WALTER KIMBALL

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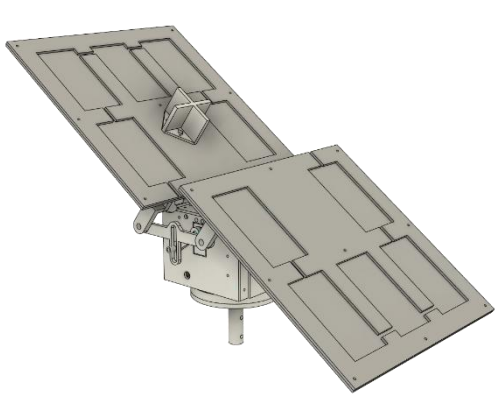
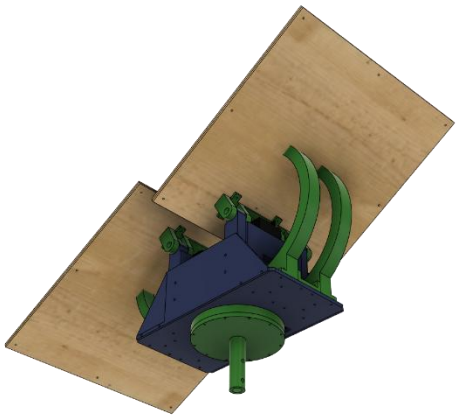
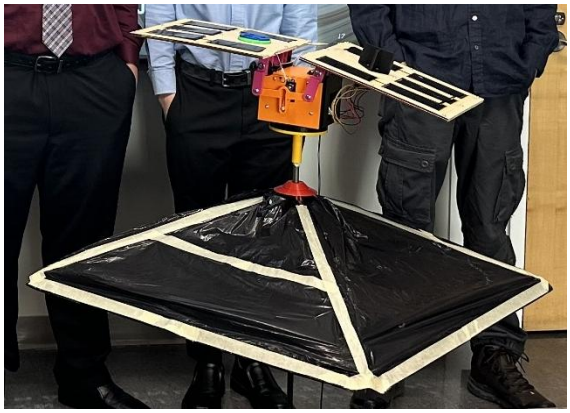
Solarbrella - NYU







What?

- Build a prototype of an Umbrella that can gather energy from the sun.
- Have the panels orient themselves to be able to maximize power
- Be able to **charge devices** as well as store extra energy

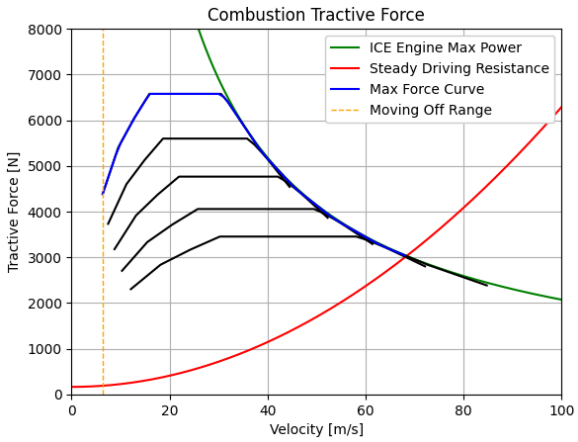
How?

- Components were designed in **Fusion 360**
- An **Arduino** was used for positioning the electric panels.
- A **Lazer cutter** and **3D printers** were used for manufacturing

Results

- The prototype was successfully able to orient the panels in the direction of light sources
- The umbrella was able to output close to 10 watts of power
- Successfully **charged a phone** in sunlight

Mudbug Off Road Truck - NYU



What?

- Have a complete design of an off-road capable mini pickup truck that could handle **extreme grades and fuel ranges**
- Meet performance and requirements like payload, speed, and fuel efficiency
- Meet packaging requirements for items like passengers, vehicle components, and luggage

How?

