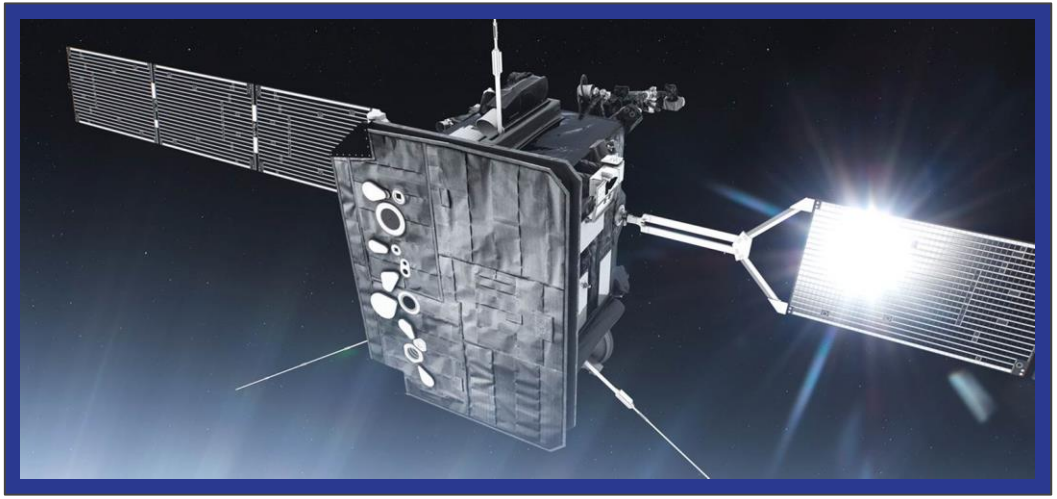
2017 HSIC Challenge

Team Throwing Shade - PVPHS

OUTLINE

- Challenge
- What Is A Solar Heat-Shield?
- Design Process
- Project Schedule
- Budget
- Work Division
- Design



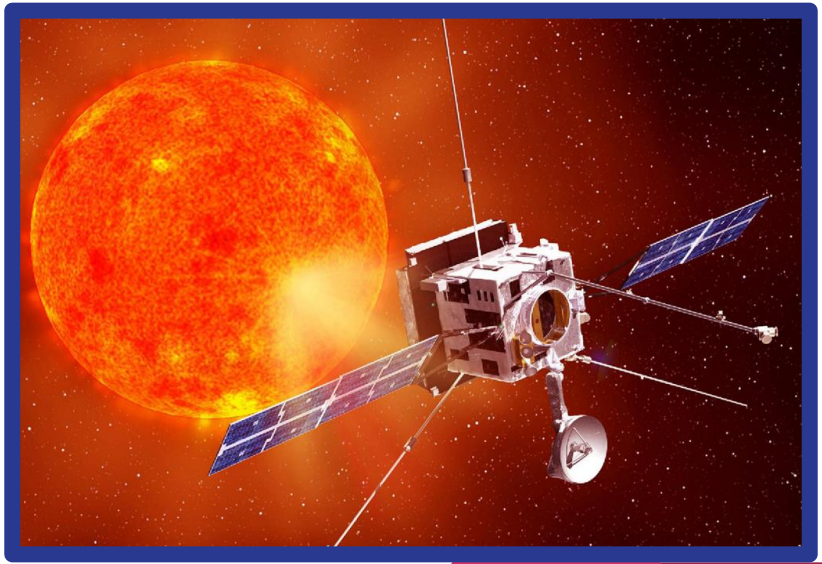
CHALLENGE

To Build a Solar Heat-Shield:

- Weight-efficient and under 20 lbs
- Stay under the $500 budget
- Begins in a 6” by 6” box
- Deploys a self-supporting structure which:
  - Shades the largest area
  - Doesn't touch the floor
  - Deploys in less than 10 minutes

WHAT IS A SOLAR HEAT-SHIELD?

