NASA TECHRISE STUDENT CHALLENGE

2023-24 Challenge Overview

https://www.futureengineers.org/nasatechrise

The Challenge

NASA is calling on middle and high school students to join the third NASA TechRise Student Challenge, which invites students teams to submit experiment ideas to fly on a high-altitude balloon or a rocket-powered lander.

Students in sixth to 12th grades at a U.S. public, private, or charter school -including those in U.S. territories- you are challenged to team up with your schoolmates to design an experiment under the guidance of an educator.

The high-altitude balloon will offer approximately four hours of flight time at 70,000 feet and exposure to Earth's atmosphere, high-altitude radiation, and perspective views of our planet.

The rocket-powered lander will fly for approximately 120 seconds at an altitude of approximately 80 ft (~25 m) over a test field designed to look like the Moon's surface.

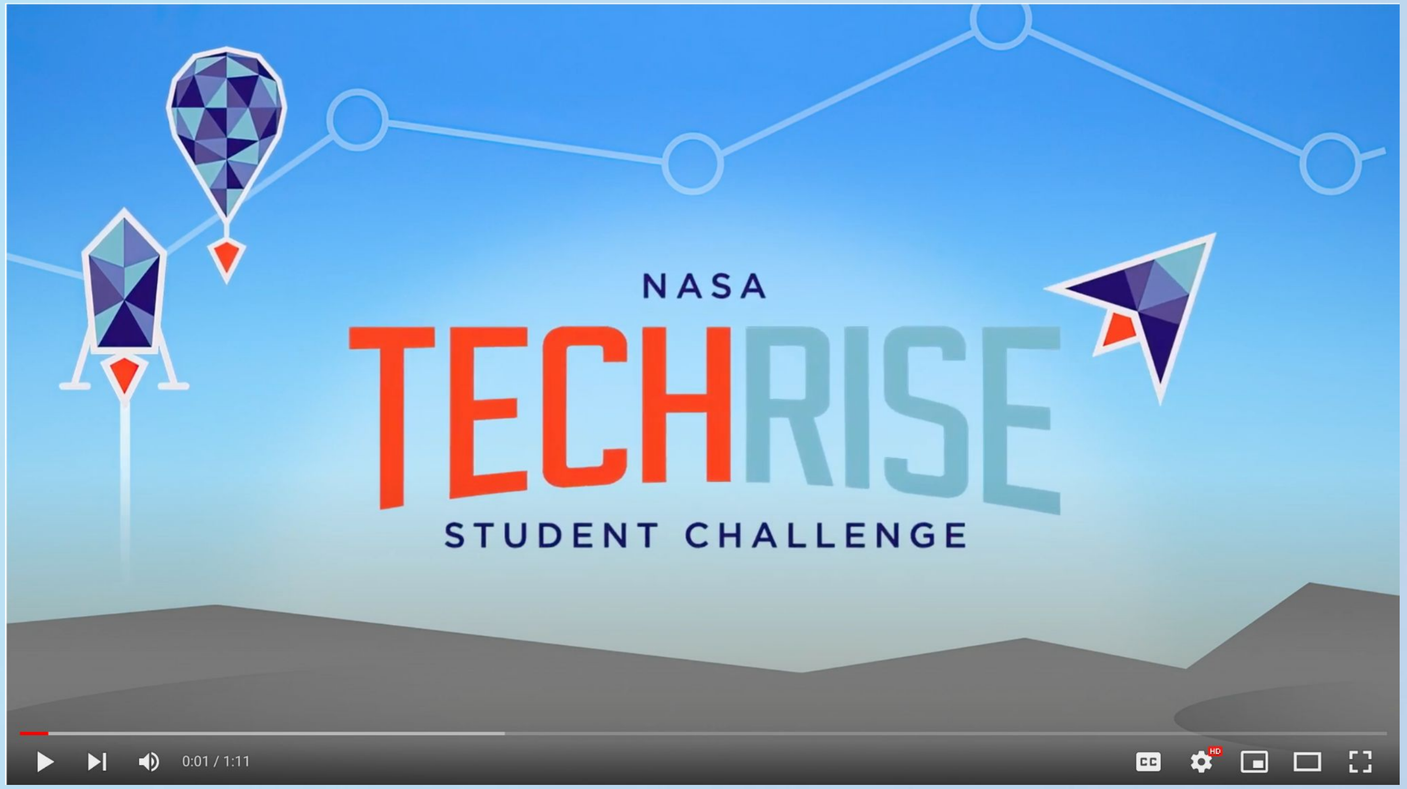
The NASA TechRise contest offers participants hands-on insight into the payload design and suborbital flight test process, with the goal of inspiring a deeper understanding of space exploration, Earth observation, coding, electronics, and the value of test data.

