F.L.A.M.E.

Fire Locator and Arial Monitoring Equipment

Animas High School

NASA Student Launch Proposal

High School/Middle School Division

Alex Larson - Liam Lacey - Wells Wait

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Table of Contents

General Information

- Mailing Address
    - 22 Osprey Way, Durango, CO 81301
    - 90 Florid Place, Durango, CO 81303
- Team Organizational Structure
    - Team Leader - Alex Larson
    - Vice Leader - Wells Wait
    - Social Media - Liam Lacey(Interim)
    - Safety Officer - Liam Lacey(Interim)
- Team Member & Adult Educators Contact Info
    - Alex Larson - alex.larson090@gmail.com
    - Wells Wait - wells.wait.coder@gmail.com
    - Liam Lacey - georgelacey06@gmail.com
    - Scot Davis, Adult NAR Mentor, - durangoscot@gmail.com
    - Caleb Anderson - Caleb81301@gmail.com - (970) 426-8965
    - Other team members - To be determined based on proposal acceptance
- NAR
    - Mentor - Scot Davis
    - Section - Cloud Busters
- Tripoli
    - Mentor - Scot Davis
        i. TRIPOLI #: 25112
        ii. Certification level: 2
    - Section - Tripoli Southwest Colorado/Durango
- NASA Design Review Panel Proposed meeting times (CST)
    - Monday 4:00-5:00 pm
    - Thursday 8:00-9:00 am
    - Thursday 10:00-11:00 am
- Administration Letters(Linked PDF)
    - Animas High School
    - Durango High School

Overview

Our team is based in Durango, Colorado, an area often threatened by wildfires. Colorado sees about 2500 wildfires each year (weather.gov). Current fire monitoring uses low-flying drones and higher-altitude planes and helicopters. Launching a rocket is cheaper than flying a plane and needs no permanent setup. We aim to replace low-flying drones and high-altitude monitoring in remote areas with our cost-effective solution.

The rocket will climb to 4,000 feet and release a sensor payload to gather data for ground review using modern analysis. This payload is a self-flying plane that uses GPS to follow a set flight path. It will use infrared and regular cameras to collect fire condition data. We should also be able to check plant moisture in the morning due to water's heat properties. The plane can replace low-flying drones and high-altitude monitoring in remote areas, needing only basic training and costing less than other options.

We've put in about 105 hours of writing and brainstorming. The team leader and vice leader spent roughly 90 hours at the start, ensuring we had a well-thought-out plan and creating the initial proposal layout and content. The extra 15 hours came from adding a team member and getting help from outside editors. We wrote this proposal based only on the NASA 2025 student handbook requirements. We followed the handbook's format for all topics and their order. If you have any questions about our proposal's goals or technical parts, please email our team leader and mentor.

Facilities

Our team has access to various work locations for our rocket and scientific payload. Our main gathering place and work hub is at Animas High School (AHS), where we have a well-equipped Makerspace and a large classroom for meetings. The Makerspace contains a wide array of tools, including a miter, saw, four 3D printers, and essential hand tools. Additionally, The Makerspace offers three laser cutters, a CNC machine, welding equipment, band saws, a drill press, and a table saw, all connected through a ventilation and dust collection system. This comprehensive range of tools and safety equipment makes it an ideal workspace, especially considering its proximity to town.

In addition to the facilities at AHS, we also plan to conduct meetings in a large classroom adjacent to the Makerspace. This space is well-suited for in-person gatherings due to its proximity to our primary work area and its design to facilitate collaborative and project-based work. While team gatherings will be held in this room, it will also allow us to spread out when we are working on different sections of the payload and rocket. Dividing the group up to work on individual components will allow each section of our payload and rocket to get the attention to detail they require.

The electrical components of the payload section will be primarily built at Wells Wait's house (team Vice Leader), where a small computer engineering workspace is located. This space includes soldering equipment, two 3D printers, a Dremel, a multimeter, and a computer for in-house machine learning training. This space will be used during the initial creation and programming of our payload. It will likely also be used for initial tests and half digital simulation. In addition, we have access to a wood shop with tools similar to those used in the Animas School Makerspace to help with the project when the Makerspace is unavailable or we need to have more room to work.

