No Heat Shield
Honorable Mention
for
NASA HUNCH
Design and Prototyping 2021

Congratulations for being chosen to receive an Honorable Mention for NASA HUNCH Design and Prototype 2021. This is to provide more praise for those who have done significant design and testing. Take pride in knowing that your work demonstrated many significant innovations and ideas. HUNCH recognizes that your team put a lot of thought and time into your design and testing. You had multiple prototypes you worked through, completed several interesting ideas, did testing with each prototype, demonstrated a deeper knowledge and skill in CAD.

Although you are not being invited to the Final Design Review, your work will remain on the HUNCH design and prototype page where it will continue to show the hard work your team put into the project.

Further Development

We are looking into using Carbon-Fiber tubes as the frame material. Another point of improvement the payload and payload housing.

Outside Research Sites

NASA

https://www.nasa.gov/

Aerospace

https://aerospace.org/

The University of Tokyo

Center for Aviation Innovation Research

http://aviation.u-tokyo.ac.jp/

About Team TARP

Based at CCHS, Team TARP specializes in aerodynamics and dropping stuff. Some notable drops include: Dylan's monitor, TARP, and pretense.

Aaron Edwards Carter Hewett Dylan McElroy

Contact Team TARP

Clear Creek High School

Advisor: Ms. Elizabeth McCarty

2305 East Main Street

League City, Texas 77573

Phone: (281) 284-1700

Email: emccarty@ccisd.net

Dylan McElroy:damcelroy03@gmail.com

Carter Hewitt: shatteredpoems@gmail.com

Aaron Edwards: ajedwards827@gmail.com

TARP:
The Atmospheric Reentry Parachute

A NASA 2021 Hunch Project

The Problem:

When in orbit, a space craft is circling the Earth at around 17.500 miles per hour. Returning from space through Earth's atmosphere usually requires a heat shield to protect the occupants from the excessive temperatures generated as the friction of the air particles slow down the space craft. These heat shields are costly to make and are usually single-use.

The Hypothesis:

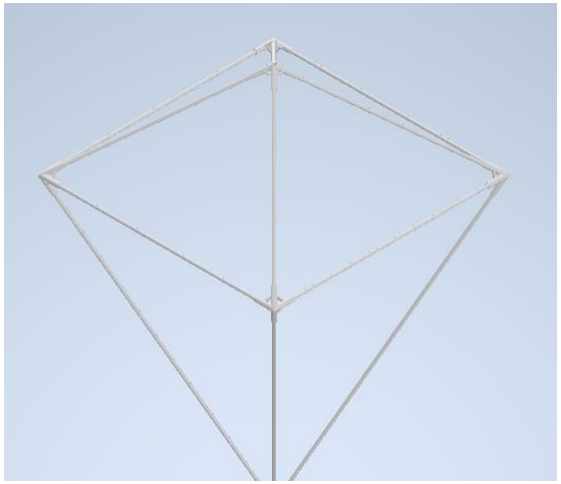
Dr. Shinji Suzuki suggested that an object with a small amount of mass and a large amount of surface area could be released from orbit and return to Earth without burning up. His initial proposal was to use paper airplanes but NASA wanted a more accurate testing device.

Our Solution:

We have designed a testing device that can be released from anywhere in the atmosphere to prove the idea that a low mass, high surface area object will not burn up in re-entry with no heatshield. It will have an electronic package attached to transmit location data to be tracked. It has been calculated to have an approximate terminal velocity of 4.25 m/s.

Our Design

We designed TARP to be a lightweight rectangular pyramid unmanned parachute that can operate even in the upper atmosphere. It has a fixed-support-frame to ensure that no matter which way it is dropped it will always right itself and operate as it was intended.