Prizes

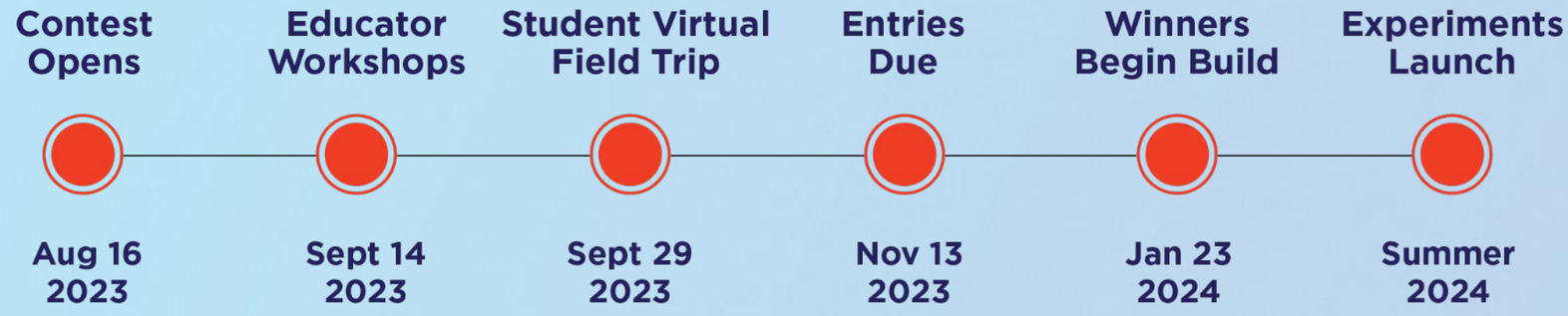
60 winners (30 for the high-altitude balloon and 30 for the rocket-powered lander) will be selected to build their payload. The prize package consists of:

- $1,500 to build the experiment
- A flight box in which to build the experiment
- An assigned spot to test the experiment on a high-altitude balloon or rocket-powered lander test flight
- Technical support from Future Engineers advisors when building the experiment

Watch the Challenge Video!



Challenge Timeline



Regions

- Teams will compete in one of 20 competitive regions

Steps to Enter

- **STEP 1: FORM A TEAM**

Your team needs to have at least 4 students and one educator/teacher.

- **STEP 2: REVIEW PROPOSAL TEMPLATE AND GUIDE**

Your entry needs to be a written proposal that describes your experiment. It's important to review both the proposal template and guide to understand the requirements.

- **STEP 3: CHOOSE ROCKET-POWERED LANDER OR BALLOON**

Decide whether a Rocket-Powered Lander or High-Altitude Balloon is best for your experiment idea by watching the videos on the NASA TechRise Student Challenge web page and reviewing the slide decks and design guidelines.

- **STEP 4: PLAN YOUR EXPERIMENT**

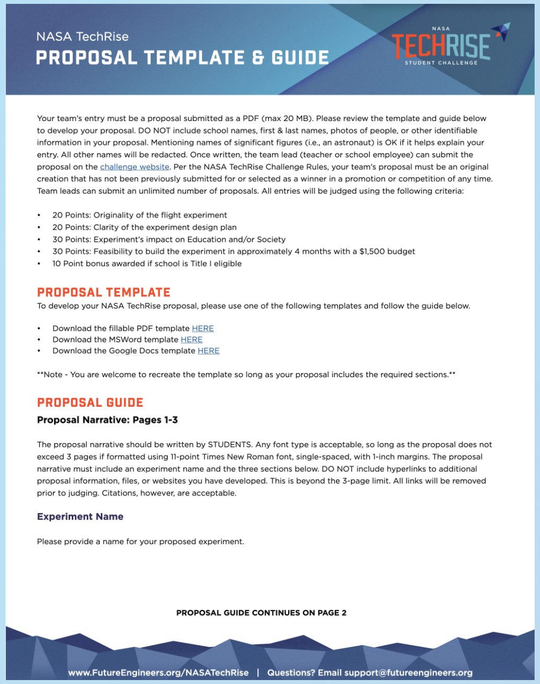
Use the corresponding brainstorming and components design resources to explore experiment ideas and consider how to build your idea.