- James Early first introduced the idea 1989.
- Protection from the rays of the sun.
- Climate engineering
- Diverts radiation from sun.



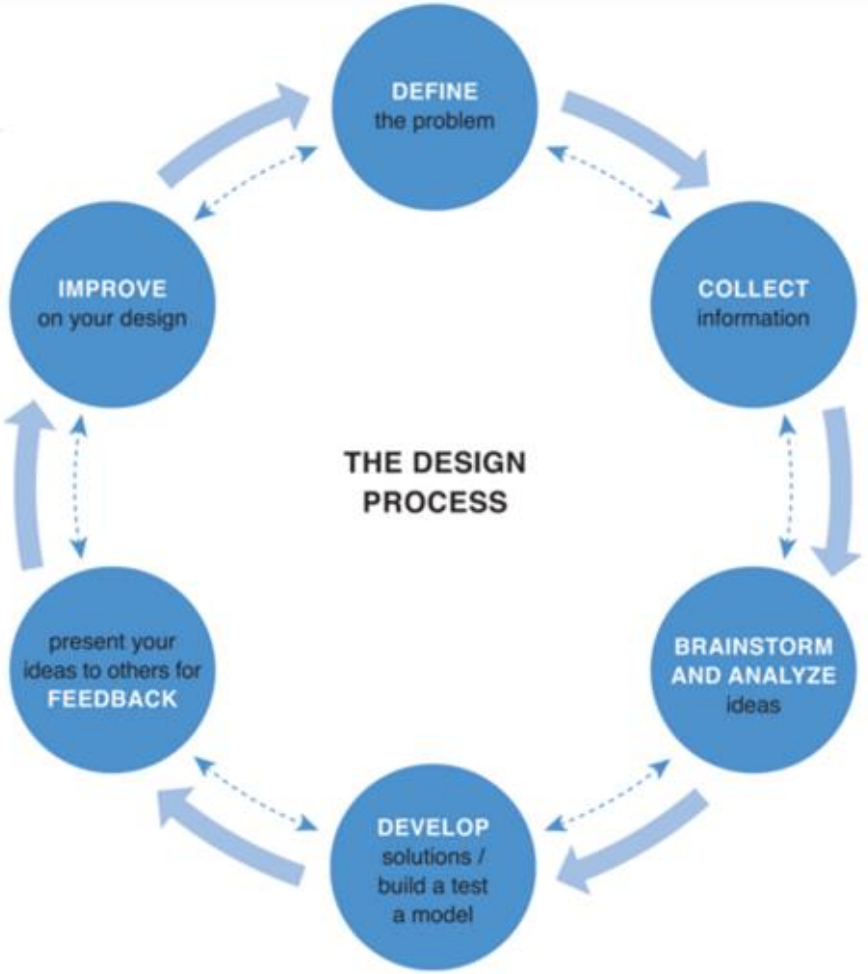
DESIGN PROCESS

Problem/Challenge
- Build a Solar Heat-Shield

Brainstorm
- Design Ideas
- Material Ideas
- Conceptual Drawings

Development
- Prototyping
- Design Changes

Improvement/Conclusion
- Finalize Design
- Building of Solar Heat-Shield



PROJECT SCHEDULE

Date	Activity
Thurday 11/3	Position Elections
Wednesday 1/25	Team Name, read rules,
Friday 2/3	Brainstorming and design matrices, began prototyping
Friday 2/10	Continued prototypes and evaluating measurements for the final design. Chose deployment method
Sunday 2/12	Began working on the PDR and finished prototyping
Friday 2/17	Worked on PDR and design
Sunday 2/26	Finished PDR
Friday 3/3	Worked on device, deployment method and tape measure structure
Friday 3/17	Worked on device, deployment method and tape measure structure
Sunday 3/19	Worked on device and presentation, deployment method and tape measure structure
Friday 3/24	Worked on the device and the presentation, fabric between structure
Saturday 3/25	Worked on the device and the presentation, fabric between structure
Friday 3/31	Final touches and tweaks. Finalize the the presentation
Saturday 4/1	Competition Day

