THE WEATHER BALLOON CHALLENGE

DESIGN GUIDELINES

Below are guidelines to keep in mind when making your Los Angeles (LA) data visualizatons and weather balloon payload. 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!

GOOD LUCK!

IMAGE GUIDELINES

You may submit up to 6 images. These are the images we hope to see in your submission:

- Data Visualization: Graph/Visualize an image of Los Angeles historical weather data over the past 20 years to explain LA weather/climate trends.
  - Example: Average annual temps in Los Angeles for the past 20 years.
  - Advanced Vizualizations may Include: High/Low Temperatues, Precipitation, Annual Comparisons to 20-year average or Other Data
  - In your text or image, describe if you think the climate in LA may change over the next 10 years. Why or why not?
- Photo/Image of your Weather Balloon Payload Before Your Drop Test
- Photo/Image of your Weather Balloon Payload After Your Drop Test
- Data Visualization: Graph/Visualize monthly Los Angeles weather compared to the monthly weather of another US city of your choice to understand their different regional climate factors.
  - Example: Average monthly temps of both cities in 2017 on the same graph.
  - Advanced Visualizations may Include: High/Low Temperatures, Precipitation, Other Years or Data.
  - In your text or visualization, explain the different climate factors of each city.
- Photo/Image of your Weather Balloon Payload Layout and Overall Design
- Additional/Optional Image of your choice.

Maximum 3MB file size per image. Accepted image formats: GIF, PNG, JPG/JPEG, BMP, or SVG. Please do not submit any images with faces!

DATA VISUALIZATION DESIGN GUIDELINES

FOR WEATHER BALLOON CHALLENGE

LOS ANGELES IS A BIG PLACE. WHERE ARE TEMPERATURES MEASURED?

We will use weather data from the National Weather Service's downtown Los Angeles station on the University of Southern California (USC) campus. (Data sets are provided on the next page). A fun fact about LA weather history is that the LA station moved in 1999 from a parking stucture to the USC location surrounded by greenery, which caused a shift in weather records! (https://www.jpl.nasa.gov/news/news.php?feature=1273).

PROVIDED WEATHER DATA SETS

We have collected annual and monthly weather data for Los Angeles from the National Weather Service (going back 20 years). We've also collected monthly weather data from a few cities that may be interesting comparisons for climate factors, but you are welcome to choose you own comparison city and gather your own data!

- Annual Weather Data in Excel
- Annual Weather Data from NOAA.gov in PDF Format
- Monthly Weather Data in Excel
- Monthly Weather Data from NOAA.gov in PDF Format

LOOK UP YOUR OWN WEATHER DATA SETS

https://www.ncdc.noaa.gov/cdo-web/

There are many ways to look up weather data, but this is where to get weather data from the US Government's National Oceanic and Atmospheric Administration. On this site, you may browse datasets by searching for a city, choosing a data range, and choosing the data type. It wll ask you to put the data request in your cart, but it is free to check out. The data you order from your cart will be emailed shortly thereafter.

WANT TO KNOW MORE ABOUT WEATHER DATA AND CLIMATE FACTORS?

Check out our Weather Science Lessons and Power Point Slide Decks. They are aligned with Middle School Weather Standards, but are informative for all ages!

LOS ANGELES IS A BIG PLACE. WHERE WILL THE BALLOON LAUNCH?

We cannot launch downtown. We will launch in the outskirts of LA County amongst trees and foothills. Yod do not need to design for an ocean landing. We will not launch if there is an offshore wind.

PAYLOAD DESIGN GUIDELINES
FOR WEATHER BALLOON CHALLENGE

ONBOARD COMPONENTS, SIZE, AND WEIGHT

Our weather balloon launch must comply with Federal Aviation regulations, including requirements that the entire payload (everything suspended from the balloon) should weigh no more than 4 pounds. For your prototype and test, we have provided "paper and penny mockups" of the onboard components that you can print, cut, fold and stuff with pennies to simulate size/weight of each component. More detail about each component is provided below. Your design should include a payload frame or housing (made of recycled materials) that can hold all of the onboard components, EXCEPT the parachute. Since the parachute is 75 grams (0.17 lbs), the total weight of your frame and all onboard components EXCEPT the parachute should be 3.83 lbs.

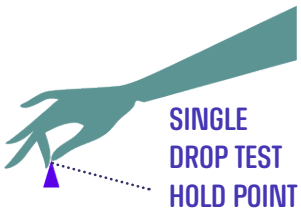
- Flight Computer with Temp & Pressure Sensor (Mounted to Monitor the Atmosphere)
- Battery Pack for Flight Computer
- GPS Tracker
- Camera and Camera Mount (Mounted to See the Earth's Horizon)
- Audio Beacon and Battery
- Parachute (NOT part of mockups. It will attach separately to the cord/string)

MATERIALS:

To build your payload, you may use any LA Blue Bin recyclable materials combined with any fasteners, adhesives, or string of your choice. The payload doesn't need to be rainproof, but it does need to withstand wind and humidity and landing anywhere the wind blows it. LA recyclable materials can be found here: https://bit.ly/2qx3JsC

SINGLE ATTACHMENT POINT:

For the launch, we will use a 350g helium-filled weather balloon. A single string will connect the balloon to your design, so you need to build ONE attachment point for your design to connect to our balloon. Our hope is to have stable video during ascent (that is not spinning around like crazy!)