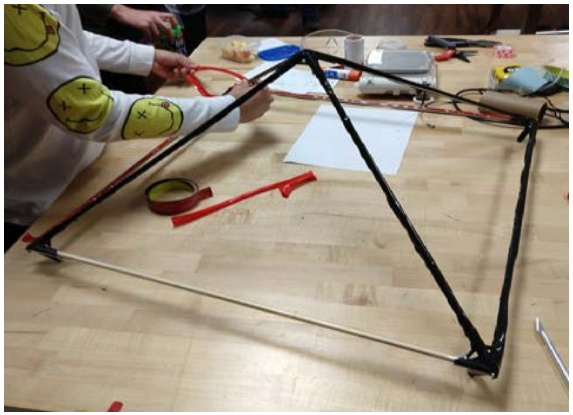
The Ideas Behind TARP

The Plan: TARP was designed with the idea of easy manufacture and assembly in mind. The parts necessary to make it are all off the shelf materials with the exception of the 3D printed corner joints.

Easy to build: The assembly is extremely easy well. The rods only have to be cut down to the proper length and the parachute material only has to be cut down as well. Once that is all done, the pieces simply attach together.

Cheap to Build: The re-entry device is relatively cheap to make with the electronics being $44.55 and the carbon fiber tubing and mylar sheets being $9.625 per ft for .31"OD and $0.265 per sq.ft respectively.

One Time Build: This design was made to be a single use device but it could potentially be used multiple times with minimal repair depending on weather and terrain conditions.



We are working on Earth to prepare for Mars.

NO HEAT SHIELD PROJECT

iSchool of Lewisville

Contact Us

bg6770@students.responsiveed.com
or
ns1443@students.responsiveed.com

ABOUT OUR PROJECT

Our glider is a simple, lightweight, item that descends through the atmosphere without burning up. It can be built by using simple and common material that anyone can buy. And by using simple Arduino-compatible components it is able to take in information and transmit it at a frequency of 433MHz. This makes it capable of being used as a temporary atmospheric probe to transmit atmospheric data.

OUR MAIN MATERIALS

CARDBOARD SHEETS

We use cardboard sheets to construct the main body due to it being lighter than the other materials we have considered and after receiving feedback from Glen Johnson that said to go for something light.

ARDUINO COMPATABLE

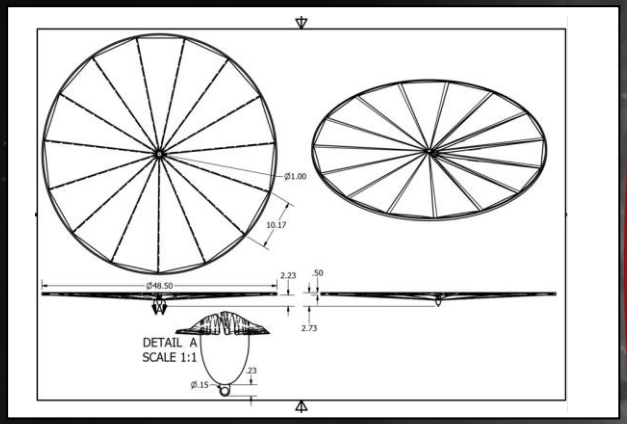
All of our electronics from the sensor to the transmitter are fully Arduino compatible in order to make sure that everything runs smoothly.

SOLDERING KIT

Although the majority of our electronics can be connected through pins, inputs, and female-to-male jumper wires, soldering is required to connect specific components to the rest of the system

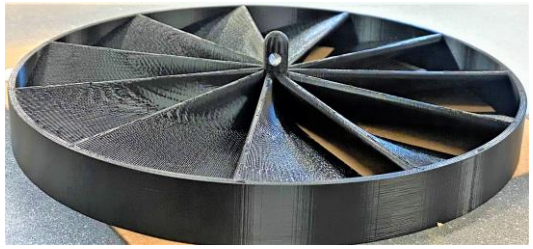
Why was this project requested?

Nasa discovered that dust particles from space can travel back into the earth's atmosphere without burning up. So, they wanted to see if we can design a prototype that can successfully re-enter the atmosphere without the use of a heat shield and without burning up.



