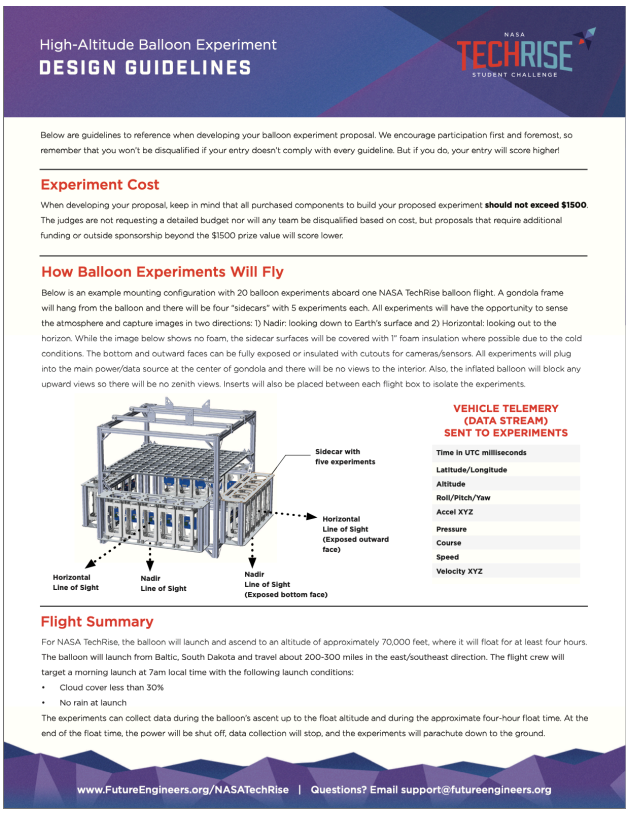
DESIGN GUIDELINES

The NASA TechRise Student challenge invites student teams to develop experiment ideas for either a suborbital rocket or a high-altitude balloon. Due to the uniqueness of this challenge, there are suborbital rocket guidelines and high-altitude balloon guidelines. Please select the vehicle type to below to view the guidelines applicable to your entry type.

Please click to view the
NASA TechRise High-Altitude Balloon Guidelines



High-Altitude Balloon Experiment
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!

Experiment Cost

When developing your proposal, keep in mind that all purchased components to build your proposed experiment **should not exceed $1500**. The judges are not requesting a detailed budget nor will any team be disqualified based on cost, but proposals that require additional funding or outside sponsorship beyond the $1500 prize value will score lower.

How Balloon Experiments Will Fly

Below is an example mounting configuration with 20 balloon experiments aboard one NASA TechRise balloon flight. A gondola frame will hang from the balloon and there will be four "sidecars" with 5 experiments each. 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. While the image below shows no foam, the sidecar surfaces will be covered with 1" foam insulation where possible due to the cold conditions. The bottom and outward faces can be fully exposed or insulated with cutouts for cameras/sensors. All experiments will plug into the main power/data source at the center of gondola and there will be no views to the interior. Also, the inflated balloon will block any upward views so there will be no zenith views. Inserts will also be placed between each flight box to isolate the experiments.

VEHICLE TELEMERY (DATA STREAM) SENT TO EXPERIMENTS

Time in UTC milliseconds
Latitude/Longitude
Altitude
Roll/Pitch/Yaw
Accel XYZ
Pressure
Course
Speed
Velocity XYZ

