No Heat Shield

Finalist List

for

NASA HUNCH

Design and Prototyping 2021

Congratulations for being chosen as a Finalist for NASA HUNCH Design and Prototype 2021. Your design was chosen as a Finalist because your team has fulfilled all or most of the requirements for your project along with quality in design and manufacturing the prototype. Your team demonstrated good testing of your prototype and knowledge of the problems and extensive understanding of the environment for your project. There was a lot of really amazing competition for these spots and all people from the semi-finalist

By being a Finalist means that you are a winner but this does not mean your idea will fly to space. This is real engineering. Although it is possible the reviewers could see one design that is exactly what they want, it is more likely NASA may choose one or a few ideas from each team to incorporate into a different design. It is also very possible that requirements or needs have changed since the beginning of the school year and they are not interested in the idea at this time. This is the nature of engineering but it does not diminish your accomplishments.

Design to Flight

The goal of HUNCH is to keep your names attached to these ideas and to have you assist with later developments of your projects when possible. Your projects and information will be provided to Mike Bennett who runs the HUNCH Design to Flight program that will coordinate the sending of your ideas to the engineers as they request it and working with your team to give engineers assistance whenever possible. This might include updating or making new CAD drawings, assembly of prototypes, choosing flight components and/or assisting with presentations. You will receive an email through your teachers in the coming days requesting specific information about your project.

Patents

In general, NASA does not seek patents on materials that are only related to space, however, if there are other potential uses for the device or ideas related to Earth bound applications, HUNCH will ask NASA Tech Transfer to assist in working through patent process. It is our goal that students and schools are included in any patents with as much credit as possible. We do not anticipate this as an income generator but more as value to your resumes.

Presentations:

General:

- Practice your presentation.
- Look sharp and professional.
- Everyone from the team should talk.

- Briefly introduce yourselves including your name and grade and school and state.
- Reviewers will already be aware of the problem and the constraints– I'll take care of that.
- Start with a demonstration of your prototype and briefly describe the testing that has been done.
- Point out details that make your design innovative, more robust, cleanable, repairable or desirable.
- Mention one or two things that didn't work initially but you were able to make changes and move forward.
- Briefly talk about how your prototype is different from the final product would be and include the materials you think will be used on the design that would fly to space.
- Answer questions quickly and concisely but completely so you can answer more questions and receive more comments. If you don't know something, say that you will have to check on it and plan to get back with them with an answer by email.
- Relax. These people are interested in what you have to say and know what its like to be on the spot.

Specific to No Heat Shields

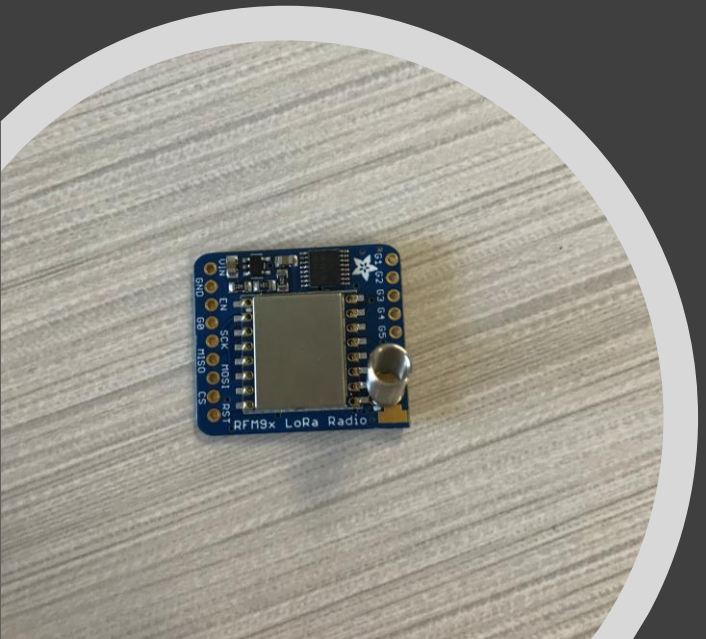
- This is a fairly new idea at NASA. Large surface area and small mass is the main concept with a radio transmitter that lets us know its survivability.
- Show simplicity of design both in the aero surface and the electronics package. COVID has prevented purchase of some of the transmitters you wanted but know all about what would make the desired transmitter the best option that will be successful.
- How might your device be deployed from a space craft or the ISS?
- You will be giving your talk with the other Finalists on **April 30—12:30 to 2:00 CT**
  I will be sending out invites for a Microsoft Teams meeting in the next couple of days to the teams.

