow our vehicle to be more suited for carrying heavy payloads. Fiberglass also doesn't have a grain pattern, making the vehicle extremely secure and resistant to damage regardless of the direction of the force. Furthermore, fiberglass is relatively cheap especially compared to other materials such as carbon fiber, making it affordable and within the budget of a high school team. Considering all these factors, fiberglass is an ideal choice for the body tube sections of the vehicle, including the booster, payload section, and nose cone. Our fiberglass will be supplied by Wildman Rocketry due to our previous history with them as a trusted supplier of fiberglass as well as various additional benefits we are grateful to receive from them. The fiberglass provided by Wildman Rocketry is readily

available and customizable, as well as being offered to our team at a generous discount.

Due to the use of fiberglass in our vehicle construction, precautions will be taken to ensure the safety of team members during construction. When cut, fiberglass particles may cause irritation to the skin and respiratory system. PPE such as safety glasses, masks, and other appropriate precautionary equipment will be used when cutting and handling fiberglass components to minimize any possibility of harm.

4.2 Projected Altitude

- Projected altitude and description of how it was calculated

The vehicle's projected altitude will be 4,600ft AGL (Above Ground Level) using the selected K1440 Cessaroni solid rocket motor. This prediction is based on previous experience with rocket performance under heavier payloads and similar vehicle dimensions and materials. The projected apogee is within the specified range of 3,500ft to 5,500ft AGL. The vehicle's rail exit velocity is expected to be approximately 98.23ft/s, greater than the minimum 52 ft/s. Figure 4.2.1 shows our current Rocksim model, with the simple airframe required for the specified sensor payload. The team does expect the Launch Week altitude to be lower than the RockSim simulated apogee based on past experiences. This is why the team's target altitude will be 4,600ft AGL. Our estimated weight has decreased significantly from previous years, due to the relative simplicity of the systems. A drag coefficient of 0.4 is expected based on previous projects, as both the airframes and the drag coefficients of Project Hrafn and Project Vör were similar. This is subject to change as the model is updated and data is collected.

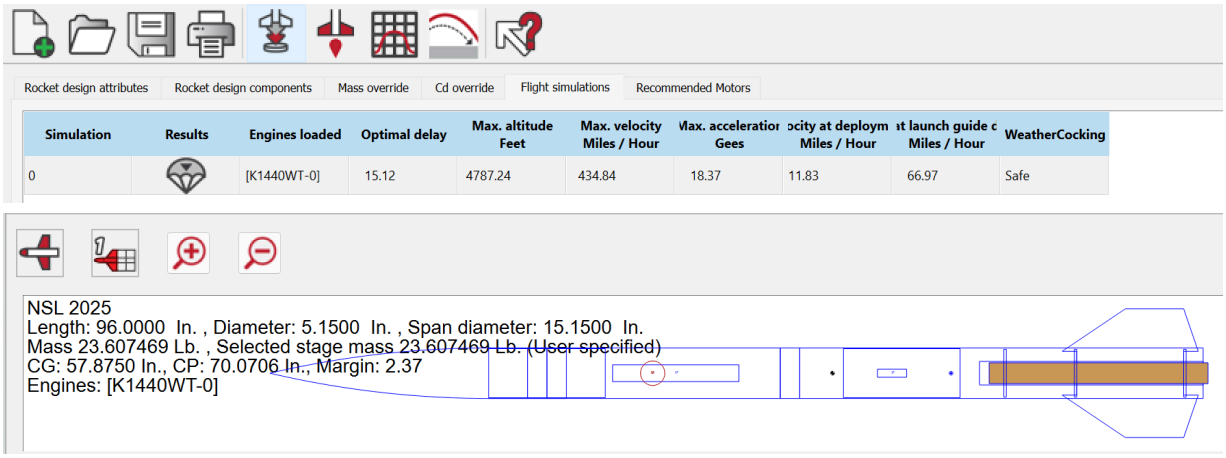


Figure 4.2.1 RockSim Screenshot

4.3 Projected Recovery System Design

- Planned recovery system design

Our vehicle design's projected recovery system will be a basic dual-deployment parachute system. At apogee, the booster and the Avionics bay will separate and release the drogue chute, slowing the vehicle's initial descent. The drogue parachute is currently projected to be an elliptical 18 in. parachute. At 600 ft AGL, the Payload bay and the Avionics bay will separate via a black powder charge, releasing the main parachute. The main parachute is currently expected to be a 60 in. diameter Iris Ultra parachute, but this is subject to changes due to flight mass. Both separations will have a primary and backup altimeter and black powder charges at the separation point.

4.4 Projected Motor Selection

- Projected motor brand and designation

Our team plans to use a Cesaroni K1440 Solid Rocket Motor. This motor was chosen due to its ability to carry the launch vehicle to the targeted altitude. This motor provides a quick and high-thrust burn, giving the vehicle a higher velocity and greater stability at the rail exit. The Cesaroni K1440 was also chosen due to our past experiences with the motor, its availability, and its reliability.

4.5 Projected Payload

- Detailed description of the team's projected payload

Inspired by the USLI challenge to transmit specific safety statistics, our team is proposing a system to record and transmit certain rocket diagnostics such as landing location, gyroscope data of an on-board STEMnaut, internal temperature/air quality of the vehicle, and battery status using sensors inside the rocket and an Adafruit low range radio transmitter to send the information to a separate Adafruit radio receiver that will be located with the team members behind the launch viewing area lines. Within the payload section will be a CPU and a radio transmitter that will begin pushing out a signal after the rocket has landed. This is ultimately separate from the specifications of the USLI challenge as we decided to adjust for the scope of our club while still being able to explore new techniques that the team was interested in such as transmitting radio frequencies. All sensors will be housed inside the vehicle itself and

collect data during the flight. It is not until the rocket has landed that it will start transmitting the data that has been collected.
The primary portion of the payload is the sensors and the radio transmitter. These components will all be housed inside the payload body tube throughout the entirety of the flight. As the sensors collect data, they will send it to an onboard CPU connected to the Adafruit radio transmitter. Once the rocket has landed, the team will send a signal to the onboard transmitter to start sending the data to a separate Adafruit radio receiver. The team will have possession of this receiver and then be able to know key diagnostics about how the flight went.
While radio transmission is not an unexplored area within rocketry, students on the team have shown interest in the idea of looking into how we could best use a radio. This interest stems from the usefulness of using radios in this way. Now, students on the team can have some background knowledge on radio communication and these skills can be applied in so many areas of space travel. Overall, understanding how radio waves of this kind work is a very important skill to have, and many members of the team were interested in learning about it. Our goal is for the lessons learned from this project to be beneficial both for future high-powered rocketry applications as well as in the space exploration industry.

4.6 Vehicle and Payload Design Requirements

- Addressing the General, Vehicle, Recovery, Payload, and Safety Requirements (Outlined on pages 53-60 of the handbook)

General
Team members (students) are responsible for completing every part of the project from design until the launch of the vehicle and payload, including manufacturing and assembly. Motors, black powder charges, and electric matches will be handled exclusively by the team's mentor. The team will limit the use of past work and understand the consequences of excessive use thereof. The list of students attending launch week will be determined by the roster deadline set by NASA and will include students who have been actively engaged in the project throughout the school year. The team does not currently include any foreign national members and will report if any foreign national members join prior to CDR. The STEM engagement requirement will be met according to the plan outlined in section 5.1 of this report. This will be completed by the FRR deadline and will be led by our outreach lead, Katelynn Eastman. Along with direct outreach, our team maintains various social media accounts including Instagram, Facebook, and X. These will be updated continuously with progress on our projects and activities. All required documents for the PDR, CDR, and FRR milestones, along with any addendums that may be required, will be submitted by the due dates specified in the handbook. The team acknowledges the penalties for late or incomplete submissions and is committed to meeting all deadlines. All submissions will be in PDF form and will include a front page, table of contents, and page numbers. The team will use a conference room at Cedar Falls High

School for video conferencing with the NASA review panel. All the necessary technology is equipped in this room or can be easily set up, and will be tested before each video conference. Our team's mentor is Zeb Nicholson, and his information is located in sections 1.2 and 1.5. Finally, our team will utilize a spreadsheet to track hours spent working on projects. Additionally, attendance numbers at meetings will be used to record the time spent in discussion and brainstorming.

