Aerostar

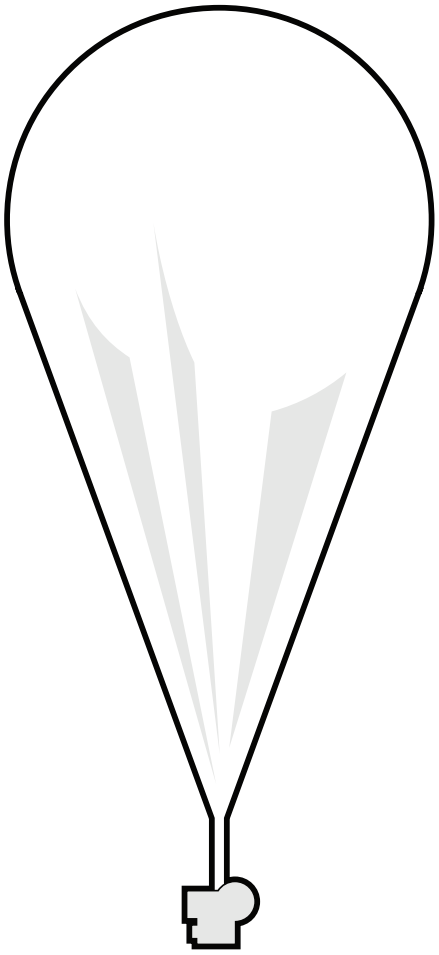
CYCLONE ZERO-PRESSURE BALLOON

NASA TECHRISE STUDENT CHALLENGE

Vehicle Summary

Aerostar's Cyclone zero-pressure balloon system is a rapidly-deployable balloon system capable of achieving altitudes from 50,000 ft – 130,000 ft with a wide variety of user payloads. For NASA TechRise, the balloon will launch and ascend to the NASA TechRise float altitude of approximately 70,000 feet. Once the flight vehicle reaches float altitude, the system takes advantage of stratospheric wind patterns to steer the balloon. Using altitude control maneuvers like venting lift gas (causing the balloon system to descend) or dropping ballast (causing the balloon system to ascend), the Aerostar flight engineer can find the best wind layer to steer the platform in the desired direction. Once the mission is complete, the Cyclone flight is terminated, and the payloads are cut away from the balloon and descend on a parachute for recovery by Aerostar flight crews. Aerostar's Cyclone zero-pressure balloon system will enable NASA TechRise students to conduct remote sensing and climate/atmospheric experiments.

Flight Integration Details



Aerostar Cyclone Zero Pressure Balloon

Requirements	AEROSTAR + NASA TECHRISE
Maximum Size	4 x 4 x 8 in (10 x 10 x 20 cm)
Total Maximum Weight	2.2 pounds (1 kilogram)
Provided Flight Box Weight	Approximately 0.5 pounds (230 grams)
Liquids	Yes; Up to 150ml non-hazardous liquid allowed
Biological Materials	No experiments that grow/monitor living organisms; Seeds or plant substrates (e.g., soils, artificial soils) are allowed.
Extra Batteries	No extra batteries; Please rely solely on the vehicle power.
Wireless Communications	No Bluetooth, Wi-Fi, cellular phones, or RF communications
Lasers	No lasers; However, sensors that use internal lasers to detect particles or gather other data (e.g., PM/air quality sensors) are allowed so long as students are not directly interacting with a laser and a laser does not transmit outside of the experiment.
Power & Data	
Voltage	9 V
Current	1.5 A
Vehicle Data	Vehicle data is streamed to each experiment as serial data
Key Event Triggers	No event triggers. Experiments must rely on the vehicle data stream or their own sensors for triggers, if needed.
Environmental Conditions	
Overview	Experiment is attached to a gondola frame and exposed to the environment, including ambient atmospheric temperature/pressure
Flight Path Characteristics	The flight path is expected to traverse multiple surface features such as vegetation (natural or agricultural) and/or bodies of water (e.g., rivers, reservoirs, lakes, other).
Launch Conditions	Morning launch; Minimal to no cloud cover; No rain
Float Altitude	Approximately 70,000 feet for 4 hours
Temperature	5C to -82C (However, since the payload will be insulated with some foam, we recommend components rated to -40 degrees C)
Line of Sight	Experiment will have line of sight in two directions during flight - down to Earth (nadir) and out to the horizon (horizontal)
Pressure	~4,400 Pa to ~100,000
Acceleration	Up to 6 g in any direction