Our team is attempting to find additional workspaces to supplement our current workspace's limitations. The locations we are currently attempting to get access to include Fort Lewis College and Miller Middle School.

Fort Lewis College, which is adjacent to AHS, has a high-power rocket club and many manufacturing facilities. In addition to the school's robust facilities, there are many knowledgeable faculty. Miller Middle School is a short drive from AHS. Though it is currently under repair until the end of September, it will soon provide additional new engineering facilities. We have a lot of options when it comes to tools and locations, which will give us the ability to divide into smaller groups for more focused study sessions.

- Animas High School - 4:00 pm to 9:00 pm weekdays
  - 4x 3D printers
  - 3x Laser Cutters
  - Welder
  - Drill press
  - Sander
  - Drill
  - CNC
  - Miter saw
- Fort Lewis Computer Engineering Lab - By appointment
  - Oscilloscope
  - Variable power supply
  - Air soldering
- Wells Wait’s Houses - No Limitations
  - Soldering station
  - 2x 3D printers
  - Dremel
  - 4090 for ML training
  - Band saw
  - Miter saw
  - Lathe
  - Router
  - Drill press
  - Welder

Safety

Our group will strictly follow the safety rules listed here and on the products we use. Our Safety Officer will watch over the use of riskier tools and materials. We'll add more safety info for specific products if needed. The Safety Officer will update our safety rules as they see fit and make sure everyone follows them. They'll change the rules when we add new tools or methods or if the current rules aren't good enough. The Safety Officer will be there during any big task, especially when people are using possibly dangerous tools or substances. They'll also keep an eye on and help individuals when they can to keep things safe and running smoothly. Below are some tools and supplies we'll likely use, with specific safety details.

In indoor spaces such as the Makerspace in AHS and Wells's house, we'll follow these rules: wear closed-toe shoes, don't use power tools alone, use eye, body, and ear protection, and clean up after every use. We'll also follow any rules set by the places or groups we work with, such as having a verified adult in the building when working at Animas High School. During meetings, building, or solo work outside regular spaces, we'll stick to the safety rules below and any additional safety guidelines added by our safety officer. All building plans should be checked by the safety officer for specific safety guidelines. This way, when we face new tools, methods, spaces, or other unexpected needs or events, we can keep things safe.

Materials and Tools: Dangers and Prevention

3D Printers

- Dangers
    - Toxic fumes - caused by the melting of plastic
    - Burns - from nozzle, build plate, or fresh parts
- Preventative Safety Guidelines
    - Do not place any hands into the printer while in operation
    - Wait 5 minutes after a print is finished before removing
    - Ensure the printer has proper ventilation before printing in filaments that emit harmful fumes

Miter saw

- Dangers
    - Bodily harm
    - Getting pulled in - when clothing or hair gets caught, it can pull you into the blade
    - Eye Injury
- Preventative Safety Guidelines
    - Secondary Observer - having someone to ensure you are safe and taking necessary precautions
    - No loose clothing - this can get caught, resulting in mistakes or getting tangled in the blade

- Slowly cutting - helps prevent accidents by giving more time to react
- Safety goggles - for dust protection and to protect from eye injury
- Hearing protection
- Spin-up saw before the operation - keep the load on the blade low
- Secure workpiece- to prevent objects from getting knocked away from the blade

Drill Press

- Dangers
  - Bodily harm
  - Getting pulled in - when clothing or hair gets caught, it can pull you into the drill
  - Eye Injury
- Preventative Safety Guidelines
  - Safety goggles - for dust and to protect from eye injury
  - Spin-up drill before operation
  - Secure workpiece - to prevent it from spinning into anyone

Super glue

- Dangers
  - Toxic fumes
  - Physical contact - can cause chemical burns and skin irritation
  - Unintended Adhesion
  - Eye Injury
- Preventative Safety Guidelines
  - Gloves - made of a material that liquids can not penetrate to help against physical contact
  - Mask - when in a small room without proper ventilation
  - Cleaning supplies - something to clean up any glue that gets past PPE
  - Safety glasses - to protect from eye injury