Vehicle

The projected apogee of this year's vehicle will be 4,600ft AGL. We will be using the commercially available Stratologger CF for our altimeters. The team has used this model of altimeter quite often, including for previous NASA SLI projects. The altimeters will be activated on the launch pad using arming switches that can be secured in the "on" position. These switches will be accessible from outside the vehicle. Each altimeter will be entirely independent and powered by its own Duracell battery. These batteries were chosen for their high quality, familiarity, and reliability, and will be visible and marked as a fire hazard. The vehicle will be capable of being disassembled and reassembled for multiple launches in one day with minimal time wasted between flights. The igniters for the motor will be powered using a twelve-volt battery. The recovery electronics and payload system will be isolated from each other to prevent interference, and each recovery device will have its own power supply. Batteries will be charged such that they can remain on the pad for the required 3 hours plus flight time without losing functionality.

The vehicle will be made up of three main sections. The first is the booster section, consisting of the motor, protective wadding, and the drogue parachute. The second is the booster recovery section, carrying the altimeters, black powder charges, a main parachute, protective wadding, GPS tracker, and any other equipment required for separation and deployment. This section will be tethered to the booster section. The third section is the payload bay, which will include the deployment system and sensor measurement package. This section will also include the protective wadding, main parachute, and black powder charges needed for recovery of the payload section. Currently, ballast is not planned to be used, however, if necessary, the mass of ballast will not exceed 10 percent that of the total vehicle weight at burnout. All separation points will have a shoulder length of at least 10 inches.

The team currently plans to take the vehicle to an apogee altitude of 4,600ft AGL using a K1440 Cesaroni solid rocket motor. This commercially available rocket motor uses ammonium perchlorate composite as its solid propellant, generating an impulse of 2372 Ns, lower than the limit stated by the handbook of 2560 Ns. Our vehicle's projected rail exit velocity of 98.23 ft/sec meets the requirement by the handbook of 52.0 ft/sec. By the CDR, the team will state if a motor change is necessary or not. If a motor change is determined after the CDR has passed, a NASA Range Safety Officer will need to review a corresponding submission. An Aeropack retainer will hold the motor as this avoids the use of a friction fit and we have used such products in the past with great success. The vehicle will not exceed Mach 1 at any time during the flight. The vehicle starts heavier near the bottom of the vehicle, but motor burnout quickly lowers the mass. The team will only use one motor, and will not employ forward canards, forward-firing motors, hybrid motors, or motor clusters anywhere on the vehicle.

The team will design the rocket to accommodate the 12-foot 1515 rail launch rail as specified by the handbook. Additionally, the vehicle will be ready to launch within two hours of preparations, abiding by the handbook's preparation rules. The current projected static stability margin is 2.43 calibers. While this may vary somewhat as the design is finalized, care will be taken to ensure it is always above the 2.00 caliber minimum.
A mock payload weight will be put into the subscale vehicle proportional to the actual payload weight. The subscale vehicle will be launched before January 8, 2025, using a G-class motor. This should sufficiently portray the full-scale vehicle's proportional capabilities and flight stability. The Stratologger CF will be used in the subscale vehicle as the altimeter, the same as the full-scale vehicle. The subscale vehicle will be newly built to conform to this year's project's requirements and possible differences in dimensions between projects. The CDR report will include the altimeter's flight data as proof of subscale flight.
The vehicle flown for the full-scale demonstration flight will be the same one flown on launch day in order to ensure that all systems, including recovery, structural integrity, stability, and payload, will be identical. This will also serve as a demonstration of the team's ability to prepare the vehicle for flight. The purpose of the vehicle demonstration flight will be to demonstrate that the payload, vehicle, and recovery systems all perform as intended. The vehicle will be constructed in its entirety by student team members during the current school year. No modifications will be made after the vehicle demonstration flight without explicit approval from the NASA RSO. Altimeter data will be used in the FRR to prove the success of the demonstration flight. The vehicle will be fully constructed and flown by March 17, 2025, at the latest. Each section of the launch vehicle will be labeled clearly with the team name and contact information.
Recovery
The recovery sequence will begin with the deployment of an 18-inch drogue chute at apogee. This will provide a faster descent until the main parachute deployment, minimizing the effects of wind drift. At 600 ft AGL, the Avionics bay and payload sections will separate, deploying the booster's main parachute. The main parachute is expected to be a 60-inch Iris Ultra parachute, though this may change depending on the weight determined and future calculations. Ground ejection tests will be completed prior to launch to ensure that the vehicle is not damaged during deployment and that the black powder charges can successfully deploy the parachutes.
The team will use electronically activated black powder charges. The electronic matches used for ignition will be wired to redundant altimeters with independent power sources. The motor ejection charge will not serve as a primary or secondary means of deployment, though it does provide triple redundancy as a tertiary charge. The vehicle will land within the 2500-foot recovery zone within the 90-second maximum descent time. Electronics, including altimeters and GPS units, will be tested prior to and on launch day. The GPS unit will be a Featherweight GPS tracker purchased from Off We Go Rocketry. There will be two devices transmitting from the vehicle; the GPS unit will be one and the other will be an Adafruit LoRa radio that will be transmitting the data from the sensor package post-flight back to the team.

Payload
The only use of energetics in the payload section of the vehicle will be within the recovery subsystem for main parachute deployment. Energetics will not be used in any case relating to the payload system contained within the vehicle. All parts of the vehicle will be designed and assembled in compliance with NAR and FAA rules and regulations.
Safety
The team Safety Officer overseeing this project is Arthur, who takes responsibility for the safety of team members as they work on this project. He will be present for most team events, whether that be construction or the launch of the rocket and payload. Throughout this project, at multiple stages of vehicle and payload design, construction, and assembly, Arthur will give safety presentations to set expectations and safety requirements for team members. A separate Launch Safety presentation will be given for launch days and launch tests. A Material Safety Data Sheet (MSDS) spreadsheet will be created and updated to reflect the current chemical inventory of the team.
A launch and safety checklist will be created for every launch of the vehicle and payload by the team that is involved and related to NASA. The team will set and follow guidelines to ensure the safety of the team in the construction, assembly, launch, and recovery of the vehicle. All rules and regulations set by the FAA and the local rocket club's RSO will be followed.

4.7 Technical Challenges and Solutions

- Addressing major technical challenges and solutions

One major technical challenge facing the team this year is the communication aspect of relaying sensor data from onboard sensors back to the team behind the flight line using a radio communication method. While the team is familiar with integrating sensors into their vehicle based on past projects they are much less familiar with how to build and code the radio communication aspect of the sensor data. The team has plans to collaborate with the local amateur ham radio club in town to learn more about radios and the hardware side of their project. The team will also be reaching out to the school's robotic club to get help learning how to code the radio communication of the data.

V) Stem Engagement

5.1 Stem Engagement Plan and Evaluation Criteria

- Plans and evaluation criteria for required STEM engagement activities. (See Project requirement on pages 38-43)

To achieve and succeed the goal of 250 participants who are engaged in the educational STEM outreach events, our team will cooperate with local elementary schools, junior highs, and youth organizations to help teach and encourage their participation in STEM. The Rocket Club members will provide and guide hands-on activities, this will encourage future generations to become active in our club. We will maintain steady communication with the administration of local schools and organizations to build relationships and showcase safe, inclusive experiences where they can expand their knowledge of the rocketry field.
In prior years, our team has collaborated with elementaries, junior highs, Boy Scouts, Girl Scouts, and Cub Scout Packs. Interacting with the scout troops has been a privilege, as it provides an opportunity to connect with communities beyond our own. We also plan on engaging with the Boys and Girls Club of the Cedar Valley, 4 H groups, and the University of Northern Iowa Expanding Your Horizons Group.