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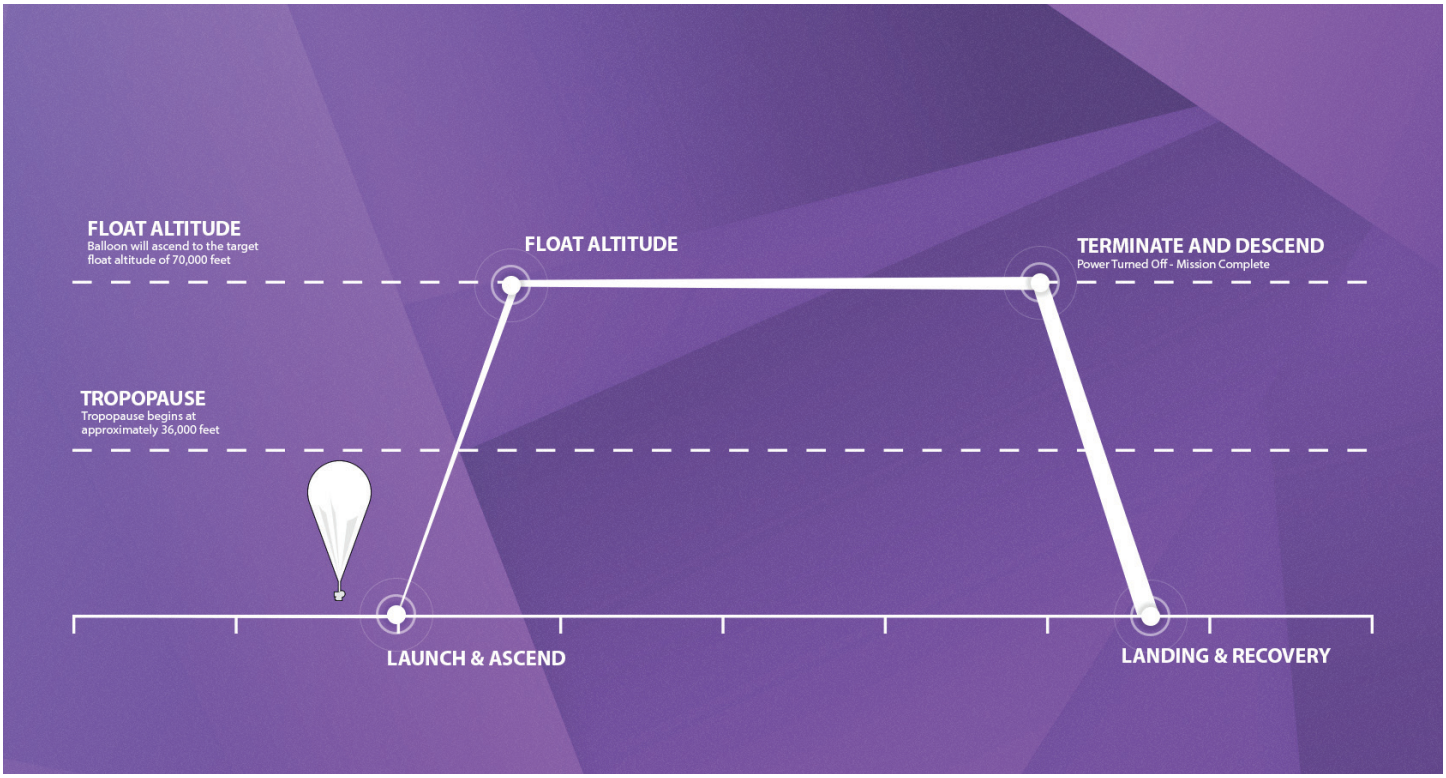
FLIGHT PROFILE



EXPERIMENT FLIGHT BOX

Winning teams will receive a flight box and a technical development guide to prepare for their balloon flight.

Maximum Size: 4 x 4 x 8 in (10 x 10 x 20 cm)
Total Maximum Weight: 2.2 pounds (1 kg)

FLIGHT PROFILE DETAILS

Prepare for Launch	Flight experiments will be powered on and readied for flight. Target launch time is in the morning.
Launch & Ascent	Experiments will ascend through the troposphere into the stratosphere for approximately 1 hour. During this time, experiments will be powered-on and can collect data.
Float Altitude	Upon reaching the target altitude of approximately 70,000 feet, the experiments will float and gather data for at least 4 hours.
Termination & Descent	After 4+ hours at float altitude, power to the experiments will be turned off, the balloon will release from the gondola, a parachute will deploy and the experiments descend.
Landing & Recovery	Experiments land, the location is tracked, and best efforts will be made to recover the experiments and mail them back to teams.

VIDEO

PHOTO