Epoxy

- Dangers
  - Fumes
  - Physical contact - can cause chemical burns and skin irritation
  - Thermal reaction - Can heat up when reacting
  - Filling agent - can easily become airborne
  - Eye Injury
- Preventative Safety Guidelines
  - Gloves - made of a material that liquids can not penetrate to help against physical contact
  - Mask - when in a small room without proper ventilation or using a filling product (mask type dependent on risk)
  - Low thermal mass or partially filled containers - working in smaller batches will help keep the temperature down, but when working with large batches,

containers should have locations not making contact with the epoxy for cool locations to hold
    - Cleaning supplies - something to clean up any epoxy that gets past PPE or onto any equipment
    - Safety glasses - to protect from eye injury

Soldering

- Dangers
    - Burns
    - Material toxins - fumes can be dangerous depending on the materials being heated
    - Fires
    - Eye Injury
- Preventative Safety Guidelines
    - Stiff solder for 3-inch distance soldering - this allows for the soldering to take place away from the hand holding the solder while still keeping control.
    - Having fire suppressant - this can come in the form of water and will help to put out any small embers or flames.
    - Ventilation - a pull fan or other means of keeping smoke away from the work area while keeping air quality safe; a mask will work if none are available.
    - Material selection - while some materials may be hazardous, keeping them to a minimum is important, and taking extra precautions when not
    - Clean workspace - this will help prevent anything flammable from catching as well as clear obstacles for hand motion, helping to prevent burns.
    - Good lighting and open concept- this helps to ensure no accidental burns by blocked visibility.
    - Safety glasses - to protect from eye injury

Fiberglass

- Dangers
    - Skin irritation - this includes eyes and other facial features
    - Lung irritation and damage - can cause issues if prolonged exposure
    - Eye Injury
- Preventative Safety Guidelines
    - Gloves - when working with unfinished fiberglass, sanding, cutting, or any other action that could expose irritating fibers
    - Mask - when sanding, cutting, or any other action that could produce fiberglass dust
    - Eye protection - when sanding, cutting, or anything else that produces fiberglass dust
    - Dust collection - when possible, use tools that collect dust to limit exposure
    - Protective clothing - when sanding, cutting, or anything else that produces fiberglass dust to prevent skin irritation

- Open location - when producing fiberglass dust, the location should be outside or in a location designed for this situation
- Clean up - when done working with fiberglass, dust should be collected, and people should wash their hands and take showers if there is any irritation
- Application - when applying fiberglass cloth with epoxy or other reasons, respective safety guidelines should be followed

Motors

- Dangers
    - Unexpected ignition
    - Motor not igniting
- Preventative Safety Guidelines
    - Secure containment - remove sources of potential ignition and to prevent damage in case of ignition
    - Shunt wires - when preparing the motor, the leads should be shunted to prevent unintentional electrical ignition
    - Follow the pre-launch checklist - will ensure proper operation of the rocket and safe ignition
    - Safety Officer - watch over all motor prep as an extra set of eyes
    - NAR mentor - store and handle the motor before launches, ensuring all NAR guidelines are met

Paint

- Dangers
    - Fumes - many paints emit harmful fumes when used
    - Toxicity - some paints can be harmful to the skin
    - Eye Injury
- Preventative Safety Guidelines
    - Proper PPE- respirator & gloves
    - Safety glasses - to protect from eye injury

Laser cutter

- Danger
    - Eye damage - from looking at the laser
    - Burns
- Preventative Safety Guidelines
    - Special glasses or coating - if watching the cutting process, glasses designed for laser cutters must be worn, or a coating must be applied on any clear panels
    - Leaving the room - keeping out of the room or facing away from the cutter if no glasses are used
    - Do not place any hands inside the laser cutter while active

NAR/TAR Personnel Procedures

NAR Safety Code:

1. Certification: We will only fly or possess rocket motors within the scope of our certification.

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

3. Motors: We will only use certified, untampered rocket motors and will only use them for purposes recommended by the manufacturer. We will also not allow smoking, open flames, or heat sources within 25 feet of our motors.