No Heat Shield

- Cole Valley Christain School
- Teacher: Julie Morgan
- Team: Ellison Daniel, Alex Smith

MECHANICAL DESIGN:

- This project is designed to gracefully tumble though the atmosphere from any angle. It has as drag coefficient of 1.176, where a solid object of similar mass has a drag coefficient of 0.14. It is also designed to fold so that it can be as small as possible before deployment.



Electronics Package

- (top left) For our electronics package we have decided to use 4 solar panels, a lightweight GPS module, a small battery, and a transmitter.

Components

- HC-12 transmitter transmits a signal approximately 725ft (220m) though buildings. With the HC-12 transmitter, the signal drops 10 db per 100 ft.
- Each solar panel produces 30 mA.
- We are using a 500mAh battery to power the transmitter when the solar panels.
- With a 500 mAh or a 3.7 V battery while GPS was transmitting for twenty-five minutes, the battery only drained to 3.54 V without solar panels connected.
- Our electronics package can withstand and continue to transmit from 0 to 106 degrees Celsius.

Our Team

- Alex (left) mainly worked on the CAD design of our prototype. Ellison (right) mainly worked on the electronics, planning, and testing for this project.

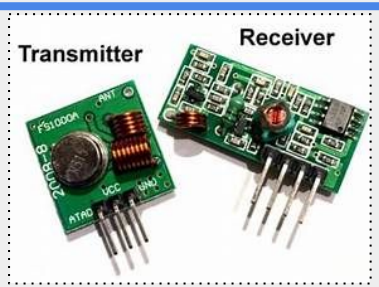
No Heat Shield

School: Council Rock South
Teacher: Mr. Bauer

MARS 1

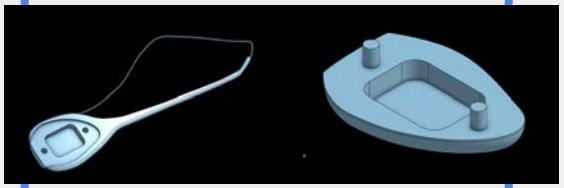
The Prototype

Our project is based off a maple seed and is made to copy the vortex spin of the seed in order to slow it down upon reentry enough so that a heat shield is not necessary to keep it from burning up. It also has an electronic payload which will broadcast a ping frequently so that the prototype can be located as it descends.



Constraints and requirements

- 200 gram electronic payload including radio
- Transmit 437 MHz
- Antenna 6 .42”
- Send a ping every 10 seconds
- Light with a large surface area to reduce friction



Team

Demetra Kohart
Landon Hennicke
Sabrina Adler
Vincent Chiccarine
Matt Floyd
Ben Hogan
Kari Johnson
Greg McDonald
Zachary Miller
Anvitha Naikoti
Joe Salevsky
Matt Staller
Gracie DeSaro
Isabella Francisco

MARS 1

- Designed to mimic a maple seed
- Curved to refrain from pointy edges
- Designed to slow itself down to not burn up in the atmosphere
- 3D wing shape to mimic airfoils
- Tested vie drone drop of 400 ft

MARS 2

- Designed to mimic a maple seed
- More straight stem with a sharper, angled spine
- Designed in Onshape by tracing an image of a real maple seed
- Tested via drone drop of 350 ft