BUDGET

Item	Cost/Unit	Quantity	Cost	Tax	Shipping	Total	Running Balance
							500
Trash Bags	0.093	4	0.372	0	0	0.372	499.628
String	0.019	4	0.076	0	0	0.076	499.552
Tape Measure (only inches prototype)	6.99	1	6.99	0	0	6.99	492.562
Tape Measure (phantom catz prototype)	1.88	1	1.88	0	0	1.88	490.682
Space blanket	1.25	1	1.25	0	0	1.25	489.432
Vex metal plates	0.06	4	0.24	0	0	0.24	489.192
Screws	0.0749	16	1.1984	0	0	1.1984	487.9936
Nuts	0.03	16	0.48	0	0	0.48	487.5136
Vex metal bars	0.13	6	0.78	0	0	0.78	486.7336
1/8 in Lexan	0.028	180	5.04	0	0	5.04	481.6936
Velcro	9.47	1	9.47	0	0	9.47	472.2236

Item	Cost/Unit	Quantity	Cost	Tax	Shipping	Total	Running Balance
HobbyKing 2.4Ghz Receiver 6Ch V2	44.99	1	44.99	1	9.99	55.98	416.2436
Motors (Servos)	5.95	8	47.6	0	9.11	56.71	359.5336
Spring Loaded Hinges	11.25	6	67.5	0	0	67.5	292.0336
Tape Measure	19.97	2	39.94	1.99	0	41.93	250.1036
Turnigy nano-tech 1300mah 3S 25~50C Lipo	19.24	2	38.48	0	0	38.48	211.6236
Mylar Thermal Blankets, 54" x 84" (Pack of 20)	9.95	1	9.95	0	0	9.95	201.6736
Turnigy Accucel-6 80W 10A Balancer Charger	45.69	1	45.69	0	0	45.69	155.9836
XT60 Drone Connectors (5 Pack)	2.9	1	2.9	0	0	2.9	153.0836
AA Batteries	0.41	8	3.28	0	0	3.28	149.8036
Heat Shrink	19	0.00125	0.02375	0	0	0.02375	149.77985
Electrical Tape	1	1	1	0	0	1	148.77985
Duct Tape	4.5	1	4.5	0	0	4.5	144.27985
Hot Glue	0.48	10	4.8	0	0	4.8	139.47985
Acrylic	0.0213	360	7.668	0	0	7.668	131.81185
Use of Laser Cutter	10	1	10	0	0	10	121.81185
PVC (1" Dia)	0.033	6	0.198	0	0	0.198	121.61385
Sheet Metal	10	1	10	0	0	10	111.61385
Vex Aluminum Bars	0.065	9	0.585	0	0	0.585	111.02885
Air Pump	19.99	1	19.99	0	0	19.99	91.03885

WORK DIVISION

Amy Ross
- President
- Build Team
- Electronics Team
- Programming Team
- Presentation Team
- PDR Team

Olivia Bradley
- Vice President
- Build Team
- Purchasing Team
- Presentation Team
- PDR Team

Gia Morelli
- Secretary
- Build Team
- Purchasing Team
- Presentation Team
- PDR Team

Harmont Grenier
- Programming Lead
- PDR Lead
- Build Team
- Electronics Team
- Presentation Team
- PDR Team

Cameron Potvin
- Electronics Lead
- Build Team
- Presentation Team
- PDR Team

Tori Wong
- Treasurer and Purchasing Lead
- Build Team
- Programming Team
- Presentation Team
- PDR Team

Sonali Loomba
- Historian
- Presentation Lead
- Build Team
- Programming Team
- PDR Team