VI) Project Plan

6.1 Development Timeline

- A detailed development schedule/timeline or work breakdown structure (WBS) covering all aspects necessary to complete the project successfully.

The Cedar Falls Rocket Club will meet as a group on Tuesdays and Thursdays to discuss club goals, necessities, and project progress checks. After a large group meeting, members will split up into their respective sub-groups to discuss their current goals and deadlines. Each group's respective lead will update them on current progress and will work to keep the group on task. Meetings between all club leads will occur biweekly to go over upcoming deadlines and expectations.

6.2 Budget

- A detailed budget to cover all aspects necessary to complete the project successfully, including team travel to the launch.

Total Budget: $12,290.88
$650 will be budgeted by the team for motors this year (including hazmat charges). Full-scale launches will use the Cesaroni K1440 Motor and have budgeted for 3 of these motors. While only two are necessary (one for the full-scale test launch and one for the final Huntsville launch). For risk mitigation purposes three motors will be bought instead. In addition, $100 will be budgeted for two Aerotech G80 rocket motors for our subscale launch.
The team plans to budget $5,895 for travel. The Huntsville trip would use 7 hotel rooms for 4 nights. The budget for hotels will be $4,144 with a rate of $148.00 per night. For transportation to Huntsville, the team will use three vans, using 50 gallons of fuel per van in each drive, for a total of 300 gallons. Presuming a price of $3.50 per gallon, travel costs to Huntsville will need $1050.00 in budgeting. Additionally, the team plans to launch demonstration flights in North Branch, MN. Assuming 15 gallons per van per direction, travel to North Branch will cost $315.00. Altogether, the travel costs are $5,500, and with 7% tax factored in, the total budget for travel is approximately $5,895.
The subscale model will require $550 to be budgeted this year. The cost will be significantly less than the full-scale vehicle since the quality of materials used for the subscale launch will not be the same as the full-scale launch (ex. Bluetube as opposed to fiberglass), and the payload will be simulated with mass. This cost includes body tubes, fins, simulated payload mass, shock cord, and other necessary materials.
A budget of $2,088.23 in materials will be planned for the final launch vehicle. This amount is found in the cost of materials such as body tubes, nose cones, and fins made of fiberglass. The most costly items will include the parachutes and payload materials.
The team’s itemized budget plus projected travel expenses total $10,800. An additional 20% has been added as insurance as a part of the team’s safety plan in order to cover unpredictable events such as broken parts, travel uncertainties, extra items, etc, adding up to a total of $12,960. The team plans to fundraise a total of $14,000 in order to build up funds for the following year, as well as for other concurrent projects written in the sustainability plan for this year.
Itemized Budget 2025

Item:	Cost:	Quantity:	Total Cost:
Payload Materials	$350.00	1	$350.00
Cesaroni K1440 Motor	$196.25	3	$588.75
5" Fiberglass bodytube (per ft)	$46.25	7	$323.75
Cesaroni 54mm 6-Grain Hardware Set	$135.00	1	$135.00
5:1 Ogive Filament Wound Fiberglass 5" nosecone	$150.00	1	$150.00
60" Parachute	$212.85	1	$212.85
18" Drogue Parachute	$100.95	1	$100.95
5" Fiberglass body tube coupler	$47.41	2	$94.82
RocketPoxy structurual adhesive	$65.00	1	$65.00
G10 Fiberglass 12"x12"x0.125" sheet (for fins)	$18.00	3	$54.00
Kevlar Shock Cord - 1500#- Main Chute (per ft.)	$0.97	35	$33.95
Kevlar Shock Cord - 1500#- Drogue Chute (per ft.)	$0.97	35	$33.95
Tube Bulkhead - 5"	$7.99	4	$31.96
Motor Mount Tubing - 54mm fiberglass	$27.00	1	$27.00
Centering Ring - 5" x 54mm inner dia. Fiberglass	$10.00	4	$40.00
AeroPack Retainer - 54mm	$31.03	1	$31.03
1/4" quick links	$1.49	6	$8.94
4-40 Nylon shear pins (20-pack)	$1.00	6	$6.00
Removable Plastic Rivets (10-pack)	$5.00	5	$25.00
1/4" threaded steel rod (3ft. each)	$1.75	2	$3.50
PerfectFlight StrattologgerCF altimeter	$54.95	2	$109.90
Scale Model	$550.00	1	$550.00
Aerotech Motor for Scale Model	$50.00	2	$100.00
1/4" threaded steel rod (3ft. each)	$1.75	1	$1.75
Coupler Bulkhead - 5"	$11.50	3	$34.50
Tax:			$217.88
Total Cost:			**$3,330.48**

2025 NSL Budget - Travel					
Hotel:	**Cost per room**	**Number of Rooms**	**Number of nights**		**Total Cost**
Home2 Suites by Hilton	$148.00	7	4		$4,144.00
Gas:	**Cost per Gallon**	**Number of gallons for one-way trip**	**Number of Vehicles**	**Trips**	**Total Cost**
	$3.50	15	3	2	$315.00
Gas:	**Cost per Gallon**	**Number of gallons for one-way trip**	**Number of Vehicles**	**Trips**	**Total Cost**
	$3.50	50	3	2	$1,050.00
Travel Tax:	**$385.63**		**Total Travel Budget:**		**$5,894.63**

6.3 Funding Plan

- A detailed funding plan

The team's fundraising plan consists of a combination of resources. The “work for donation” portion includes small business contributions and sponsorships from larger companies or donors. A few team members have family members who own small businesses and are looking to donate to the club this year. A donation envelope challenge will also be used to raise $5,000. Members are more than welcome to go door to door on Main Street and through the community, educating businesses or homeowners on how their support and donations would be helpful during our NASA SLI journey. Larger grant opportunities will also be available to help raise funds for this year’s club projects. On top of that, the team will make use of the previous year’s “surplus funds” in order to cover any initial costs collected at the beginning of the year.

6.4 Local Sustainability Plan

- A clear plan for sustainability of the rocket project in the local area. Includes how to provide and maintain established partnerships and regularly engages successive classes of students in rocketry. It should also include partners (industry/community), recruitment of team members, funding sustainability, and STEM engagement activities.

The plan for the team's sustainability includes word of mouth, school announcements, posters, events, and social media. We participate in presentations and activities, such as launching paper rockets with local Boy and Girl Scout troops, as well as elementary students. We hold several informational presentations at the beginning of the year, growing significantly from year to year with each success the club has brought. The Cedar Falls Rocket Club attracts students from all fields, ranging from art to computer science to business. The club utilizes every skill a student brings with them, as the team knows the more perspectives included, the better the team will become.
Our club will also participate in The American Rocketry Competition (TARC). In addition to being a qualifying event for NASA, SLI it will help our members gain experience which they can potentially use in future NASA Student Launch projects.
Some members of our club will compete in Rockets for Schools (RFS), another qualifying competition for NASA SLI. Working on this project will help members get experience and prepare them for NASA SLI in the future.