Future Improvements

- Experiment with triboelectric nanogenerators
- Harness the static energy being stored in the seed on descent
- Similar to how a helicopter generates a lethal voltage during flight

Materials

- RF 433 Transmitter
- Recommend use of
  - Titanium Alloys
  - Carbon Composites
- Used materials
  - Monocoat
  - Plywood/balsa wood

Our Team

Top (left to right): Matt Gorton, John Greener, Rick Hamilton

Middle (left to right): Emily Anne Matheson, Tyler Fiore

Bottom (left to right): Shriya Sivakumar, Kyle Hughes

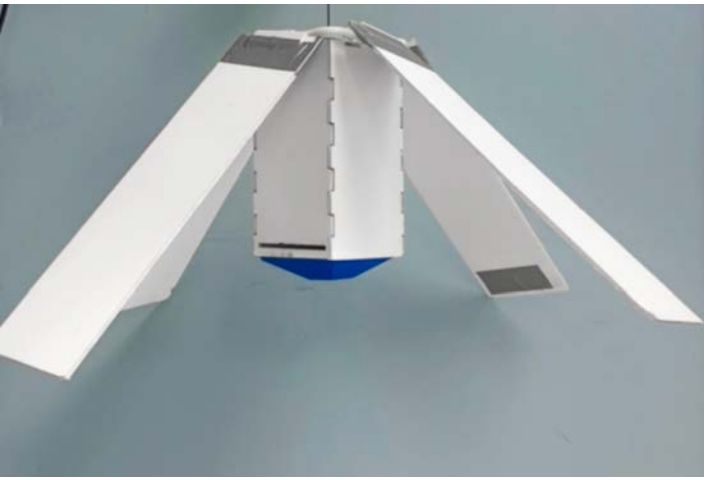
Contact Us

tricountyhunch@gmail.com
(508) 528-5400

Sharks No Heat Shield

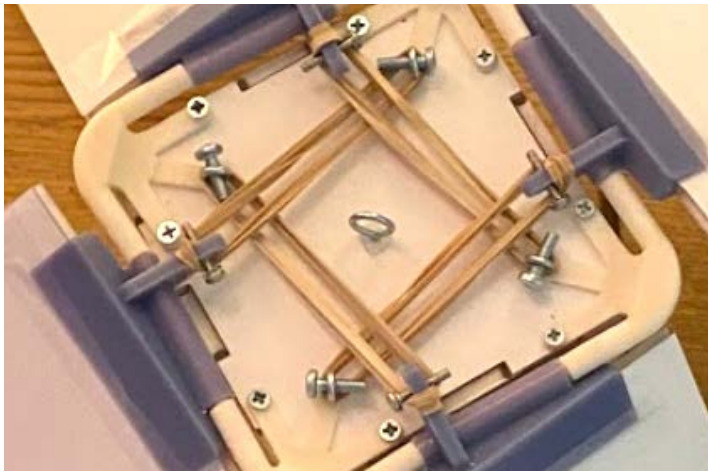
Tri-County RVTHS, Franklin MA

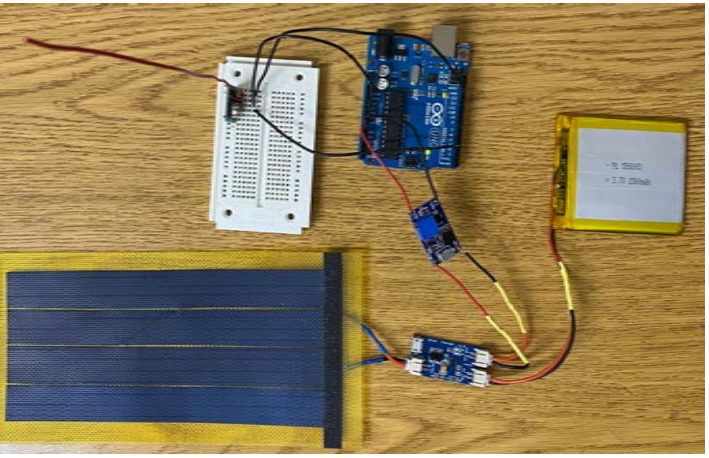
Advisor & Teacher: Kristen Magas



VEHICLE: HELICOPTER

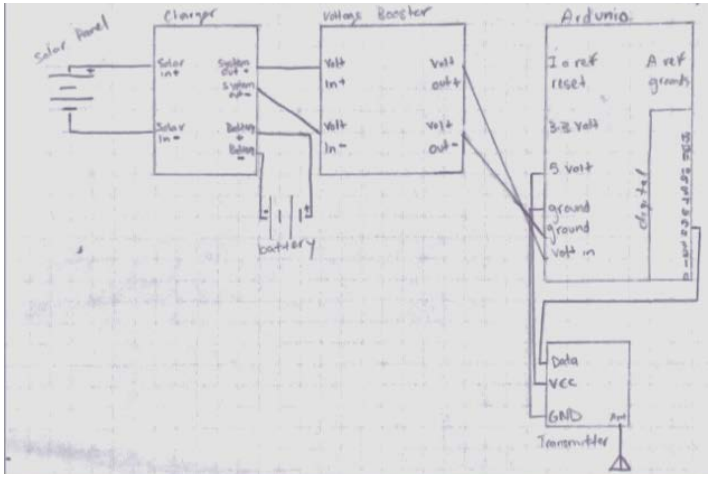
4 attached helicopter blades provide drag to slow down while rotating the body to increase stability. The blades fold down for compact storage on the carrying spacecraft and automatically deploy after being released. The body of our design includes a spacious 5x5x10" inch box for the electronic transmission components and additional experiments if desired. The sides of the storage compartment will contain the solar cells.





ELECTRONICS: WSPR