4. Ignition System: We will only launch our rockets with an electrical launch system including electrical motor igniters that are only installed after our rocket is at a designated prepping area. Our rocket will include a safety interlock that is in series with the launch switch that is not installed until our rocket is ready for launch and will use a launch switch that returns to the “off” position when released.

5. Misfires: If our rocket does not launch when the electrical launch system is initiated, we will remove the safety interlock and wait 60 seconds after the last launch attempt before approaching the rocket.

6. Launch Safety: We will use a 5-second countdown before launch and ensure that spectators have an opportunity to be warned. We will ensure no personnel are closer to the launch pad than allowed by the Minimum Distance Table. When arming rockets with electronics, we will ensure no one is at the pad except for safety personnel and team collaborators required for the arming and disarming operations. We will check the stability of our rocket before flight and will only fly if determined to be stable.

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

8. Size: Our rocket will not contain any combination of motors that total more than 2560 N-sec (K Class motor) of total impulse. Our rocket will not weigh more at liftoff than one-third of the certified average thrust of the high-power rocket motor(s) intended to be ignited at launch.

9. Flight Safety: We will not launch the rocket at targets, into clouds, near airplanes, or on trajectories that take it directly over the heads of spectators or beyond the boundaries of the launch site, and will not put any flammable or explosive payload in our rocket. We will not launch our rockets if wind speeds exceed 20 miles per hour. We will comply with Federal Aviation Administration airspace regulations when flying and will ensure that our rocket will not exceed any applicable altitude limit in effect at that launch site.

10. Launch Safety: We will launch our rocket outdoors, in an open area where trees, power lines, occupied buildings, and persons not involved in the launch do not present a hazard. The launch area will be at least as large on its smallest dimension as one-half of the maximum altitude to which rockets are allowed to be flown at that site or 1500 feet, whichever is greater, or 1000 feet for rockets with a combined total impulse of less than 160 N-sec, a total liftoff weight of less than 1500 grams, and a maximum expected altitude of less than 610 meters (2000 feet).

11. Launcher Location: Our launcher will be 1500 feet from any occupied building or from any public highway on which traffic flow exceeds ten vehicles per hour, not including traffic flow related to the launch. It will also be no closer than the appropriate Minimum Personnel Distance from the accompanying table from any boundary of the launch site.

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

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

Hazardous material: We will take action to properly dispose of all hazardous material.

Hazard Recognition and Accident Avoidance

Students will be briefed on hazard recognition by the following 3 step plan:

1. Knowing What a Hazard Is
    a. A hazard is something that has the potential to cause harm in any way
2. Knowing the General Types of Safety Hazards we might encounter
    a. Burns, cuts/slices, toxic fumes, damaging dust, fires, property damage, unexpected motor combustion, eye damage, hearing damage, electrical
3. Controlling the Hazard
    a. Fire: Remove heat, flame, or fuel (once deemed safe to approach).
    b. Burns: Keep hot equipment contained and train people who are in danger.
    c. Electrical: Use the safety interlock system on a rocket to de-energize.

d. Cutting: Secure the piece being cut before starting. Do not wear loose clothing, and keep an eye on where everything is.
e. Damaging dust: Wear masks and dust management equipment.
f. Property Damage: To mitigate, we will work in designated locations designed for what we are doing.
g. Unexpected motor combustion: The motors will be contained in a location where the combustion will not cause any major damage.
h. Eye damage: Wear safety glasses and goggles when needed.
i. Hearing damage: Wear hearing protection when loud noises are present.
j. Toxic fumes: Use a mask when in a small room without ventilation.

Caution Statements

Caution statements will be verbally explained before any process that could lead to harm, such as but not limited to: rocket launches, hazards, laser cutting, etc. Use of PPE will be utilized when other measures are not enough to control exposure to hazards.