Appendix I) Project Calendar

September 2024

Sunday	*Monday*	*Tuesday*	*Wednesday*	*Thursday*	*Friday*	*Saturday*
1	2	3 Team Meeting	4	5	6	7
8	9	10 Team Meeting	**11 Proposals Due 8 A.M CDT**	12	13	14
15	16	17 Team Meeting	18	19	20	21
22	23	24 Team Meeting	25	26	27	28
29	30					

October 2024

Sunday	*Monday*	*Tuesday*	*Wednesday*	*Thursday*	*Friday*	*Saturday*
		1 Team Meeting	2	**3 Awarded Proposals Announced**	4	5
6	**7 Kickoff and PDR Q&A**	8 Team Meeting	9	10	11	12
13	14	15 Team Meeting	16	17	18	19
20	21	22 Team Meeting	23	24	25	26

27	**28 PDR Report, presentation slides, and flysheet submitted by 8 A.M CDT**	29 Team Meeting	30	31		

November 2024

Sunday	*Monday*	*Tuesday*	*Wednesday*	*Thursday*	*Friday*	*Saturday*
					1	2
3	4	5 Team Meeting	6	7	8	9
10	11	12 Team Meeting	13	14	15	16
17	18	19 Team Meeting	20	21	22	23
24	25	26 Team Meeting	27	28	**29 Gateway Registration deadline**	30

December 2024

Sunday	*Monday*	*Tuesday*	*Wednesday*	*Thursday*	*Friday*	*Saturday*
1	2	**3 CDR Q&A** Team Meeting	4	5	6	7

8	9	10 Team Meeting	11	12	13	14
15	**16 Huntsville rosters due**	17 Team Meeting	18	19	20	21
22	23	24 Team Meeting	25	26	27	28
29	30	31 Team Meeting				

January 2025

Sunday	*Monday*	*Tuesday*	*Wednesday*	*Thurs day*	*Friday*	*Saturday*
			1	2	3	4
5	6	7 Team Meeting	**8 Subscale Flight deadline CDR, flysheet, presentation slides, and transmitter data sheet due 8 A.M CDT**	9	10	11
12	13	14 Team Meeting	15	16	17	18
19	20	21 Team Meeting	22	23	24	25
26	27	28	29	30	31	

		Team Meeting				

February 2025

Sunday	*Monday*	*Tuesday*	*Wednesday*	*Thursday*	*Friday*	*Saturday*
						1
2	3	4 Team Meeting	5	6	7	8
9	**10 Team Photos Due**	**11 FRR Q&A** Team Meeting	12	13	14	15
16	17	18 Team Meeting	19	20	21	22
23	24	25 Team Meeting	26	27	28	

March 2025

Sunday	*Monday*	*Tuesday*	*Wednesday*	*Thursday*	*Friday*	*Saturday*
						1
2	3	4 Team Meeting	5	6	7	8
9	10	11	12	13	14	15

		Team Meeting				
16	**17 Vehicle Demonstration deadline, FRR, presentation slides, flysheet, list of radio transmitted data, and transmitter data sheet due by 8 A.M CDT**	18 Team Meeting	19	20	21	22
23	24	25 Team Meeting	26	27	28	29
30	31					

April 2025

Sunday	*Monday*	*Tuesday*	*Wednesday*	*Thursday*	*Friday*	*Saturday*
		1 Team Meeting	2	3	4	**5 Launch window opens for teams not traveling to Launch Week. PLAR must be submitted within 14 days of Launch. Teams launching at home must have successful VDF and PDF prior to final**

						competition launch.
6	7	8 Team Meeting	9	10	11	12
13	**14 Payload Demonstration Flight and Vehicle Demonstration Re-flight deadlines. FRR Addendum submitted to NASA project management team by 8:00 a.m. CDT**	15 Team Meeting	16	**17 Launch Week Q&A**	18	19
20	21	22 Team Meeting	23	24	25	26
27	28	29 Team Meeting	**30 Teams arrive in Huntsville, AL.**			

May 2025

Sunday	*Monday*	*Tuesday*	*Wednesday*	*Thursday*	*Friday*	*Saturday*
				1	2	**3 Launch**

						Day
4 Backup Launch Day, PLAR must be submitted within 14 days of launch.	5	6 Team Meeting	7	8	9	10
11	12	13 Team Meeting	14	15	16	17
18	**19 PLAR submitted by 8 A.M CDT.**	20 Team Meeting	21	22	23	24
25	26	27 Team Meeting	28	29	30	31

Appendix II) Risk Assessment

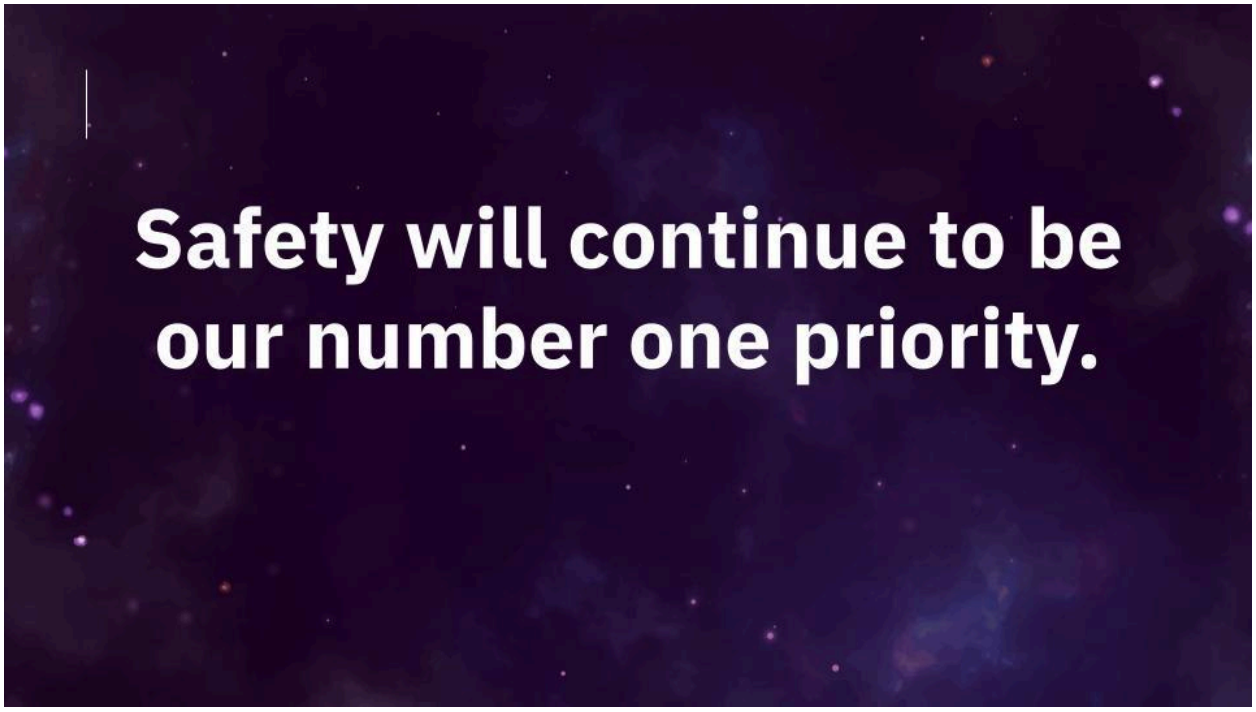
Risk:	Causes:	Risk Level:	Mitigation:
Power Tool Usage	Improper equipment use, a lack of personal protective equipment, and inattention.	Medium	Following a supervisor's briefing on proper power tool handling, team members are required to show that they understand how to use the tools. Members who use power tools must always use the proper personal protective equipment (PPE). It will not be allowed for members to use power tools if they are clearly tired.
Hand Tool Usage	Improper usage of equipment, lack of PPE, and lack of alertness.	Low	Before being permitted to use hand tools, each member must show a supervisor that they know how to use them correctly. As long as hand tools are being used, members must always wear the proper PPE. It will not be allowed for members to use hand tools if they are clearly tired.
Hazardous Chemical/Material Usage/Handling	Improper usage of materials/chemicals, lack of PPE	High	Information for handling hazardous materials and chemicals will be distributed to all members. The chemicals and/or

			materials in concern may only be handled by designated or certified persons, if appropriate. Members must also wear all essential personal protective equipment (PPE) when handling any dangerous products or substances.
Soldering Fumes/Injury	Improper handling of soldering equipment, lack of PPE, poor ventilation.	Medium	Team members will be briefed on handling soldering equipment and given information on how to lessen the impact of the fumes. Members will only be permitted to use soldering equipment if they can demonstrate their proficiency with it. Additionally, before beginning, the Safety Officer will specify which PPE each member soldering has to wear. Furthermore, soldering will only be done in an area with enough ventilation to lessen the impact of solder fumes.
Uncured Epoxy Usage	Improper handling of Epoxy, improper clean-up of Epoxy.	Low	All members will get instructions on the proper handling and application of epoxy prior to use. Before beginning, the Safety Officer will instruct the team members to put on the appropriate