Objective/ problem statement

We are tasked to design a payload that is reentering the atmosphere without the use of a heat shield, due to money costs, a heat shield may not be used. It is proven possible that you can reenter the atmosphere without a heat shield. The object we designed will collect and provide data as well as carry a microchip and a special location device that will provide a location every 10 minutes while in space and every 60 seconds when hitting the pressure point of the atmosphere so we can accurately track if our design made it thru the reentry of the atmosphere successfully and it will give us a more accurate location.



What is Heat Shielding?

Objects re-entering the athmosphere are using a heat shield, a heat shield is needed to utilize aerodynamic drag during re entry. The force is significantly greater during re entry compared to launch. The athmosphere is on average 56 Fahrenheit, due to the increase in force during re entry the tempature can increase up too 3000 Fahrenheit. Because space crafts are very heavy, they have no option but to use a heat shield.

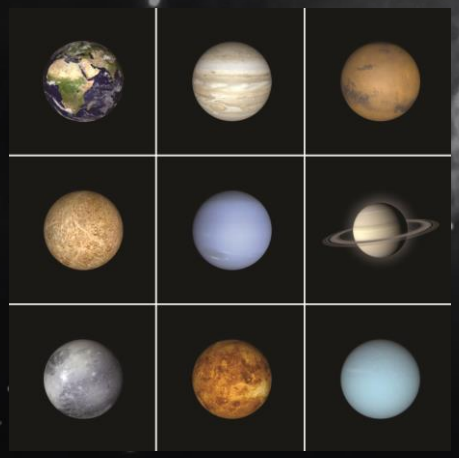
PROTOTYPE 1 (LEFT), PROTOTYPE 2 (RIGHT)

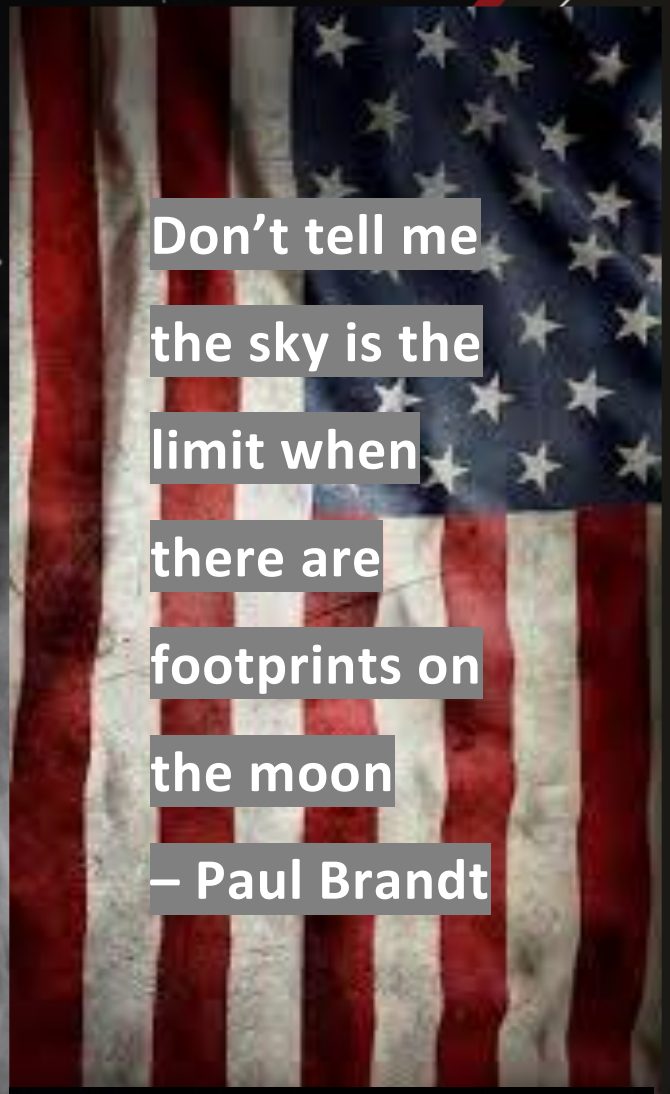
AFTER CREATING PROTOTYPE 1 WE NOTICED THAT WE NEEDED MORE STOPPING POWER. WE DESIGNED A SECOND ONE AND MOVED THE BLADES CLOSER TO OPTIMIZE STOPPING POWER AND ROTATION ENERGY

Future Goals/Objectives:

Our goal is to make a difference in the future, our objectives are trying to reenter the atmosphere without a heat shield and help with the exploration of mars and other planets.