State and Federal Law Compliance

Federal law requires aircraft to be registered if they weigh more than 0.55 pounds (250 grams). During the testing and building process of our payload UAV, we will attempt to keep our weight below the regulation threshold. If this is unfeasible with the deployment nature of the UAV, we will get it registered with the FAA. Our rocket will only be launched in designated airspace with the UAV using GPS position to keep inside the designated area while above 400ft.

NAR Mentor Role

Our mentor is Scot Davis who is a TRIPOLI member with a stage two rocketry certification. Scot will take care of the storage and handling of rocket motors and energetic devices, in his free time from being a local firefighter. The rest of the materials will be stored at Animas High School and other working locations. Transportation will be the responsibility of the team.

Safety Acknowledgement:

Following the NASA SL Handbook, all members of the team have read and acknowledged the below rules:

1. Range Safety Inspections will be conducted on each rocket before it is flown. Each team shall comply with the determination of the safety inspection or may be removed from the program.

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

3. The team mentor is ultimately responsible for the safe flight and recovery of the team's rocket. Therefore, a team shall not fly a rocket until the mentor has reviewed the design, examined the build, and is satisfied the rocket meets established amateur rocketry design and safety guidelines.

4. Any team that does not comply with the safety requirements shall not be allowed to launch their rocket.

Technical Design

We will be attempting to launch a plane for high-altitude fire detection. We will be using an infrared camera and a regular camera to record data, which will be processed on the ground using a combination of basic algorithms and a convolutional neural network. We will be using this system and its processed data to not only detect fires but also give basic information about them, such as surrounding plant moisture content and similar data that can help control fires. For this design, we decided that using a plane-like structure(referred to as a UAV) would allow for the most versatility, being operable in high and low altitudes. This plane system will also be power efficient through the use of gliding, allowing for longer flight times. We have discussed several alternatives in a later subsection, but this seems to be the best fit.

Major Technical Challenges

1. Width of rocket
    a. Affecting Stability
        i. Larger fins - moving weight toward the top of the rocket
    b. Cost and Weight
        i. Smaller UAV - Minimizing the size of the UAV will, in turn, make the body tube we can use smaller, thus making reaching the height window easier
    c. Exit from Rocket
        i. Release payload before apogee - this will prevent us from having to wait for ground clearance as described by the proposal guidelines on page 60 4.4.4 as this is only for decent.
            1. This will require an exemption from 4.3.2 in the payload requirement section on page 59 as it prohibits pre-apogee deployment. We don't believe we need to do this as we are doing the High school/middle school division, where we have designed our experiment.
            2. If unable to get exemption form 4.3.2, we will release after apogee and use a remote tether to deploy the UAV.
        ii. Avoiding the rocket and parachute - release before apogee to prevent any issue with the parachute
            1. If not exempted from 4.3.2, we will likely use a long tether to keep the UAV above the parachute.
    d. Wing Unfold
        i. To effectively store the UAV inside the rocket, the wings must be able to fold and unfold reliably. We will be using a primarily mechanical system designed around holding fabric or thin plastic wings with two carbon fiber tubes and wing ribs. It will spring open and then lock into place, ensuring that the wind will not close the wings.
2. Weight of rocket vs reaching altitude range
    a. We will be using PLA, ABS, and carbon-infused filaments for all 3D-printed rocket parts.

Safety Regarding Payload and Rocket

Safety requirements for the rocket and payload will be developed alongside the designs for both, respectively, to better match the dangers involved in the operating and building process. They will, at a minimum, follow all the basic safety procedures listed in the safety section as well as any relevant FAA and TRIPOLI safety guidelines.

Payload

Our payload will be pushed out of the rocket close before apogee for a controlled descent, allowing for stable images at high altitudes. We will be creating a system to keep decent slow near apogee while keeping landing sight close to the launch pad. We plan on doing this with a custom folding UAV with GPS guidance. This will allow us to get a large field of view by turning as well as allow for testing at low altitudes. In addition, this will be useful outside of rocket deployment with only a decrease in field of view.