			PPE. Members will also receive instruction on how to properly clean Epoxy, both on their skin and in the workspace, and will be expected to adhere to the associated regulations.
Sanding Fiberglass	Lack of PPE, and poor ventilation.	High	Members will receive instructions on the proper methods and equipment for properly sanding fiberglass. They must also follow the Safety Officer's instructions and wear the appropriate PPE. Because fiberglass emits particles when it is sanded, it must be done in a well-ventilated space.
Cold Weather Launching Conditions	Improper cold weather clothing and garments.	Medium	Members will receive instructions on launch circumstances and a reminder to wear appropriate clothes before the launch, particularly in cold weather. Members will be urged to wear base layers, gloves, hats, coats, warm pants, warm socks, and shoes/boots if the launch temperature drops.
High Winds During Launch	Unstable weather conditions leading to high wind speeds.	High	Monitor weather forecasts carefully before launch. Use

			wind measurement tools on-site. Delay launch if wind speeds exceed safe thresholds for rocket stability.
Rocket Tipping on Launch Pad	Improper balancing, uneven ground, or weak supports.	Medium	All team members will receive instructions on the proper setup and securing of the rocket to a stable launch rail or tower. Prior to launch, the Safety Officer will ensure the launch pad is positioned on level ground. The rocket's alignment on the pad will be checked to ensure it is vertical or slightly angled into the wind, depending on weather conditions, to maintain stability during launch.

Appendix III) Launch and Construction Safety Presentations



Handling Motors

- Motors will only be handled by those certified to handle them.

Handling Wood

- Be cautious of splinters from unsanded wood.
- Avoid skin-contact with sandpaper.

Handling Fiberglass

What to wear -

- Loose fitting, long-sleeved clothes.
- A mask that covers nose and mouth.
- Goggles or Safety Glasses
- Gloves

What to be cautious of -

- Fiberglass splinters
- Skin irritation

Soldering

- Solder only in well-ventilated areas, to prevent inhalation of fumes.
- Be cautious to avoid burns from the solder or soldering iron.

Handling Electronics

- Do not touch exposed wires.
- Do not work on electronics connected to a power source.
- Use proper tools to avoid damaging the electronics or hurting yourself.

Handling Chemicals

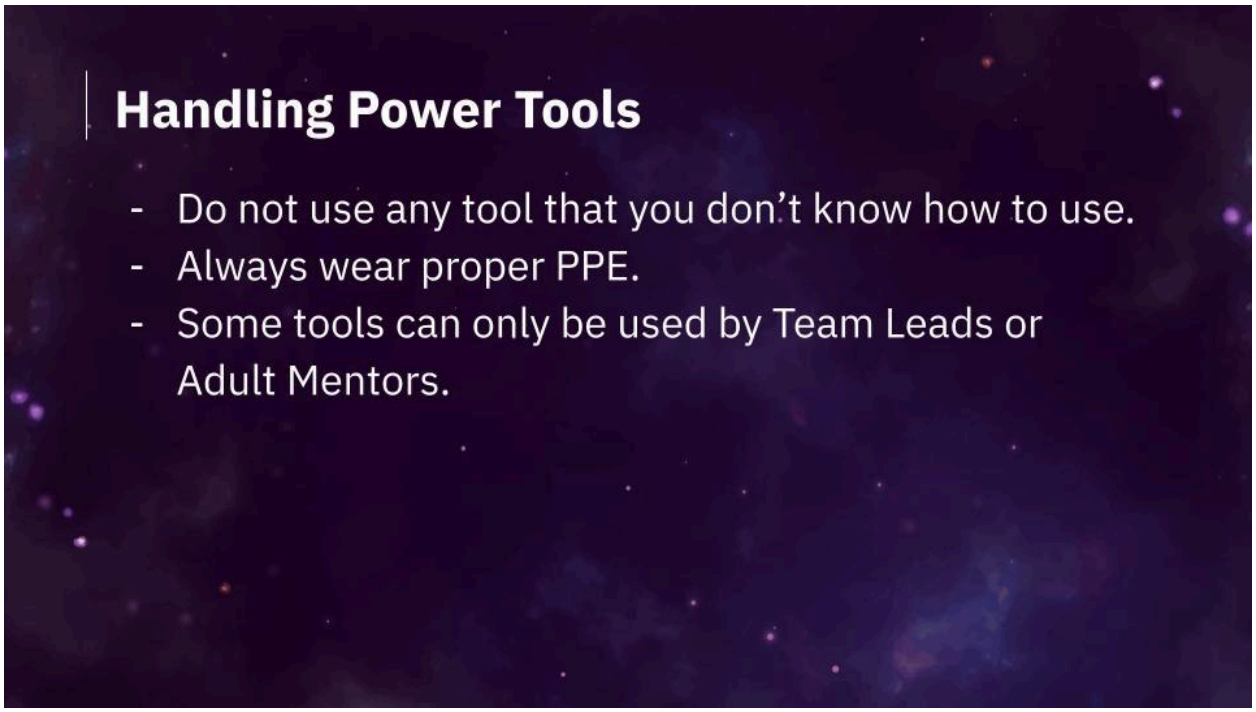
- Always wear proper PPE (personal protective equipment)
  - (gloves, safety glasses, closed toed shoes, etc)
- Be aware of proper spill/skin contact mitigation procedures.
- Avoid contact with skin or eyes and do not ingest or any materials used during the rocket construction process.

Handling Adhesives and Epoxies

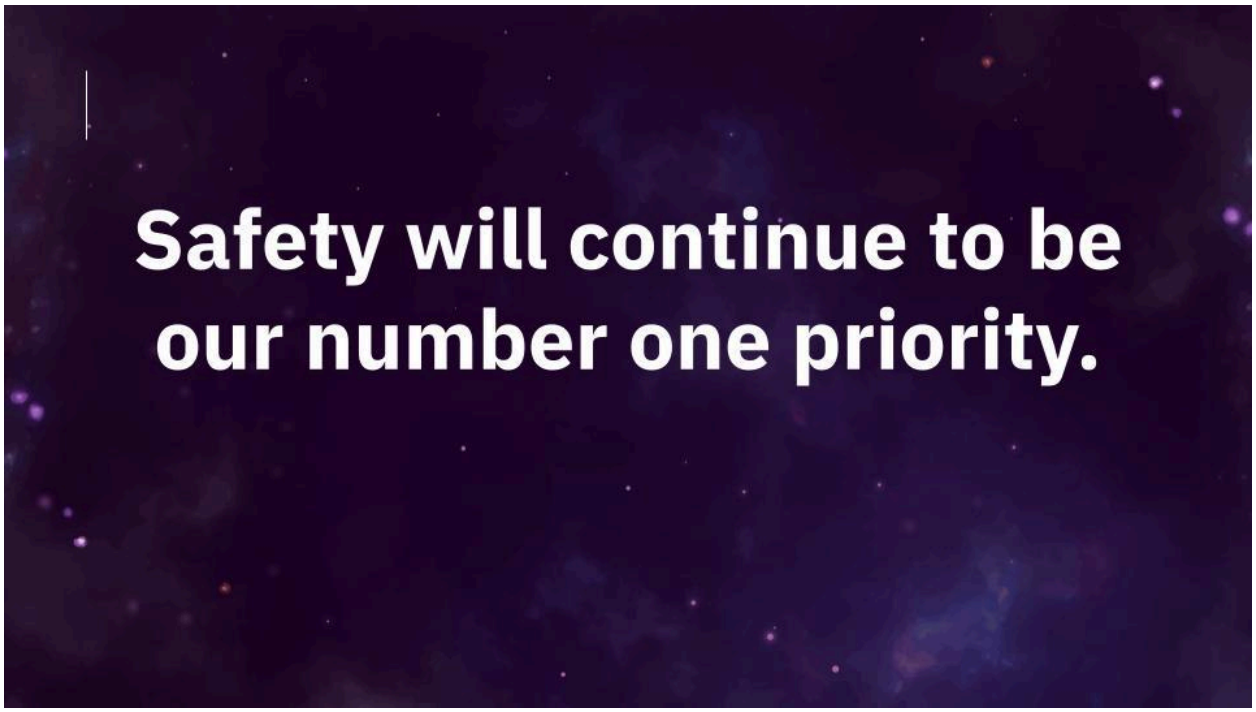
- Epoxies used in rocket construction are made to be near permanent.
- Try to avoid all contact with skin, hair, and clothes.
- Avoid inhaling fumes from epoxies.