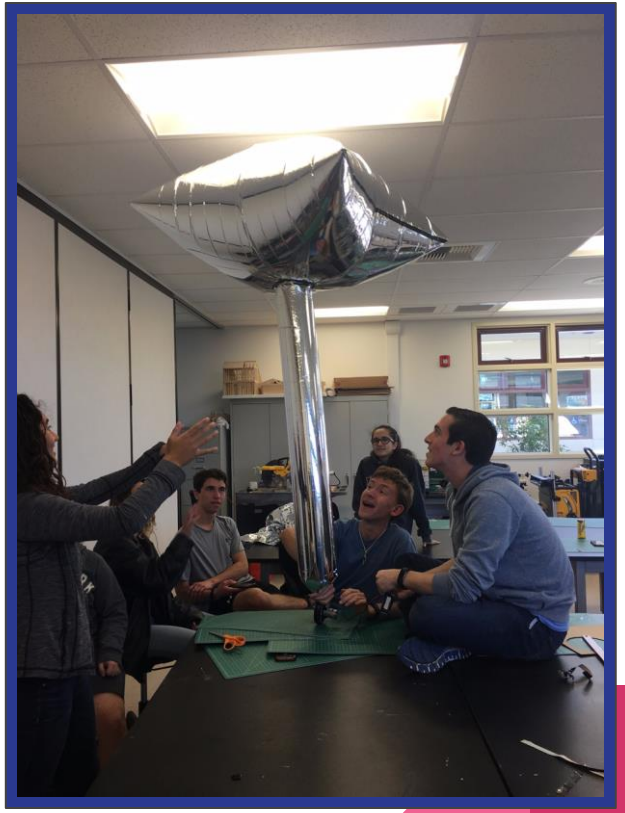
Ben Louttit
- Build Team
- Electronics Team
- Programming Team
- PDR Team

Lauren Tateyama
- Build Team
- Electronics Team
- PDR Team

Stephen Schatz
- Build Lead
- Build Team
- Electronics Team
- Programming Team
- PDR Team

THE SHADE

- 2-Segment Mylar balloon
- Modified Air Mattress Pump for air supply
- Cubic Storage Unit



DESIGN MATRICES

Platform Material	Feasibility	Efficiency	Ingenuity	Cost	Durability	Replacement part accessibility	Power Source	Total
Cardboard	3	3	2	3	2	3	3	19
Wood	3	3	1	2	3	3	3	18
Plastic	3	3	3	2	3	3	3	20

Fabric	Feasibility	Efficiency	Ingenuity	Cost	Weight	Replacement part accessibility	Opacity	Total
Umbrella/Tent fabric	2	3	1	3	3	3	2	17
Parachute silk	3	3	2	3	2	3	2	18
Latex balloon	1	1	3	3	3	3	1	15
Trash bag	3	2	1	3	3	3	3	18
Mylar	2	3	2	3	3	3	3	19
Mylar Balloon	2	2	3	3	3	3	3	19

Deployment	Feasibility	Efficiency	Ingenuity	Cost	Weight	Replacement part accessibility	Power Source	Size	Total	Votes
Spring/Lever	3	3	2	2	3	2	3	3	21	5
Turn Table/Pulley System	1	2	3	1	2	2	2	1	14	
Car Antenna/Plastic Turn Table	2	1	3	2	2	1	2	2	15	
Blown Air	3	3	3	3	2	3	3	2	22	4
Tape Measure	2	3	2	2	3	3	3	3	21	

Blown Air	Feasibility	Efficiency	Ingenuity	Cost	Weight	Replacement part accessibility	Power Source	Size	Total
Air Mattress Pump	2	2	3	3	2	2	2	2	18
Vacuum	2	3	3	1	2	2	3	2	16
Leaf blower	1	3	3	1	1	1	1	1	12