- **Sensor module**
    - Thermal sensor
    - Small RGB camera
    - Data recording system (microcontroller + storage)
- **UAV specifications**
    - Differential thrust body - to remove as many flaps as possible
        - Part 3D print / part foam - 3D prints for structural components
        - Two lightweight motors - brushed DC motors for weight
        - Wing-shaped body - to increase lift to help with short wingspan
        - Single flap for high altitude lift trimming
    - Two deployable wings - dimensions dependent on testing and body tube
        - Length 1 foot - based on the length of storage compartment
        - Width ~4in - constrained by body tube width
    - Custom GPS guidance computer and radio transmitter following FCC guidelines and using basic password encoding
    - Weight: 0.54 lb - if exceeded, we will register our UAV and complete the TRUST online test
- **Deployment system**
    - Side hatch release - allows a longer UAV body to be deployed rapidly
    - Launch spring - to push the UAV outside and away from the rocket and eventual parachute deployment
    - Release before apogee when velocity is manageable - allows the UAV to avoid the parachute

Payload fallback plan

At peak altitude, our payload will be ejected from the rocket for a controlled descent, enabling stable high-altitude imaging. We're developing a system to slow the descent near the apogee while keeping the landing area close to the launch site. Our plan involves a custom-built folding UAV with GPS guidance. This setup will provide a wide field of view through rotation and allow for low-altitude testing. Moreover, this design will be useful beyond rocket deployment, with only a slight reduction in the field of view. The versatility of this system extends its applications beyond rocketry.

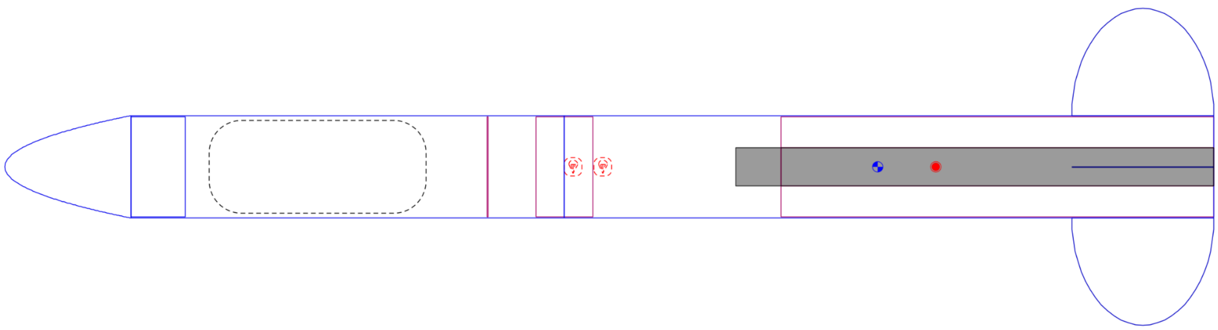
Rocket

High-power model rockets provide a convenient method to achieve impressive altitudes. Reaching heights of 4,000 ft without rocket propulsion poses a significant challenge, often necessitating skilled pilots for large-scale fire and moisture monitoring at such heights. In isolated areas, the swift deployment of aircraft-like devices or alternative detection systems for comprehensive coverage could greatly improve initial response capabilities.

While helicopters and planes are commonly utilized for fire monitoring in our region, more remote locations could benefit substantially from rapid aerial support. The swift launch of a high-flying observation platform holds the potential to significantly enhance early detection and response capabilities in hard-to-reach areas susceptible to wildfires and other environmental hazards.

- **Rocket design specifications**
  - Diameter: 5.5in
  - Total length: 67in
  - Top Section
    - Length: 24in - Without nose cone
    - Payload compartment length: >12in
  - Bottom section: 36in
  - Four fins
    - Fin root chord: 8in
    - Fin height: 6in
    - Fin shape: Elliptical
  - Motor: Aerotech K250
    - Total impulse: 2553 N*s
    - Length: 25.5in
- **Rocket controls**
  - GPS tracking: TeleGPS - Located in a protected section of the rocket
  - Dual Deployment System for Parachute
- **Rocket Flight Plan**
  - Target altitude: Slightly over 4000 ft - calculated using OpenRocket Simulation
  - Drogue parachute deploy: 1-2 seconds after apogee - to allow time for payload deployment
  - Main parachute deploy: 1000 ft off ground