Using Hand Tools

- Always ask how to use a tool, do not handle tools you do not know how to use.
- Always wear proper PPE.


Handling Power Tools
- Do not use any tool that you don’t know how to use.
- Always wear proper PPE.
- Some tools can only be used by Team Leads or Adult Mentors.


Rules for Safe Rocketry
2024-2025 NSL Launch Safety


Safety will continue to be our number one priority.

Certification

- One may only use/possess motors that they are certified to handle.

Materials

- The construction of rockets will only be made of lightweight materials.

Examples - Paper, wood, rubber, plastic, fiberglass, and ductile metals.

Motors

Motors must -

- Be certified and commercially produced.
- Not be tampered with.

Within 25 ft of motor -

- No smoking, open flames, or heat sources.

Ignition Systems

- Rockets will only launch using electrical launch system and motor igniters.
- Igniters must be installed on launch pad.
- Electrical safety interlock must be in series with the launch switch, and launch switch must be returned to off after ignition.

Misfires

In the case of a misfire (the ignition being pressed and the rocket not launching), safety interlock or battery must be disconnected and one must wait 60 seconds before approaching the rocket to inspect it.

Launch Safety

Before Launch -

- Have means to warn spectators of danger
- Confirm no one is closer than the minimum safe distance (200 ft)
- Confirm the rocket is stable
- Perform a 5 second countdown to launch

Launcher

- Rocket must be launched from an apparatus that provides rigid/stable guidance until it reaches a speed that will ensure stable flight, and is within 20 degrees of verticality.
- If launching in windy conditions, rocket must be launched away from spectators.
- Blast deflector must be in use to protect the ground, and any debris created must be picked up.

Size

Rockets Must NOT -

- Weigh more than ⅓ the average thrust of the motor being used.
- Contain any combination of motors with more than a total of 40,960 N-sec.

Flight Safety

Rockets Must NOT -

- Be launched at a target, near airplanes, or into clouds
- Be launched on a trajectory that takes it above spectators or outside the bounds of the launch site
- Have a flammable or explosive payload
- Be launched when wind speeds exceed 20 mph
- Exceed approved ceilings
- Break FAA rules and regulations

Launch Site

Launch Site Must -

- Be in an open area with a minimum diameter of half the launch ceiling, or 1500 ft.
- Be outdoors, free of trees, power lines, occupied buildings, free of uninvolved people.

Launcher Location

Launcher Must Be -

- 1500 ft from any occupied buildings, public highways (with traffic heavier than 10 vehicles per hour).
- Farther than the minimum safe distance (200 ft) from the launch site.

Recovery System

A Recovery System Must -

- Return all parts of the rocket to the ground safely and undamaged and in a manner that they can be used again.
- Be made of only fireproof/flame resistant materials.

Recovery Safety

One Must -

- NOT Attempt to recover the rocket from power lines, tall trees, or any other dangerous place.
- NOT fly under conditions where it is likely to land in spectator areas or outside launch boundaries.
- NOT attempt to catch any part of the rocket on descent.

Appendix IV) Safety Agreement

NASA Student Launch 2025

Cedar Falls High School Rocket Club

Safety Agreement

By signing this document, I Saketh Baddam (Name - First and Last) agree to abide by laws, regulations, safety standards, and procedural guidelines relating to high powered rocketry stated in the National Association of Rocketry Handbook and safety code, The Federal Aviation Administration's state and federal laws, National Fire Protection Association, all Environment and Safety laws in the location where launches take place, and any Material Safety Data Sheets for all materials used in the design and completion of the Cedar Falls Rocket Clubs entry to any NASA Student Launch (NSL) events or competitions. I understand the regulations specific to the launch site will be followed and I will listen to the Range Safety Officers' command. Additionally, I agree that the team mentor will review the design, build quality, and safety of the rocket, making sure the rocket complies with rocketry design and safety guidelines. If not, our team will not be able to launch a rocket. I agree to follow the minimum distance tables when launching rockets in each location for any purpose relating to the NSL competition. I agree to abide by any commands, rules, and procedures outlined by the Cedar Falls Rocket Clubs' Safety Officer, Team Leaders, and Adult Educators when working in the workspace, or during any team-related launch. I agree, that if I do not follow all safety guidelines, my role on this team will be terminated as well as all relation to NSL.

Saketh Baddam
Participant's Name (First and Last - Printed)

Saketh Baddam
Participant's signature

09/05/2025
Date

Max Stokes
Team Leader Name (First and Last - Printed)

Max Stokes
Team Leader Signature

9/10/24
Date

NASA Student Launch 2025

Cedar Falls High School Rocket Club

Safety Agreement

By signing this document, I Michael Brooks (Name - First and Last) agree to abide by laws, regulations, safety standards, and procedural guidelines relating to high powered rocketry stated in the National Association of Rocketry Handbook and safety code, The Federal Aviation Administration's state and federal laws, National Fire Protection Association, all Environment and Safety laws in the location where launches take place, and any Material Safety Data Sheets for all materials used in the design and completion of the Cedar Falls Rocket Clubs entry to any NASA Student Launch (NSL) events or competitions. I understand the regulations specific to the launch site will be followed and I will listen to the Range Safety Officers' command. Additionally, I agree that the team mentor will review the design, build quality, and safety of the rocket, making sure the rocket complies with rocketry design and safety guidelines. If not, our team will not be able to launch a rocket. I agree to follow the minimum distance tables when launching rockets in each location for any purpose relating to the NSL competition. I agree to abide by any commands, rules, and procedures outlined by the Cedar Falls Rocket Clubs' Safety Officer, Team Leaders, and Adult Educators when working in the workspace, or during any team-related launch. I agree, that if I do not follow all safety guidelines, my role on this team will be terminated as well as all relation to NSL.

Michael Brooks
Participant's Name (First and Last - Printed)

Michael Brooks
Participant's signature

09/06/24
Date

Max Stokes
Team Leader Name (First and Last - Printed)

Max Stokes
Team Leader Signature

09/10/24
Date

NASA Student Launch 2025

Cedar Falls High School Rocket Club

Safety Agreement

By signing this document, I Katelynn Eastman (Name - First and Last) agree to abide by laws, regulations, safety standards, and procedural guidelines relating to high powered rocketry stated in the National Association of Rocketry Handbook and safety code, The Federal Aviation Administration's state and federal laws, National Fire Protection Association, all Environment and Safety laws in the location where launches take place, and any Material Safety Data Sheets for all materials used in the design and completion of the Cedar Falls Rocket Clubs entry to any NASA Student Launch (NSL) events or competitions. I understand the regulations specific to the launch site will be followed and I will listen to the Range Safety Officers' command. Additionally, I agree that the team mentor will review the design, build quality, and safety of the rocket, making sure the rocket complies with rocketry design and safety guidelines. If not, our team will not be able to launch a rocket. I agree to follow the minimum distance tables when launching rockets in each location for any purpose relating to the NSL competition. I agree to abide by any commands, rules, and procedures outlined by the Cedar Falls Rocket Clubs' Safety Officer, Team Leaders, and Adult Educators when working in the workspace, or during any team-related launch. I agree, that if I do not follow all safety guidelines, my role on this team will be terminated as well as all relation to NSL.