Control System	Feasibility	Efficiency	Ingenuity	Cost	Weight	Replacement part accessibility	Power Source	Size	Versatility	Total
Arduino	3	2	3	1	2	1	3	1	3	19
Hobby R/C	3	3	2	1	3	1	3	3	1	20
Other Micro-Controller	2	1	3	2	2	1	3	1	3	18

ELECTRONICS DESIGN

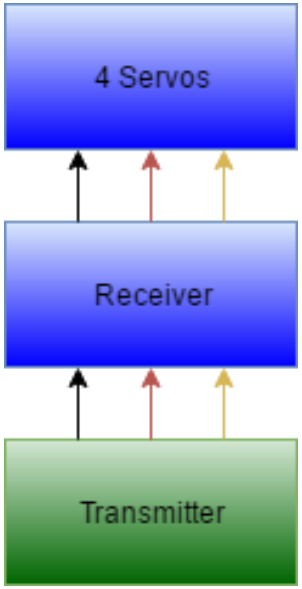
Components

1300 mAh Battery

2.4 Ghz - 6 Channel Receiver

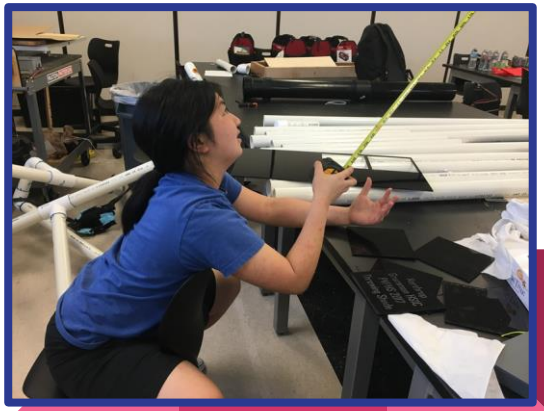
1 Mirco Servo

Air Mattress Pump



PROTOTYPING

- Deployment method: Balloon vs. Tape measures
- Box
- Mylar and spraypaint?



ASSESSMENT

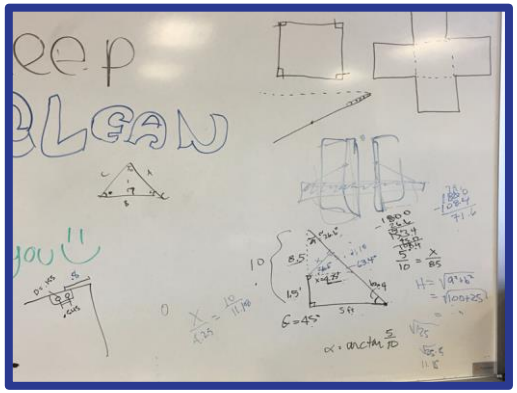
Advantages

- Cheap
- Easy Build
- Effective

Challenges

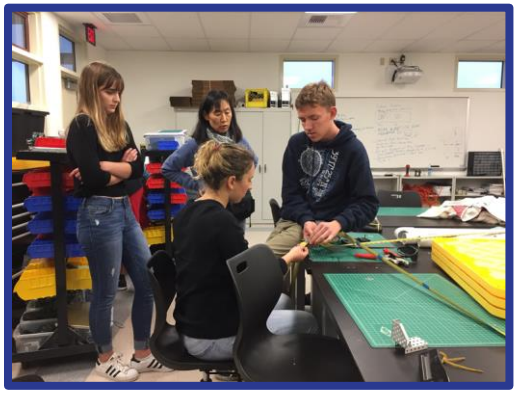
- It is difficult to retract
- It is very noisy