- Used **SolidWorks** drawings for a size-accurate packaging diagram
- Made calculations and plots in **Python** to get the theoretical performance of brakes, powertrain, suspension, and fuel consumption

Results

- Mapped out the design for a V6 Turbo hybrid Kei truck, which surpassed most design requirements set
- 0-100kph time was **430% quicker** than set while top speed was **23% higher**.
- The off-road capability was meant by having a max hill climb grade of **80% at 45kph**

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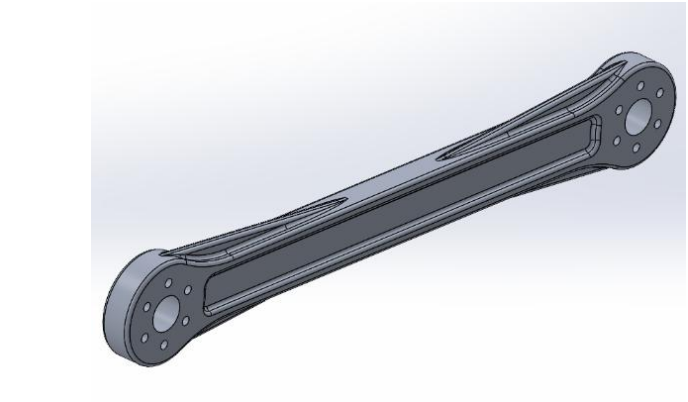
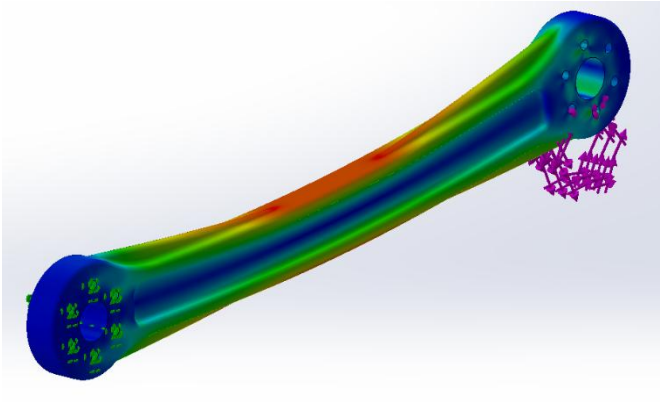
Robot Arm Linkage – NYU





What?

- A robotic arm section was to be designed for a 6-degree-of-freedom robot.
- Design constraints like maximum mass were set as well as materials and sizing
- Performance requirements were set, which included moments as well as loading conditions, with a **minimum safety factor of 1**

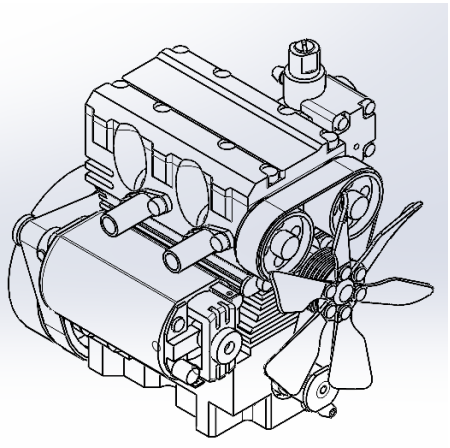
How?

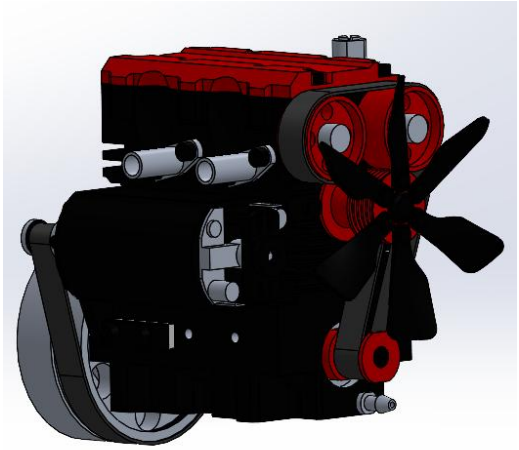
- **SolidWorks** was used for the design and simulations for the arm linkage
- **Simulations** included perpendicular loads with fixed positions as well as torques on rotary connectors