- **Rocket materials**
  - Fiberglass body tubes 5.5in in diameter
  - 3D-printed Nylon Carbon Fins
  - Air PLA for all 3D-printed internal components



STEM Engagement

Student Engagement

Our team aims to create an engaging lesson to help middle schoolers understand the basics of projectiles. We will focus on teaching about the center of pressure, mass, and stability, which are essential concepts in understanding flight. This topic is easy to demonstrate and allows for a flexible lesson that can be adapted based on the student's grade and learning pace.

The lesson will consist of two main parts: a hands-on discovery section and a brief talk. During the hands-on part, we will use 3D-printed flying objects with different stability levels. Students will have the opportunity to throw these objects and observe firsthand how the center of mass and pressure affect flight. After the hands-on experiment, they will share their observations and insights, fostering a deeper understanding of flight stability and its impact on performance.

Following the hands-on session, we will deliver a tailored lecture based on the student's academic level. The lecture will reinforce the key takeaways from the practical activity and address any misunderstandings. We will then delve into more detailed discussions about why these factors are crucial for rockets and explain the related terminology to provide a comprehensive understanding.

Additionally, we will be presenting to several classes at Animas High School that are planning to build rockets. In these sessions, we will cover how to manually determine the center of pressure and mass. As our rocket project progresses, we will assess the effectiveness of past lessons and decide on additional topics to enhance the students' learning experience.

Community Presentations

In addition to working with schools in the area to help with STEM interests, specifically with rockets, we will also be doing several presentations in our community. All of our presentations will be aimed at creating interest in what we and our peers are doing. This is a very unusual and exciting opportunity and shows what our local community is capable of despite our small size, which is very important to us. Our initial presentation will be more of a general overview of our work, but the following presentations will be more diverse. We will learn a lot through this project on technical items but also learn important skills like scheduling and team management. We are excited to share our experiences with our local community as well as others through the use of the Internet.

Digital Presence

We aim to establish a robust digital presence using platforms such as Instagram, Facebook, and our website to share images and brief updates, ensuring that our team's activities are well-documented and accessible to others. Our goal is to post at least once every two weeks, with a focus on sharing more frequent updates about new developments, challenges, and upcoming plans.

In addition to social media, we will maintain a website that provides more comprehensive information. The blog section will complement our social media posts by offering additional details, while other sections of the site will cover broader topics such as long-term plans and technical designs.

Newspaper

We will also contact some local news platforms, such as The Durango Herald, to do a piece on the NASA Student Launch program and our involvement. This will help to bring awareness to what we are doing and gather more local support for our project. In addition to local news, we will work with our school newspapers to educate our classmates on our efforts.

Evaluation Criteria

Our community outreach will be ongoing, with a dedicated team focusing on engagement. We'll start by connecting with local schools, leveraging our high school status. Then, we'll shift towards outreach for funding and local business support while also creating payload prototypes to kickstart our rocket work. As we make progress, we'll aim to give presentations and updates to interested community members, schools, and others. Our goal is to engage at least 80% of the required 250 people by early February, giving us time to reach the remaining 20% in the final months. We expect to achieve this faster, depending on class sizes and local interest. We want to show our community that even a small town can tackle big challenges and inspire younger generations to get excited about rockets and aerospace.

Our main objective is to demonstrate that our small community can achieve great things. This project isn't just about technical skills – we'll also learn valuable lessons in scheduling and team management. We're excited to share our journey with both our local community and a wider online audience, hoping to inspire others and showcase the potential of small-town innovation in the world of aerospace and rocketry.