We believe our project can make a difference in collecting data from unexplored planets to help the future of **Space Exploration**. Our hope is that we can turn our project into a weather data collector or potentially fit a little camera and send it towards unexplored planets.





Don't tell me the sky is the limit when there are footprints on the moon

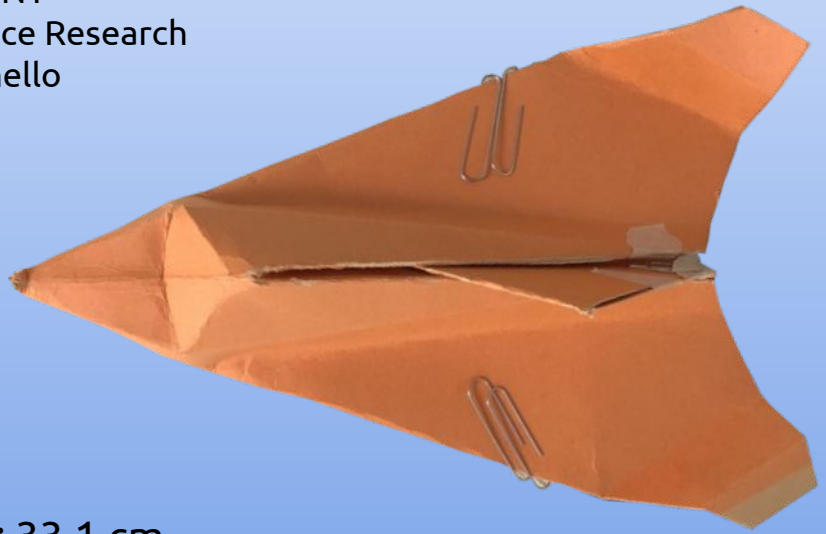
– Paul Brandt

NO HEAT SHIELD

No Heat Shield

Group Members
Wyatt Mortimer
Ken Meyers

Fairport High School
1 Dave Paddock Way,
Fairport, NY
Nasa Space Research
Mr. Stornello



Length: 33.1 cm
Width: 23.2 cm
Height: 9.0 cm

Pros

- Lots of space for electronics
- Flat areas where solar panels could fit.
- Has things that can be adjusted
- Flies stable when properly balanced

Cons

- Multiple Layers add weight
- Needs to be balanced
- It is difficult to fold

Future plans

- Balance the plane better
- Figure out which size batteries and solar panels are needed
- Test if airtight container for electronics is needed

Cypress Springs High School

Industrial Technology

Engineering Design II

Cypress Fairbanks ISD

Cypress, Texas

NASA HUNCH PROGRAM

Pods dream

Team members:

1. Abigail Orellana

Instructor:

Steven Marcus

HUNCH Advisor/Mentor

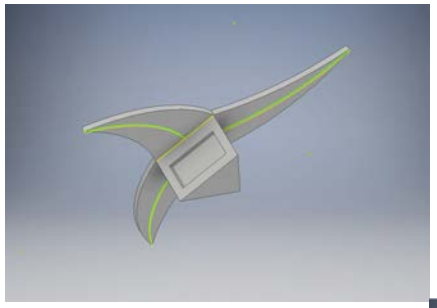
Glen Johnson

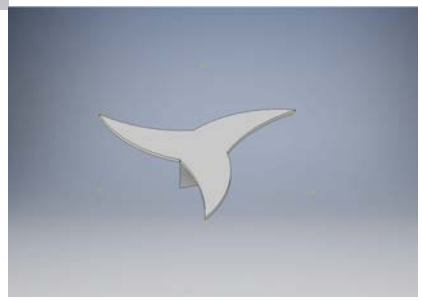
Engineering Design II

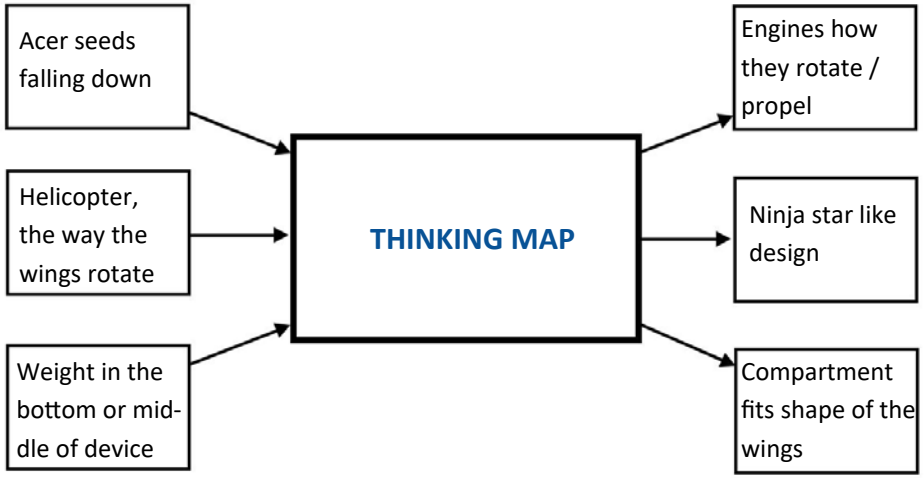
Cypress Fairbanks ISD

Cypress, Texas

No Heat Shield







GENERAL INFORMATION:

Star pod was made to track the orbit while using solar panels and batteries for back-up.

OBJECTIVES:

Create a device that allows electronic tracking to track orbital positioning .

MATERIALS:

Carbon

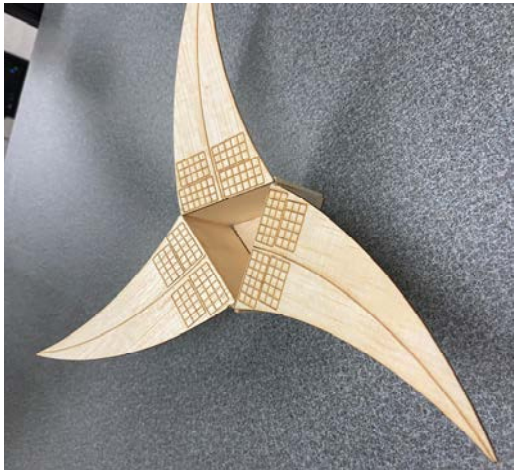
(Balsa wood exoskeleton)

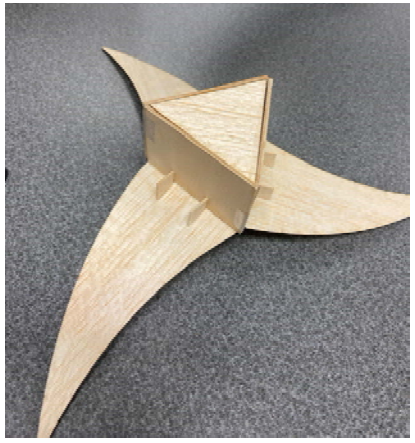
SOLUTIONS:

The device is made to look like a ninja star, there is a compartment that will hold the electronic packaging and around the device there will be solar panels.

CHALLENGES:

The difficulties I had during the project was trying to find a design that would fit best. Although I also struggled with how I was going to start the design was the main problem that needed a solution.





E-mails:

Abigail Orellana - orellanaabby06@gmail.com

Information :

I am a high school senior at Cypress Springs High school and I have an unreasonable liking to math. I'm going to major in Electrical engineering and will one day be an Electrical engineer. Please enjoy my device and its lack of originality. Its okay it’s a joke. Thank you fro your time in viewing my brochure.