SOLAR BEACH CRUISER

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PROJECT BACKGROUND

When receiving the previous generation of the Solar Beach Cruiser it was in nonoperational conditions, after thorough testing and diagnosing faults in the original system, we were able to modify and replace parts to get the system back to norm operating function.

Originally the Beach Cruiser was fitted with two brushed DC motors, and 2 x 12V DC Car Battery linked with two 100-watt solar panels.

The Solar Beach Cruiser is meant to allow people with disabilities to travel on rough terrain and obstacles, such as beaches and hiking trails where traditional wheelchairs cannot be used.



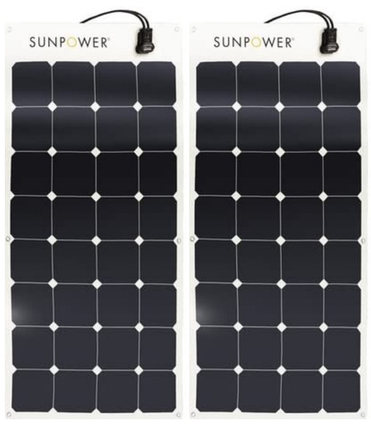
SYSTEM - LEVEL REQUIREMENTS

No.	Requirement	Requirement Objective	Requirement Capability
1	Brushless DC Motors	≥32V	Electro-craft mpp24 24V-48V
2	Controller	≥32V	Anaheim Automation 20-50V
3	Pneumatic Wheels	Extended Lifespan	Tires lasts 5 years
4	Lithium-Iron Phosphate Battery	32V	BYD- 32-36 V
5	Solar Panel	100W/17.5V/5.8A	Sun Power 100 W/17.5 V/5.8 A

PROJECT OBJECTIVE

The objective for the Solar Beach Cruiser is to revise the previous generation of the cruiser and improve its overall performance and capability.

OVERALL DESIGN APPROACH









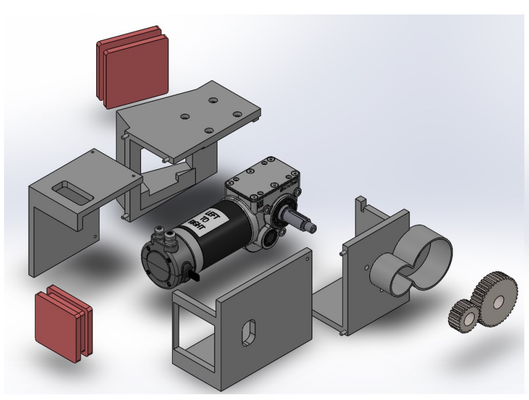
2 x 100-watt monocrystalline solar panels are used with a solar charge controller. They have a surface area of 46” x 22.4” per panel and are used for converting raw solar energy to dc power, then stored in a power source.

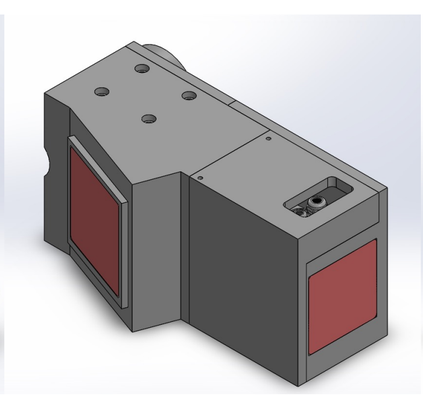
The power source is now a 32V BYD lithium iron phosphate battery, where its original was a 24V lead acid battery.

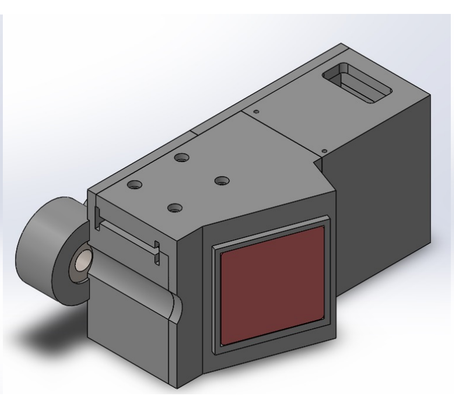
The Anaheim Automation controller can operate from 20-50VDC. This controller allows us to regulate the current from 50-100 amp to ensure the new motors don’t overheat.