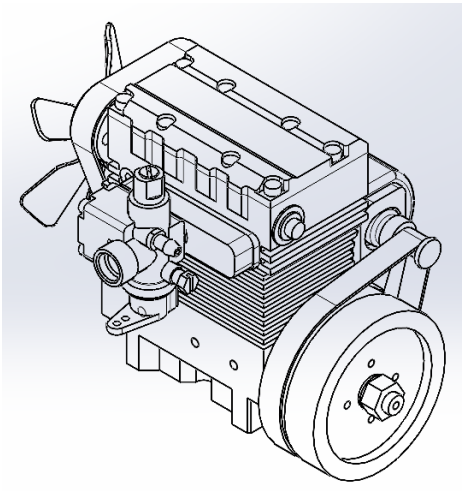
Results

- Under simulations, all requirements were met
- Under set static loads, a **safety factor of 22** was reached, while the moment had a **safety factor of 2.5**
- This design also stayed below the desired mass, with a mass of 637 grams

Semto Engine Model – Personal







What?

- Make a detailed 3D model of the SEMTO Engine ST-NF2
- This engine will be used in future projects, so mounting locations and **sizing must be accurate**.

How?

- Used **SolidWorks** for modeling the complex design in CAD
- Considered **critical dimensions** and proper **datums** that would be most critical for mounting and ventilation for future projects

Results

- A complete, **size-accurate model** with accurate properties, so the mass center and weight for later projects can be better estimated
- Included other **appearance aspects** of SolidWorks for a better-looking model

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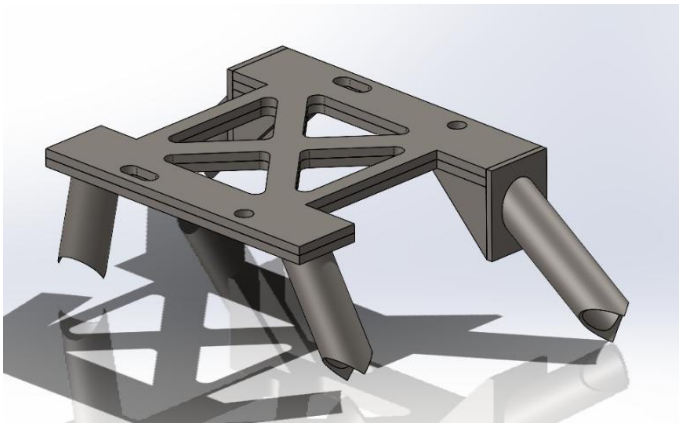
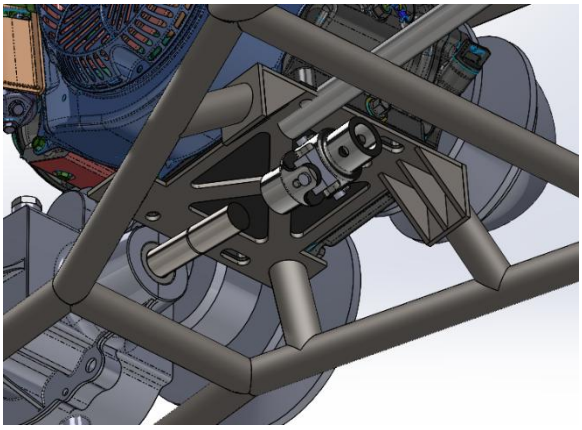
Baja Engine Mount – NYU Motorsports





What?

- Support the engine on the frame of a Baja SAE endurance car with a rigid design
- Needs to be able to hold the engine in a **high-speed autocross-style driving environment**
- Should strive to be cost-efficient

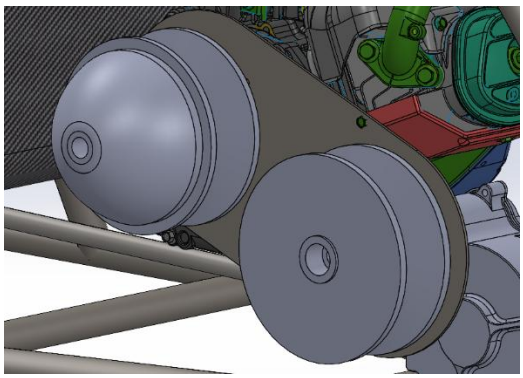
How?