Katelynn Eastman
Participant's Name (First and Last - Printed)

Katelynn Eastman
Participant's signature

9/9/24
Date

Max Stokes
Team Leader Name (First and Last - Printed)

Max Stokes
Team Leader Signature

9/10/24
Date

NASA Student Launch 2025

Cedar Falls High School Rocket Club

Safety Agreement

By signing this document, I Jocelyn Gabel (Name - First and Last) agree to abide by laws, regulations, safety standards, and procedural guidelines relating to high powered rocketry stated in the National Association of Rocketry Handbook and safety code, The Federal Aviation Administration's state and federal laws, National Fire Protection Association, all Environment and Safety laws in the location where launches take place, and any Material Safety Data Sheets for all materials used in the design and completion of the Cedar Falls Rocket Clubs entry to any NASA Student Launch (NSL) events or competitions. I understand the regulations specific to the launch site will be followed and I will listen to the Range Safety Officers' command. Additionally, I agree that the team mentor will review the design, build quality, and safety of the rocket, making sure the rocket complies with rocketry design and safety guidelines. If not, our team will not be able to launch a rocket. I agree to follow the minimum distance tables when launching rockets in each location for any purpose relating to the NSL competition. I agree to abide by any commands, rules, and procedures outlined by the Cedar Falls Rocket Clubs' Safety Officer, Team Leaders, and Adult Educators when working in the workspace, or during any team-related launch. I agree, that if I do not follow all safety guidelines, my role on this team will be terminated as well as all relation to NSL.

Jocelyn Gabel
Participant's Name (First and Last - Printed)

Jocelyn Gabel
Participant's signature

09/05/2024
Date

Max Stokes
Team Leader Name (First and Last - Printed)

Max Stokes
Team Leader Signature

9/10/2024
Date

NASA Student Launch 2025

Cedar Falls High School Rocket Club

Safety Agreement

By signing this document, I Darby Irwin (Name - First and Last) agree to abide by laws, regulations, safety standards, and procedural guidelines relating to high powered rocketry stated in the National Association of Rocketry Handbook and safety code, The Federal Aviation Administration's state and federal laws, National Fire Protection Association, all Environment and Safety laws in the location where launches take place, and any Material Safety Data Sheets for all materials used in the design and completion of the Cedar Falls Rocket Clubs entry to any NASA Student Launch (NSL) events or competitions. I understand the regulations specific to the launch site will be followed and I will listen to the Range Safety Officers' command. Additionally, I agree that the team mentor will review the design, build quality, and safety of the rocket, making sure the rocket complies with rocketry design and safety guidelines. If not, our team will not be able to launch a rocket. I agree to follow the minimum distance tables when launching rockets in each location for any purpose relating to the NSL competition. I agree to abide by any commands, rules, and procedures outlined by the Cedar Falls Rocket Clubs' Safety Officer, Team Leaders, and Adult Educators when working in the workspace, or during any team-related launch. I agree, that if I do not follow all safety guidelines, my role on this team will be terminated as well as all relation to NSL.

Darby Irwin

Participant's Name (First and Last - Printed)

Darby Irwin

Participant's signature

9/5/24

Date

Max Stokes

Team Leader Name (First and Last - Printed)

Max Stokes

Team Leader Signature

9/10/24

Date

NASA Student Launch 2025

Cedar Falls High School Rocket Club

Safety Agreement

By signing this document, I Cedric Liu (Name - First and Last) agree to abide by laws, regulations, safety standards, and procedural guidelines relating to high powered rocketry stated in the National Association of Rocketry Handbook and safety code, The Federal Aviation Administration's state and federal laws, National Fire Protection Association, all Environment and Safety laws in the location where launches take place, and any Material Safety Data Sheets for all materials used in the design and completion of the Cedar Falls Rocket Clubs entry to any NASA Student Launch (NSL) events or competitions. I understand the regulations specific to the launch site will be followed and I will listen to the Range Safety Officers' command. Additionally, I agree that the team mentor will review the design, build quality, and safety of the rocket, making sure the rocket complies with rocketry design and safety guidelines. If not, our team will not be able to launch a rocket. I agree to follow the minimum distance tables when launching rockets in each location for any purpose relating to the NSL competition. I agree to abide by any commands, rules, and procedures outlined by the Cedar Falls Rocket Clubs' Safety Officer, Team Leaders, and Adult Educators when working in the workspace, or during any team-related launch. I agree, that if I do not follow all safety guidelines, my role on this team will be terminated as well as all relation to NSL.

Cedric Liu
Participant's Name (First and Last - Printed)

Cedric Liu
Participant's signature

9/9/24
Date

Max Stokes
Team Leader Name (First and Last - Printed)

Max Stokes
Team Leader Signature

9/10/24
Date

NASA Student Launch 2025

Cedar Falls High School Rocket Club

Safety Agreement

By signing this document, I Willow Riley (Name - First and Last) agree to abide by laws, regulations, safety standards, and procedural guidelines relating to high powered rocketry stated in the National Association of Rocketry Handbook and safety code, The Federal Aviation Administration's state and federal laws, National Fire Protection Association, all Environment and Safety laws in the location where launches take place, and any Material Safety Data Sheets for all materials used in the design and completion of the Cedar Falls Rocket Clubs entry to any NASA Student Launch (NSL) events or competitions. I understand the regulations specific to the launch site will be followed and I will listen to the Range Safety Officers' command. Additionally, I agree that the team mentor will review the design, build quality, and safety of the rocket, making sure the rocket complies with rocketry design and safety guidelines. If not, our team will not be able to launch a rocket. I agree to follow the minimum distance tables when launching rockets in each location for any purpose relating to the NSL competition. I agree to abide by any commands, rules, and procedures outlined by the Cedar Falls Rocket Clubs' Safety Officer, Team Leaders, and Adult Educators when working in the workspace, or during any team-related launch. I agree, that if I do not follow all safety guidelines, my role on this team will be terminated as well as all relation to NSL.

Willow Riley
Participant's Name (First and Last - Printed)

Willow Riley
Participant's signature

9-5-2024
Date

Max Stokes
Team Leader Name (First and Last - Printed)

Max Stokes
Team Leader Signature

9-10-2024
Date

NASA Student Launch 2025

Cedar Falls High School Rocket Club

Safety Agreement

By signing this document, I Mattea Sink (Name - First and Last) agree to abide by laws, regulations, safety standards, and procedural guidelines relating to high powered rocketry stated in the National Association of Rocketry Handbook and safety code, The Federal Aviation Administration's state and federal laws, National Fire Protection Association, all Environment and Safety laws in the location where launches take place, and any Material Safety Data Sheets for all materials used in the design and completion of the Cedar Falls Rocket Clubs entry to any NASA Student Launch (NSL) events or competitions. I understand the regulations specific to the launch site will be followed and I will listen to the Range Safety Officers' command. Additionally, I agree that the team mentor will review the design, build quality, and safety of the rocket, making sure the rocket complies with rocketry design and safety guidelines. If not, our team will not be able to launch a rocket. I agree to follow the minimum distance tables when launching rockets in each location for any purpose relating to the NSL competition. I agree to abide by any commands, rules, and procedures outlined by the Cedar Falls Rocket Clubs' Safety Officer, Team Leaders, and Adult Educators when working in the workspace, or during any team-related launch. I agree, that if I do not follow all safety guidelines, my role on this team will be terminated as well as all relation to NSL.