Solar panels built into the sides of the helicopter body power a charger for the battery. The battery runs through a voltage booster which increases the battery's voltage to 5 volts. The transmitter uses the WSPR protocol to send GPS location to a receiver and WSPR.net. WSPR allows a small circuit of under 150 grams to transmit signals at distances of up to 300 km using low power.



Our Project Design Evolution

Prototype 1 (left):

- Front heavy, too bulky
- 9.1oz
- Fuselage length > wingspan
- Very few curves in design

Prototype 2 (mid):

- Mirrors design of original mockup
- Much lighter, w/ stronger styrofoam
- 6.3oz lighter than first design
- To small to carry package (inside)

Prototype 3 (right):

- Increased wingspan, smaller fuselage
- Weigh's ⅔ of 1st prototype
- Hollow fuselage
- Hold's package and maintains airtime

NASA HUNCH

QUESTIONS?

Email us at ghsheatshield@gmail.com or visit our website at https://sites.google.com/inst.hcpss.org/ghsnoheatshield

Glenelg High School

No Heat Shield

By: Jonah Wisniewski, Evan Whatley, David Richman

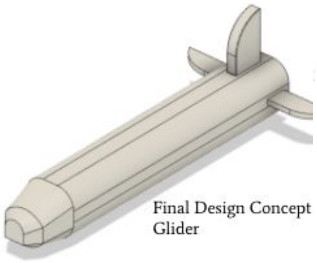
Background:

NASA's heat shields are very expensive and come with a lot of issues, we were tasked to find a solution for a spacecraft to enter the atmosphere withstanding high temperatures and the atmospheric pressures while sending a signal to earth recording different data points such as location, pressure, and time

CAD

Cons: Body Nose is too large/front heavy. Intended to hold package. Package adds additional weight to front