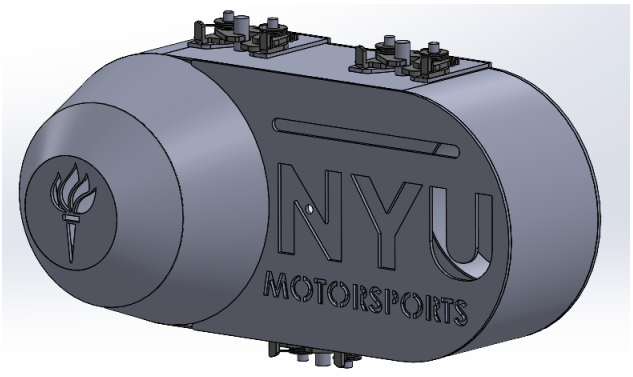
- The design was made in **SolidWorks** from tube and plate steel per Baja SAE regulations and welded together
- Simulations were run in **Ansys** to simulate the load the mount would be taking, as well as extreme cases for high-impact impulses

Results

- The design was able to withstand the **four-hour** Baja endurance race with no plastic deformation of any kind.
- Design was very **universal**, so on future Baja cars, the engine mount was easily retrofitted
- The mount had **significant weight reduction** compared to previous mounts

Baja Mechanical CVT – NYU Motorsports





What?

- Design a CVT powertrain guard that protects the driver and bystanders from the hazardous release of energy if the CVT on a Baja SAE car brakes
- Goals for the new shroud were to **reduce weight** and have a **simpler opening system**

How?

- Designed in **SolidWorks** and made from regulation-grade steel
- CVT pulleys were purchased and modeled to give accurate mass centers and weights
- A shroud **latching mechanism** was added that allows the shroud to be easily opened and closed with latch guides

Results

- A ridged shroud design was successfully designed with **13% weight reduction** compared to previous designs
- A prototype was used in competition, showing a good powertrain guard design for endurance racing
- New ventilation ports allow the airflow to keep the CVT cool and reduce wear

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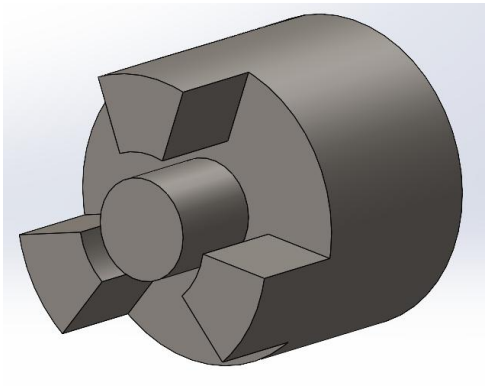
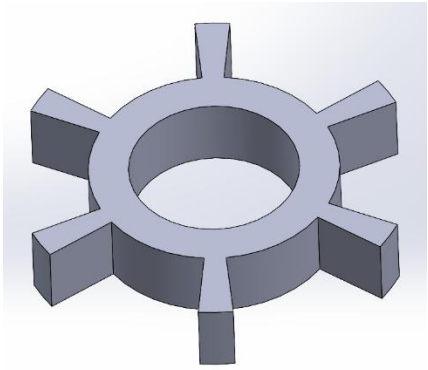
Baja Drivetrain Damper – NYU Motorsports





What?

- A linkage component in the drivetrain of a Baja SAE car that reduces the **impulsive forces** from the front wheels to the gearbox for things like hitting rocks or wheels getting locked
- This design comprises two hubs that interlock together with an elastic material between them

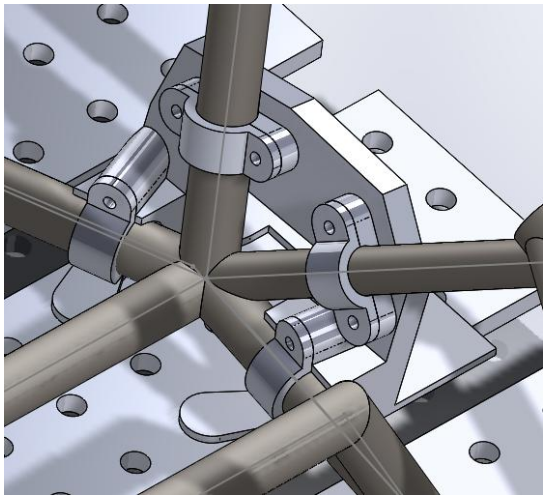
How?