- **STEP 5: SUBMIT YOUR PROPOSAL**

Once your proposal is done, save it as a PDF so that the team leader (educator/teacher) can submit it online.

Proposal Template & Guide

Write up the experiment idea using the Proposal Template & Guide



NASA TechRise

PROPOSAL TEMPLATE & GUIDE

Your team's entry must be a proposal submitted as a PDF (max 20 MB). Please review the template and guide below to develop your proposal. DO NOT include school names, first & last names, photos of people, or other identifiable information in your proposal. Mentioning names of significant figures (i.e., an astronaut) is OK if it helps explain your entry. All other names will be redacted. Once written, the team lead (teacher or school employee) can submit the proposal on the challenge website. Per the NASA TechRise Challenge Rules, your team's proposal must be an original creation that has not been previously submitted for or selected as a winner in a promotion or competition of any time. Team leads can submit an unlimited number of proposals. All entries will be judged using the following criteria:

- 20 Points: Originality of the flight experiment
- 20 Points: Clarity of the experiment design plan
- 30 Points: Experiment's impact on Education and/or Society
- 30 Points: Feasibility to build the experiment in approximately 4 months with a $1,500 budget
- 10 Point bonus awarded if school is Title I eligible

PROPOSAL TEMPLATE

To develop your NASA TechRise proposal, please use one of the following templates and follow the guide below.

- Download the fillable PDF template HERE
- Download the MSWord template HERE
- Download the Google Docs template HERE

Note - You are welcome to recreate the template so long as your proposal includes the required sections.

PROPOSAL GUIDE

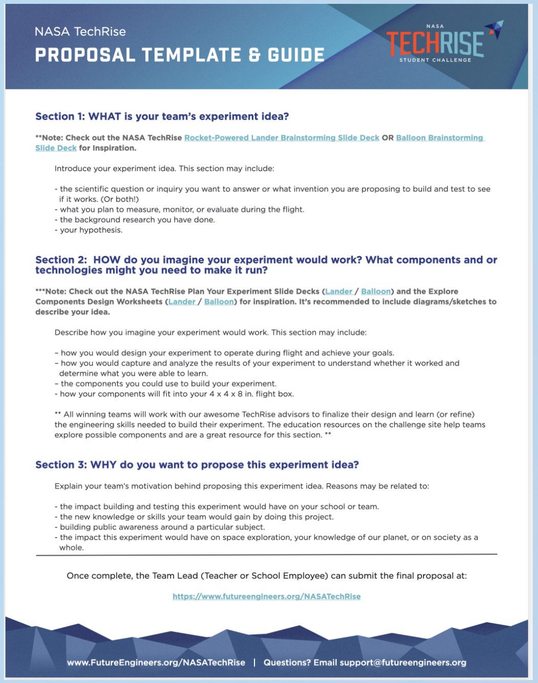
Proposal Narrative: Pages 1-3

The proposal narrative should be written by STUDENTS. Any font type is acceptable, so long as the proposal does not exceed 3 pages if formatted using 11-point Times New Roman font, single-spaced, with 1-inch margins. The proposal narrative must include an experiment name and the three sections below. DO NOT include hyperlinks to additional proposal information, files, or websites you have developed. This is beyond the 3-page limit. All links will be removed prior to judging. Citations, however, are acceptable.

Experiment Name

Please provide a name for your proposed experiment.

PROPOSAL GUIDE CONTINUES ON PAGE 2



NASA TechRise

PROPOSAL TEMPLATE & GUIDE

Section 1: WHAT is your team's experiment idea?

****Note: Check out the NASA TechRise Rocket-Powered Lander Brainstorming Slide Deck OR Balloon Brainstorming Slide Deck for inspiration.**

Introduce your experiment idea. This section may include:

- the scientific question or inquiry you want to answer or what invention you are proposing to build and test to see if it works. (Or both!)
- what you plan to measure, monitor, or evaluate during the flight.
- the background research you have done.
- your hypothesis.

Section 2: HOW do you imagine your experiment would work? What components and or technologies might you need to make it run?

****Note: Check out the NASA TechRise Plan Your Experiment Slide Decks (Lander / Balloon) and the Explore Components Design Worksheets (Lander / Balloon) for inspiration. It's recommended to include diagrams/sketches to describe your idea.**

Describe how you imagine your experiment would work. This section may include:

- how you would design your experiment to operate during flight and achieve your goals.
- how you would capture and analyze the results of your experiment to understand whether it worked and determine what you were able to learn.
- the components you could use to build your experiment.
- how your components will fit into your 4 x 4 x 8 in. flight box.