Flight Summary

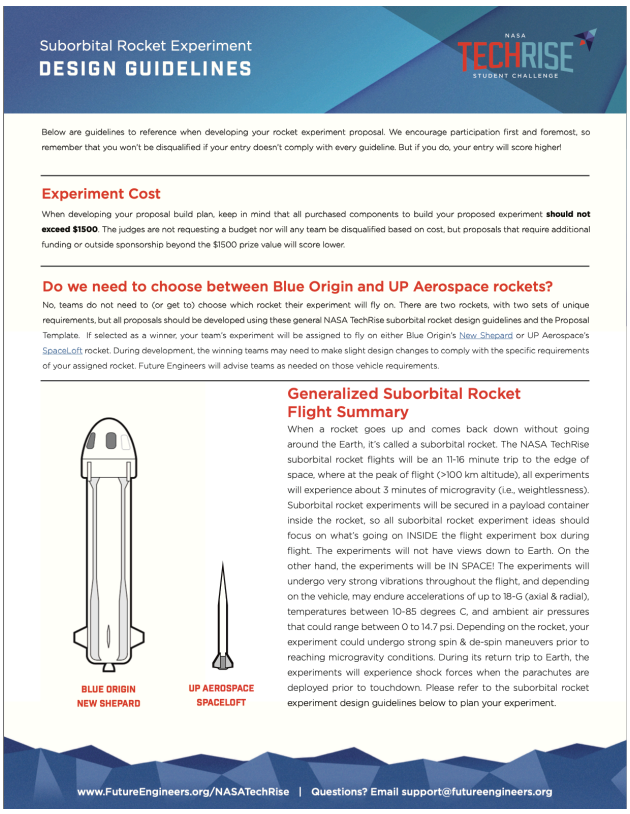
For NASA TechRise, the balloon will launch and ascend to an altitude of approximately 70,000 feet, where it will float for at least four hours. The balloon will launch from Baltic, South Dakota and travel about 200-300 miles in the east/southeast direction. The flight crew will target a morning launch at 7am local time with the following launch conditions:

- Cloud cover less than 30%
- No rain at launch

The experiments can collect data during the balloon's ascent up to the float altitude and during the approximate four-hour float time. At the end of the float time, the 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

Please click to view the
NASA TechRise Suborbital Rocket Guidelines



Suborbital Rocket Experiment
DESIGN GUIDELINES

Below are guidelines to reference when developing your rocket 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!

Experiment Cost

When developing your proposal build plan, keep in mind that all purchased components to build your proposed experiment **should not exceed $1500**. The judges are not requesting a budget nor will any team be disqualified based on cost, but proposals that require additional funding or outside sponsorship beyond the $1500 prize value will score lower.

Do we need to choose between Blue Origin and UP Aerospace rockets?

No, teams do not need to (or get to) choose which rocket their experiment will fly on. There are two rockets, with two sets of unique requirements, but all proposals should be developed using these general NASA TechRise suborbital rocket design guidelines and the Proposal Template. If selected as a winner, your team's experiment will be assigned to fly on either Blue Origin's New Shepard or UP Aerospace's SpaceLoft rocket. During development, the winning teams may need to make slight design changes to comply with the specific requirements of your assigned rocket. Future Engineers will advise teams as needed on those vehicle requirements.

Generalized Suborbital Rocket Flight Summary

When a rocket goes up and comes back down without going around the Earth, it's called a suborbital rocket. The NASA TechRise suborbital rocket flights will be an 11-16 minute trip to the edge of space, where at the peak of flight (>100 km altitude), all experiments will experience about 3 minutes of microgravity (i.e., weightlessness). Suborbital rocket experiments will be secured in a payload container inside the rocket, so all suborbital rocket experiment ideas should focus on what's going on INSIDE the flight experiment box during flight. The experiments will not have views down to Earth. On the other hand, the experiments will be IN SPACE! The experiments will undergo very strong vibrations throughout the flight, and depending on the vehicle, may endure accelerations of up to 18-G (axial & radial), temperatures between 10-85 degrees C, and ambient air pressures that could range between 0 to 14.7 psi. Depending on the rocket, your experiment could undergo strong spin & de-spin maneuvers prior to reaching microgravity conditions. During its return trip to Earth, the experiments will experience shock forces when the parachutes are deployed prior to touchdown. Please refer to the suborbital rocket experiment design guidelines below to plan your experiment.

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