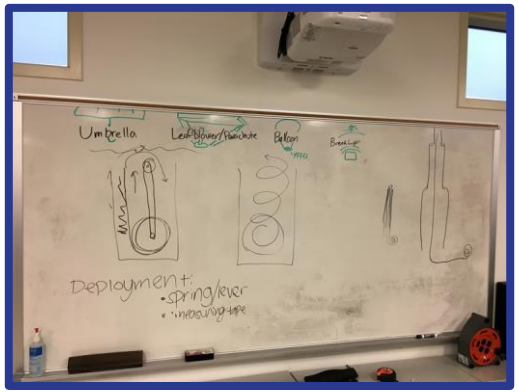
DELIBERATING DESIGNS



Calculations

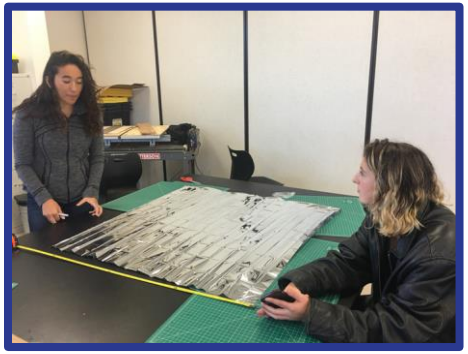
Initial Tests





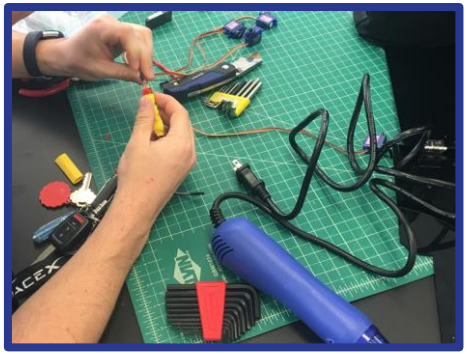
BUILDING

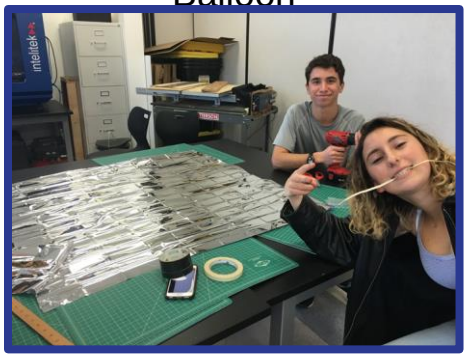
Electronics



Working on The Balloon

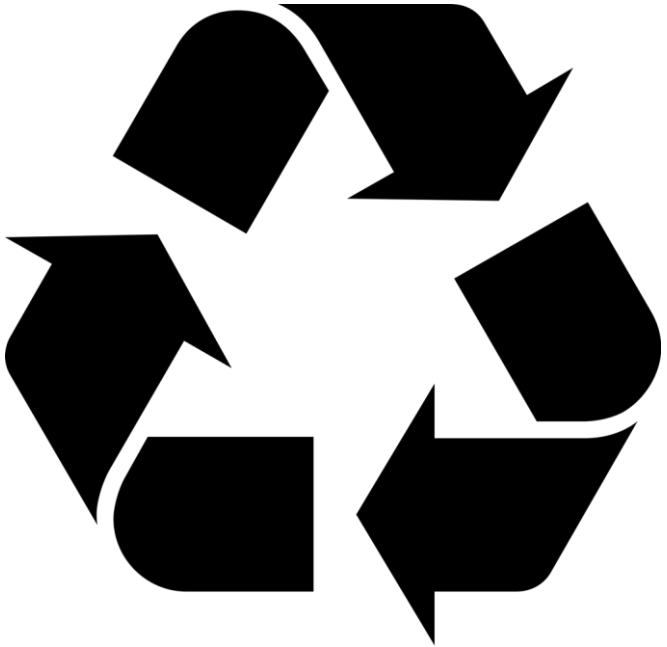
Creating the Shade





DECOMMISSIONING

- Reusable Materials
- SMERT Symposiums
- Inspiration
- Classroom Resource



SUMMARY

- Challenge
- What Is A Solar Heat-Shield?
- Design Process
- Project Schedule
- Budget
- Work Division
- Design

Questions?

Thank You!