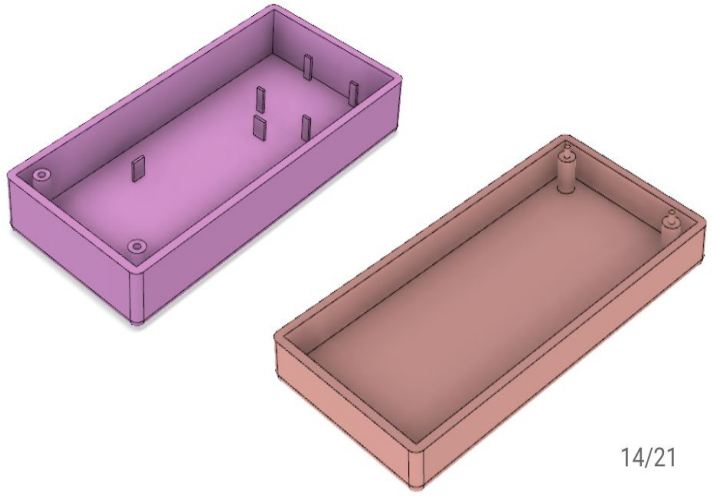
Much longer wingspan. Intended to stabilize excessive weight in front. Cons: The longer wing design adds to weight. Also lacks winglets.



Pros: Nose is domed to decrease drag. Much narrower and sleeker. Lightweight. Stabilizers modeled after mockup.

Wings more aerodynamic and lighter. Added winglet to decrease drag. Wing is also shorter and lighter.

Transmitter and Receiver



The completed circuits for our transmitter and receiver electronics packages. Both have an Arduino UNO, a breadboard, and three wires. One has a transmitter module and one had a receiver module. The transmitter assembly will be attached to the glider and send a pre-designated signal to the receiver assembly, which will relay the message to a computer. This pair only works as a proof-of-concept for the tracking system a glider in space would need and does not broadcast the location, only a message.

Transmitter Testing

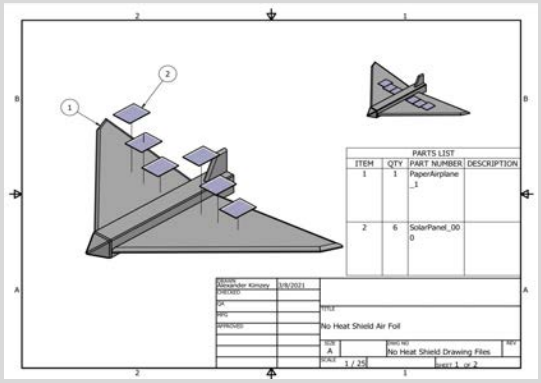
Trial	Message (Character Length)	Delay Time (s)	Distance (m)	Received?
1	28 characters	20.0s	100	Yes
2	28 characters	20.0s	200	Yes
3	28 characters	20.0s	300	Yes
4	28 characters	20.0s	400	Yes
5	28 characters	20.0s	500	Yes
6	28 characters	20.0s	600	No

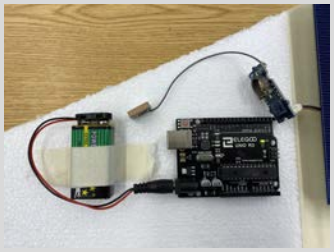
```
sketch_NHS_transmitter §
// GHS EDD No Heat Shield
#include <RH_ASK.h>
#include <SPI.h>

RH_ASK driver;
void setup()
{
 Serial.begin(9600); // Debugging only
 if (!driver.init())
 Serial.println("init failed");
}
void loop()
{
 const char *msg = "Hello There, General Kenobi!";
 driver.send((uint8_t *)msg, strlen(msg));
 driver.waitPacketSent();
 delay(20000);
}
```

No-Heat Shield Company

(No Heat Shield; Hunch Project)





Team members:

Jose De Leon

Alexander Kimzey

Jose Rojas Rojas

Details:

Our project will focus on creating a prototype that could possibly reenter the earth's atmosphere without the need for a heat shield, we will also collect data to help with creating an effective model that could be used.