SINGLE POINT FOR DROP:

To test for strength and balance, your payload should survive an eight foot drop test without flipping or damaging the paper mockups of the components. For the drop test, one hand should hold the payload where it would attach to our balloon. The bottom of the frame should be at least 8ft high before drop. NO ADDITIONAL PARACHUTES. We will already have one on the balloon cord.

PAYLOAD COMPONENTS: FLIGHT COMPUTER & TEMP / HUMIDITY SENSOR

Computer & Sensor: 48 grams (.1 lbs) Approximately 65mm x 65mm x 18mm

Battery Pack: 45 grams (.1 lbs) Approximately .75in x 2.5in x 1.9in

FLIGHT COMPUTER PAPER MOCKUP PRINT OUT

BATTERY PACK PAPER MOCKUP PRINT OUT

- Flight Computer: Records date, time, altitude (how high it is), ground speed (equivalent to wind speed because your payload drifts), direction of travel (0-359 degrees on a compass), latitude, longitude and satellite lock status.
- Powers a sensor that record temperature and pressure. Reads temperatures as low as -60 C / -76 F and pressure as low as 1000 Pa / 0.140 psi.
- Powered by a AAA battery pack.

PAYLOAD COMPONENTS: CAMERA & MOUNT

289 grams (.6664 lbs) Approximately 74mm x 74mm x 46mm

CAMERA & MOUNT PAPER MOCKUP PRINT OUT

- Records video (so you can see Earth from up high!)
- The paper/penny mockup approximates the volume and weight of the Hero7 camera and mount together all in one.
- Future Engineers will select the final camera mount type dependent on the winning design, but we approximated the weight of the wrist/arm strap for most flexibility.

PAYLOAD COMPONENTS: GPS TRACKER

102 grams (.22 lbs) Approximately 51mm x 68mm x 21mm

PAPER MOCKUP PRINT OUT

- A tracking solution for balloon flights and recovery
- Communicates directly with satellites in orbit allowing you to track your payload just about anywhere on (or off) the planet.

PAYLOAD COMPONENTS: AUDIO BEACON AND BATTERY

65 grams (.14 lbs) Approximately 28mm x 76mm x 28mm

PAPER MOCKUP PRINT OUT

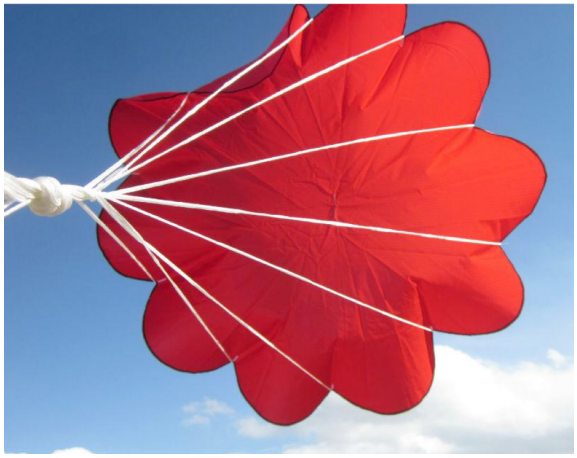
- Uses sound to help locate and recover payloads. It will transmit a loud beep allowing you to easily hone in on your payload's location even in the dark! The beeper is powered by a 9v battery that straps next to it.
- Mockup includes volume and mass of audio beacon plus the 9 volt battery

PAYLOAD DESIGN GUIDELINES
FOR WEATHER BALLOON CHALLENGE

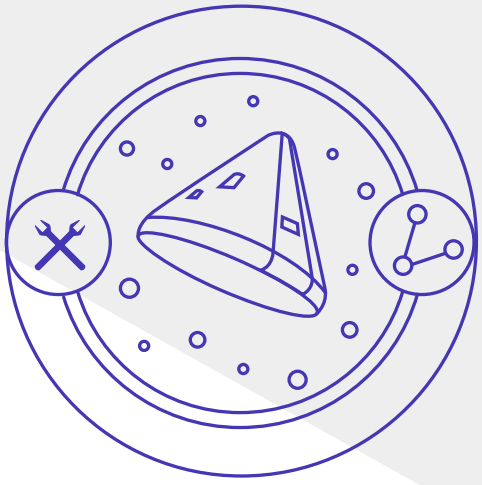
PAYLOAD COMPONENTS: PARACHUTE

75grams (0.17lbs)

NOT ATTACHED TO YOUR PROTOTYPE PAYLOAD FRAME



- Once, the balloon bursts, the parachute deploys to slow down the payload's descent.
- This helps the payload instruments land safely for re-trieval.
- For launch, the parachute will be attached to the balloon's cord (below the balloon) and should NOT be included in your submitted payload design.



Just a reminder that we reserve the right to tweak, edit, or re-create all submissions for our program needs - i.e. make sure its perfect for launch.

WE CAN'T WAIT TO SEE YOUR DESIGN !!