** All winning teams will work with our awesome TechRise advisors to finalize their design and learn (or refine) the engineering skills needed to build their experiment. The education resources on the challenge site help teams explore possible components and are a great resource for this section. **

Section 3: WHY do you want to propose this experiment idea?

Explain your team's motivation behind proposing this experiment idea. Reasons may be related to:

- the impact building and testing this experiment would have on your school or team.
- the new knowledge or skills your team would gain by doing this project.
- building public awareness around a particular subject.
- the impact this experiment would have on space exploration, your knowledge of our planet, or on society as a whole.

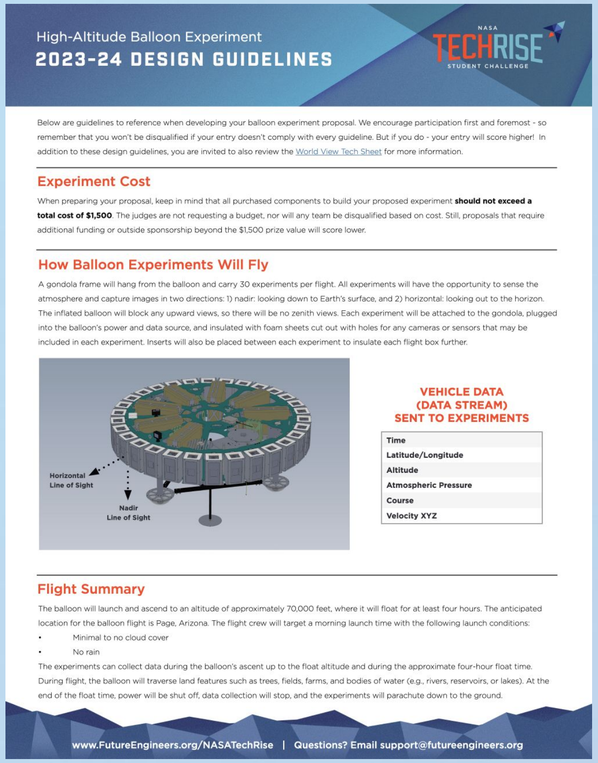
Once complete, the Team Lead (Teacher or School Employee) can submit the final proposal at:

https://www.futureengineers.org/NASATechRise

Design Guidelines

Review the Balloon Design Guidelines or the Rocket-Powered Lander Design Guidelines before submitting your proposal. A few examples include…

- Your experiment idea must be realistic so that it can be built within ~4 months
- Your experiment must fit in a 4 inches x 4 inches x 8 inches box
- Balloon experiments, including the flight box, screws, electronics, and all components inside, can weigh no more than 1 kilogram (2.2 pounds).
- Lander experiments can weigh no more than 0.5 kg (1.1 pounds).



High-Altitude Balloon Experiment

2023-24 DESIGN GUIDELINES

Below are guidelines to reference when developing your balloon experiment proposal. We encourage participation first and foremost - so remember that you won't be disqualified if your entry doesn't comply with every guideline. But if you do - your entry will score higher! In addition to these design guidelines, you are invited to also review the World View Tech Sheet for more information.

Experiment Cost

When preparing your proposal, keep in mind that all purchased components to build your proposed experiment **should not exceed a total cost of $1,500**. The judges are not requesting a budget, nor will any team be disqualified based on cost. Still, proposals that require additional funding or outside sponsorship beyond the $1,500 prize value will score lower.

How Balloon Experiments Will Fly

A gondola frame will hang from the balloon and carry 30 experiments per flight. All experiments will have the opportunity to sense the atmosphere and capture images in two directions: 1) nadir: looking down to Earth's surface, and 2) horizontal: looking out to the horizon. The inflated balloon will block any upward views, so there will be no zenith views. Each experiment will be attached to the gondola, plugged into the balloon's power and data source, and insulated with foam sheets cut out with holes for any cameras or sensors that may be included in each experiment. Inserts will also be placed between each experiment to insulate each flight box further.