Mattea Sink
Participant's Name (First and Last - Printed)

Mattea Sink
Participant's signature

9/9/24
Date

Max Stokes
Team Leader Name (First and Last - Printed)

Max Stokes
Team Leader Signature

9/9/24
Date

NASA Student Launch 2025

Cedar Falls High School Rocket Club

Safety Agreement

By signing this document, I Max Stokes (Name - First and Last) agree to abide by laws, regulations, safety standards, and procedural guidelines relating to high powered rocketry stated in the National Association of Rocketry Handbook and safety code, The Federal Aviation Administration's state and federal laws, National Fire Protection Association, all Environment and Safety laws in the location where launches take place, and any Material Safety Data Sheets for all materials used in the design and completion of the Cedar Falls Rocket Clubs entry to any NASA Student Launch (NSL) events or competitions. I understand the regulations specific to the launch site will be followed and I will listen to the Range Safety Officers' command. Additionally, I agree that the team mentor will review the design, build quality, and safety of the rocket, making sure the rocket complies with rocketry design and safety guidelines. If not, our team will not be able to launch a rocket. I agree to follow the minimum distance tables when launching rockets in each location for any purpose relating to the NSL competition. I agree to abide by any commands, rules, and procedures outlined by the Cedar Falls Rocket Clubs' Safety Officer, Team Leaders, and Adult Educators when working in the workspace, or during any team-related launch. I agree, that if I do not follow all safety guidelines, my role on this team will be terminated as well as all relation to NSL.

Maxwell Stokes
Participant's Name (First and Last - Printed)

Max Stokes — 9/5/24
Participant's signature — Date

Max Stokes
Team Leader Name (First and Last - Printed)

Max Stokes — 9/10/24
Team Leader Signature — Date

NASA Student Launch 2025

Cedar Falls High School Rocket Club

Safety Agreement

By signing this document, I Chandler Taylor (Name - First and Last) agree to abide by laws, regulations, safety standards, and procedural guidelines relating to high powered rocketry stated in the National Association of Rocketry Handbook and safety code, The Federal Aviation Administration's state and federal laws, National Fire Protection Association, all Environment and Safety laws in the location where launches take place, and any Material Safety Data Sheets for all materials used in the design and completion of the Cedar Falls Rocket Clubs entry to any NASA Student Launch (NSL) events or competitions. I understand the regulations specific to the launch site will be followed and I will listen to the Range Safety Officers' command. Additionally, I agree that the team mentor will review the design, build quality, and safety of the rocket, making sure the rocket complies with rocketry design and safety guidelines. If not, our team will not be able to launch a rocket. I agree to follow the minimum distance tables when launching rockets in each location for any purpose relating to the NSL competition. I agree to abide by any commands, rules, and procedures outlined by the Cedar Falls Rocket Clubs' Safety Officer, Team Leaders, and Adult Educators when working in the workspace, or during any team-related launch. I agree, that if I do not follow all safety guidelines, my role on this team will be terminated as well as all relation to NSL.

Chandler Taylor.
Participant's Name (First and Last - Printed)

Chandler Taylor
Participant's signature

9/9/24
Date

Max Stokes
Team Leader Name (First and Last - Printed)

Max Stokes
Team Leader Signature

9/10/24
Date

NASA Student Launch 2025

Cedar Falls High School Rocket Club

Safety Agreement

By signing this document, I Daniel Umemoto (Name - First and Last) agree to abide by laws, regulations, safety standards, and procedural guidelines relating to high powered rocketry stated in the National Association of Rocketry Handbook and safety code, The Federal Aviation Administration's state and federal laws, National Fire Protection Association, all Environment and Safety laws in the location where launches take place, and any Material Safety Data Sheets for all materials used in the design and completion of the Cedar Falls Rocket Clubs entry to any NASA Student Launch (NSL) events or competitions. I understand the regulations specific to the launch site will be followed and I will listen to the Range Safety Officers' command. Additionally, I agree that the team mentor will review the design, build quality, and safety of the rocket, making sure the rocket complies with rocketry design and safety guidelines. If not, our team will not be able to launch a rocket. I agree to follow the minimum distance tables when launching rockets in each location for any purpose relating to the NSL competition. I agree to abide by any commands, rules, and procedures outlined by the Cedar Falls Rocket Clubs' Safety Officer, Team Leaders, and Adult Educators when working in the workspace, or during any team-related launch. I agree, that if I do not follow all safety guidelines, my role on this team will be terminated as well as all relation to NSL.

Daniel Umemoto

Participant's Name (First and Last - Printed)

Participant's signature

9/5/24

Date

Max Stokes

Team Leader Name (First and Last - Printed)

Team Leader Signature

9/10/24

Date

NASA Student Launch 2025

Cedar Falls High School Rocket Club

Safety Agreement

By signing this document, I Ryan West (Name - First and Last) agree to abide by laws, regulations, safety standards, and procedural guidelines relating to high powered rocketry stated in the National Association of Rocketry Handbook and safety code, The Federal Aviation Administration's state and federal laws, National Fire Protection Association, all Environment and Safety laws in the location where launches take place, and any Material Safety Data Sheets for all materials used in the design and completion of the Cedar Falls Rocket Clubs entry to any NASA Student Launch (NSL) events or competitions. I understand the regulations specific to the launch site will be followed and I will listen to the Range Safety Officers' command. Additionally, I agree that the team mentor will review the design, build quality, and safety of the rocket, making sure the rocket complies with rocketry design and safety guidelines. If not, our team will not be able to launch a rocket. I agree to follow the minimum distance tables when launching rockets in each location for any purpose relating to the NSL competition. I agree to abide by any commands, rules, and procedures outlined by the Cedar Falls Rocket Clubs' Safety Officer, Team Leaders, and Adult Educators when working in the workspace, or during any team-related launch. I agree, that if I do not follow all safety guidelines, my role on this team will be terminated as well as all relation to NSL.

Ryan West
Participant's Name (First and Last - Printed)

Ryan West
Participant's signature

9/9/24
Date

Max Stokes
Team Leader Name (First and Last - Printed)

Max Stokes
Team Leader Signature

9/10/24
Date

NASA Student Launch 2025

Cedar Falls High School Rocket Club

Safety Agreement

By signing this document, I Arthur Wilson-Pickering (Name - First and Last) agree to abide by laws, regulations, safety standards, and procedural guidelines relating to high powered rocketry stated in the National Association of Rocketry Handbook and safety code, The Federal Aviation Administration's state and federal laws, National Fire Protection Association, all Environment and Safety laws in the location where launches take place, and any Material Safety Data Sheets for all materials used in the design and completion of the Cedar Falls Rocket Clubs entry to any NASA Student Launch (NSL) events or competitions. I understand the regulations specific to the launch site will be followed and I will listen to the Range Safety Officers' command. Additionally, I agree that the team mentor will review the design, build quality, and safety of the rocket, making sure the rocket complies with rocketry design and safety guidelines. If not, our team will not be able to launch a rocket. I agree to follow the minimum distance tables when launching rockets in each location for any purpose relating to the NSL competition. I agree to abide by any commands, rules, and procedures outlined by the Cedar Falls Rocket Clubs' Safety Officer, Team Leaders, and Adult Educators when working in the workspace, or during any team-related launch. I agree, that if I do not follow all safety guidelines, my role on this team will be terminated as well as all relation to NSL.

Arthur Wilson-Pickering
Participant's Name (First and Last - Printed)

arthur wilson-Pickering
Participant's signature

9/5/2024
Date

Max Stokes
Team Leader Name (First and Last - Printed)

Max Stokes
Team Leader Signature

9/10/24
Date