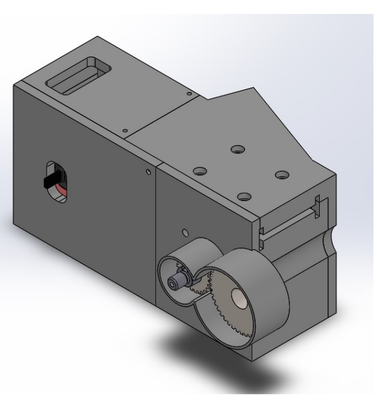
Through our research, the team managed to source two brushless motors from Electro craft with the capability of operating from 24V-48V, making it suitable to use the 32V Lithium Iron Phosphate battery.

RESULTS





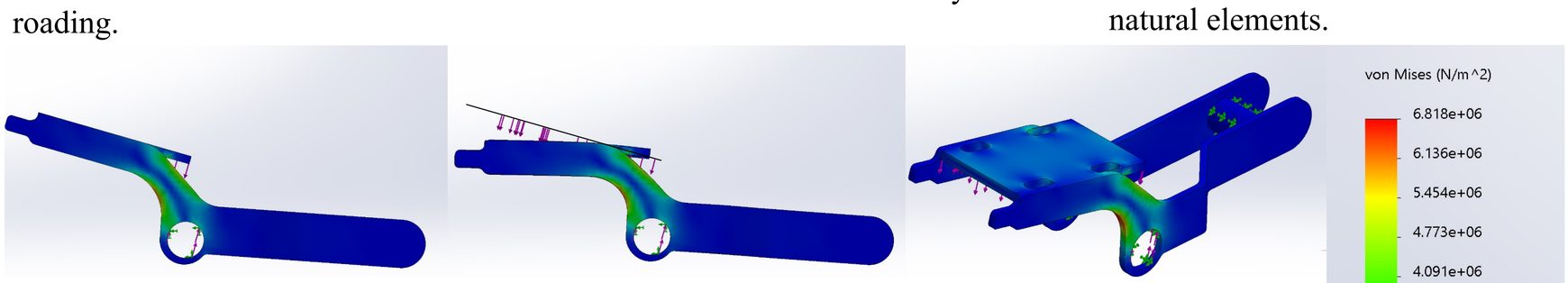




The 3D solid works drawing up top shows the break down of the cover that will protect the DC motor from the outside elements when off-roading.

The red squares indicate the placement of fans to pull in and extract air, helping the motors cool down when under heavy use.

The illustration above shows the motor inside its protective cover with a casing around the external 2:1 gear reduction for protection from the natural elements.



A von mises stress analysis was conducted showing the stress on the pivot point of the motor mounting bracket to determine if the material used can sustain the applied load without deforming or creating fractures

The stress analysis concluded that if a yield strength of 3.5*10^8 N/m^2 is exceeded, the material will yield to plastic deformation (as shown in middle image above).

MAJOR CONCLUSIONS

Our goal for the beach cruiser is to increase its overall performance: upgrading from the 24V brushed motors, to more powerful 24-48V brushless motors, along with a new controller that allows for more adjustability of its original counter part. The new system will be powered by a 32V lithium iron phosphate battery. Our team also upgraded to a more comfortable/sporty seat, making it more suitable for off-road use as it has bigger bolsters holding the rider in place which increases the rider sense of security.



A special thanks to all those who helped in this endeavor. Our advisor Professor Landsberger, our machinists Blake Cortis, and Sergio Marquez for his guidance in the electrical aspect of our controller