Project Plan

Schedule

Initial planning and design – (Completed)

Design Refinement and accomplish ability check – (Completed)

Decision to submit to NASA – (Completed)

Submit Proposal Sep 11

Find interested people - Early Sep

Awarded Proposals Known - Oct 3

Conduct final team interviews and finish assigning roles in - Early Oct

Have basic models of payload and CAD rocket models - Mid Oct

Start emailing potential sponsors - Mid Oct

Send initial emails to schools for community outreach lessons - Late Oct

Start Middle School and High School Curriculum - Early Nov

Start finalizing dates to give lessons for high school and middle school - Mid-Nov

First launch (no payload) - Early Dec
Have first school lessons complete - Early Dec(Schedules Permitting)

Second launch - Early February

Final Launch Early April

Budget

Our budget provides an initial estimate of anticipated costs, given that we haven't yet constructed prototypes for the payload area, which largely dictates our rocket's specifications and materials. We'll update this regularly in the coming months as our designs take shape.

Rocket:

Item:	Cost:	Quantity:	Total:	$2,984.18
Aerotech k250	$346.99	3	$1,040.97	
5.5in Blue Tube	$75.25	4	$301.00	
Epoxy Resin	$379.63	1	$379.63	
Fiberglass cloth (10yd by 38in)	$161.12	1	$161.12	
Filament	$50	5	$250.00	
NAR Cert Supplies/Fees	$75	5	$375.00	
Motor Mount	$11	1	$11.46	
Parachutes	$175	1	$175.00	
Miscellaneous Supplies	$150	1	$150.00	
Kevlar string	$20	1	$20.00	
Shock Cord	$25	3	$75.00	
Nomex	$45	1	$45.00	

Payload:

Item:	Price:	Quantity:	Total:	$195.00
Infrared Camera	$70	1	$70.00	
Camera	$30	1	$30.00	
UAV control board	$15	1	$15.00	
Rocket release control board	$30	1	$30.00	
UAV Body	$20	1	$20.00	
Camera Control Board	$30	1	$30.00	

Travel:

Item:	Quantity:	Price:	Total:	$8,852
Plane Tickets	5	$1,000	$5,000	
Food($30 per meal/person)	60	$30	$1,800	
Hotels(per night)	12	$150	$1,800	
Rental Car(per day)	4	$63	$252	

Funding Plan

The project's funding is split into three key phases. We start by seeking support from groups familiar with our NASA Student Launch program proposal, like Animas High School and Durango High School. Next, we'll reach out to past partners and companies known to back STEM projects. Lastly, we'll approach new organizations, look for grants, and explore other funding sources.

Our team is small now, but we'll grow in the coming months and form a group focused on fundraising and finances. We aim to secure initial funding of about five thousand dollars within a month of proposal acceptance. This will allow us to begin prototyping while building a team to continue fundraising efforts. We haven't set a specific funding goal yet, as our budget is still low and we haven't started prototyping. However, we're currently estimating around 15 thousand dollars. Below is a rough timeline of our team's financial aspects for the first few months.

Oct 15 - Funding request in progress at Animas High School
Early Nov - The financial team created and bugged refined
Mid-Nov - Emails sent to five local organizations and business
Dec 1 - Final budget created
Our financial team will decide on anything past this time as well as create more detailed timelines and lists of supplies.

Sustainability

The Animas High School team has a track record of working with various groups and businesses over time. Our aim for the coming year is to deepen these bonds. We intend to do this by keeping our communication formal and respectful, showing genuine interest in their projects, and linking their work to our rocket initiative. Besides forming connections, it's vital to keep these relationships strong, which we plan to do through regular social media engagement and giving talks throughout the year. Also, if we get funding from any company or group, we commit to providing progress updates to show what we've achieved.

Moreover, it's crucial to create a lasting path for our rocket-building and STEM activities to continue. While our STEM outreach focuses on community involvement, it's equally important to ensure there's always a core group of students to carry on the rocketry tradition at Animas High School. We'll focus our recruitment on younger students who love STEM, especially trying to bring in new talent until early November. By supporting this next wave of enthusiasts, we aim to keep the team going and preserve the valuable experience gained through years of rocketry at Animas High School. Maintaining the importance of STEM and rocketry in our community matters greatly to us, as it has not only opened up amazing chances but also helped shape who we are as active community members. We hope to spread these benefits to many more people in our area.