VEHICLE DATA (DATA STREAM) SENT TO EXPERIMENTS

Time
Latitude/Longitude
Altitude
Atmospheric Pressure
Course
Velocity XYZ

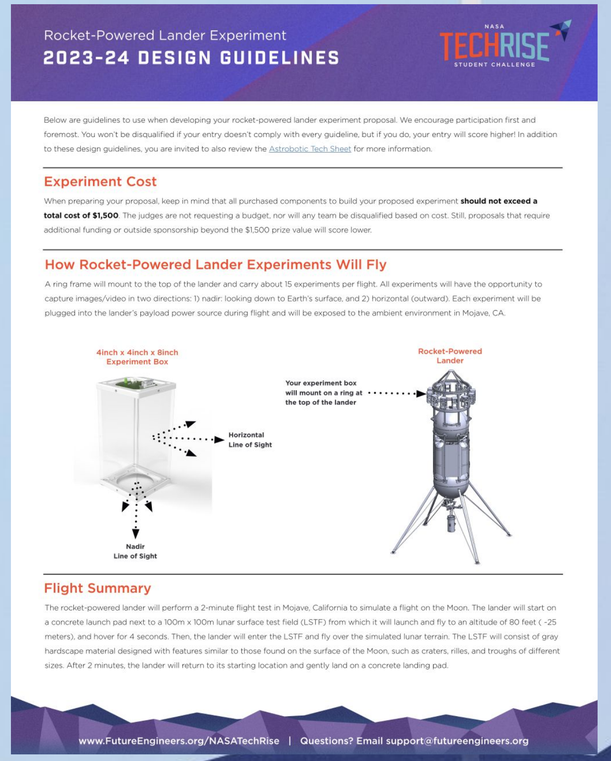
Flight Summary

The balloon will launch and ascend to an altitude of approximately 70,000 feet, where it will float for at least four hours. The anticipated location for the balloon flight is Page, Arizona. The flight crew will target a morning launch time with the following launch conditions:

- Minimal to no cloud cover
- No rain

The experiments can collect data during the balloon's ascent up to the float altitude and during the approximate four-hour float time. During flight, the balloon will traverse land features such as trees, fields, farms, and bodies of water (e.g., rivers, reservoirs, or lakes). At the end of the float time, power will be shut off, data collection will stop, and the experiments will parachute down to the ground.

www.FutureEngineers.org/NASATechRise | Questions? Email support@futureengineers.org



Rocket-Powered Lander Experiment

2023-24 DESIGN GUIDELINES

Below are guidelines to use when developing your rocket-powered lander experiment proposal. We encourage participation first and foremost. You won't be disqualified if your entry doesn't comply with every guideline, but if you do, your entry will score higher! In addition to these design guidelines, you are invited to also review the Astrobotic Tech Sheet for more information.

Experiment Cost

When preparing your proposal, keep in mind that all purchased components to build your proposed experiment **should not exceed a total cost of $1,500**. The judges are not requesting a budget, nor will any team be disqualified based on cost. Still, proposals that require additional funding or outside sponsorship beyond the $1,500 prize value will score lower.

How Rocket-Powered Lander Experiments Will Fly

A ring frame will mount to the top of the lander and carry about 15 experiments per flight. All experiments will have the opportunity to capture images/video in two directions: 1) nadir: looking down to Earth's surface, and 2) horizontal (outward). Each experiment will be plugged into the lander's payload power source during flight and will be exposed to the ambient environment in Mojave, CA.

Flight Summary

The rocket-powered lander will perform a 2-minute flight test in Mojave, California to simulate a flight on the Moon. The lander will start on a concrete launch pad next to a 100m x 100m lunar surface test field (LSTF) from which it will launch and fly to an altitude of 80 feet (~25 meters), and hover for 4 seconds. Then, the lander will enter the LSTF and fly over the simulated lunar terrain. The LSTF will consist of gray hardscape material designed with features similar to those found on the surface of the Moon, such as craters, rilles, and troughs of different sizes. After 2 minutes, the lander will return to its starting location and gently land on a concrete landing pad.

www.FutureEngineers.org/NASATechRise | Questions? Email support@futureengineers.org

Entries Due by Oct. 20, 2023, 11:59 PM PT

- A proposal needs to be written by students and submitted by a teacher/educator. All proposals must include the following sections:

- **WHAT** is your team's experiment idea?

- **HOW** do you imagine your experiment would work? What components and or technologies might you need to make it run?

- **WHY** do you want to propose this experiment idea? What impact will building and testing your experiment have on your school team? What impact will this experiment have on space exploration or your knowledge of our planet, or on society as a whole?