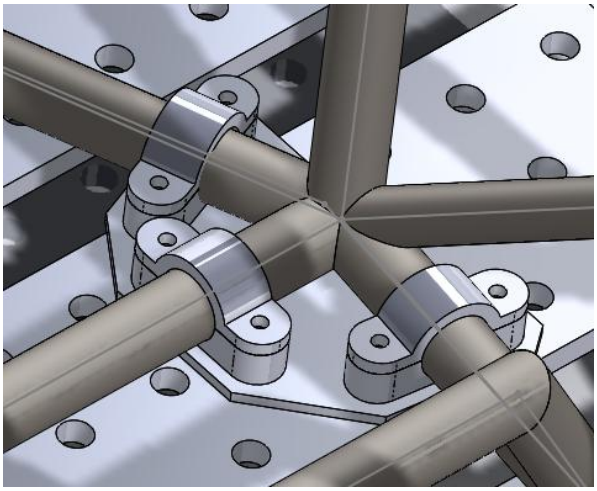
- Was designed, and **FEA** was done in **SolidWorks**
- I **hand-machined** on a lathe as well as **CNC** to create a design with minimal backlash
- Elastic material was cut on a **waterjet** for a close tolerance fit

Results

- This damper was able to provide **good shock absorption** when run in the Baja SAE competition when hitting large static objects
- Compared to the prototype, all drive shaft sag at the damper connection point was **removed**, providing a complete transfer of power

Baja Frame Fixtures – NYU Motorsports





What?

- Provide a **brace** to hold the notched tube for **welding joints** on tube frames
- Joints can have many tubes meeting at one point, so these fixtures have **complex designs** that need to be extremely accurate to minimize the **compounded error** for misalignment across an entire frame

How?

- **SolidWorks** was used as a CAD modeling software
- **SolidWorks 3D sketches** were heavily used to map out tubes pointed in multiple directions
- These fixtures where **3D printed** with necessary tolerances

Results

- The fixtures were able to be used to weld and notch tubes to match the design of our Baja SAE frame with **adequate accuracy** across the frame
- Some points were split into multiple fixtures for ease of welding and reusability.

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4870 CAD Model – Howell Laboratories

Models and Drawings
Under NDA

What?

- Created a **CAD model** of Howell Laboratories' 4870 Air Control Panel
- This assembly is comprised of over 65 custom and purchased parts with unique part numbers
- Many part models were based on drawings and contacting manufacturers for CAD files, while the rest were **hand-measured** from parts on the assembly floor

How?

- These parts and assembly models were made in **Autodesk Inventor**
- For a proper Howell Laboratory formatted bill of materials, each of the parts had **custom properties** l assigned with part specifications and details
- These models were checked into Howell's **Autodesk Vault** for company access

Results

- This assembly model is extremely useful for presenting to potential customers to give a visual of the inner workings
- One important result of these models is that all the old hand drawings will be replaced with **new computer-made drawings** from the models for easier updating.

7600 Engineering Drawings – Howell Laboratories

Models and Drawings
Under NDA

What?

- Created **over 50 engineering drawings** for various parts and assemblies of Howell Laboratories' updated 7600 Electrolytic Seawater Chlorinator
- These drawings are part of the redesign of the 7600 and had to be in the proper format Howell Laboratories set as well as follow good drawing practices, including datums, tolerances, and call-outs.

How?

- These drawings were made in **Autodesk Inventor** using the drawing programs and tools, and uploaded to **Autodesk Vault**
- The drawings went through multiple **redline revisions** first by engineers, then by the manufacturing floor
- These drawings were uploaded to Howell's **Epicor ERP** database, and manufacturing steps were added for each part based on the design and manufacturing process

Results

- These drawings and Epicor files make revising the 7600 streamlined, since with **digital drawings**, revisions can easily be made to drawings
- This resulted in **saving many hours** of work for Howell Laboratories and decreasing their backlog
- Howell Laboratories managed to **finish the 7600 project a month ahead of schedule**, which was used to warrant Howell to hire a full-time drafting engineer