

Electric Vehicle Rear Suspension (for Hub Motor)

MG7020 Mechanical Design 2

Grace Beatson, Tigger Ma, Durant Wang

Problem Statement

This project involves designing and manufacturing a prototype of a trailing arm type rear suspension for the electric vehicle being developed by Otago Polytechnic students. The aim is for the suspension to be functional on a smooth road by the end of the semester. The suspension will need to be mounted to the existing outer shell and fit the hub motor being designed by another student team. The rear suspension must be removable to be able to convert to the alternator motor but also be held securely.

Rear Suspension is the linkage to connect the rear vehicle wheel to the vehicle. Its function is to transfer the force and torque between the wheel and the frame in order to ensure smooth running of the vehicle.

The configuration used depends on cost, space needed inside the vehicle, and ease of manufacturing as the main constraints. For this year's prototype, aesthetics and comfort are less important "nice to have features"

Constraints

- Must be compatible with hub motor
- Interchangeable with alternator motor rear suspension
- Limited space inside vehicle
- Low cost

Solution

The rear suspension swing arms were constructed using aluminium RHS and 10mm aluminium waterjet cut mounts to provide attachment points for the axle and shock absorbers. The shock absorbers used were recycled from a previous project. An attachment plate was waterjet cut to distribute the force of the suspension across the rear of the vehicle and provide attachment points for the tops of the shock absorbers. The rear suspension uses the same mounting point for the swing arms as the rear suspension for the alternator motor so the two can be easily interchanged.

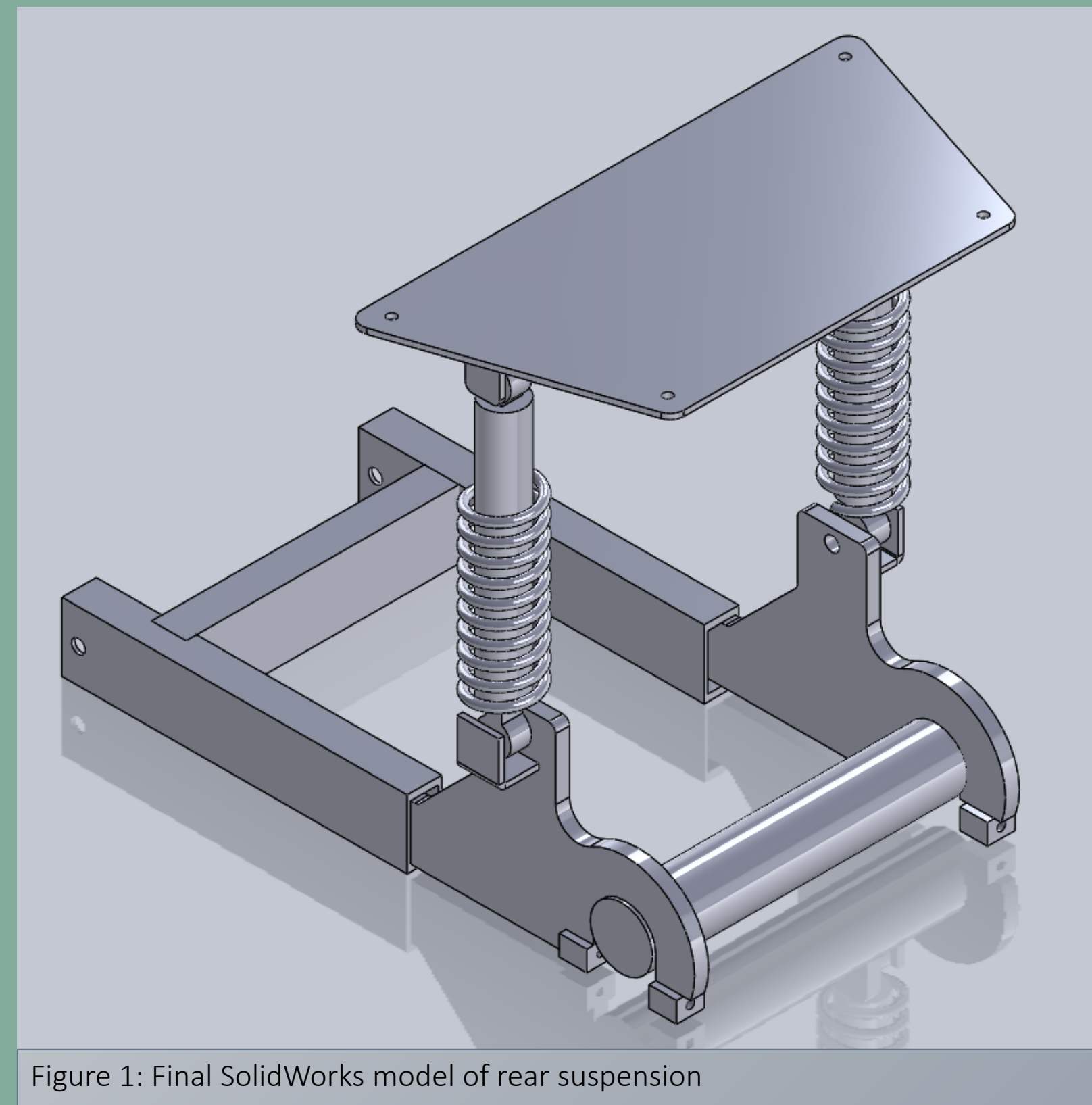


Figure 1: Final SolidWorks model of rear suspension



Figure 2: Rear suspension prototype mounted to vehicle with hub motor

Pros	Cons
Simple design	Aesthetics
Interchangeable with alternator motor rear suspension	Strength of shock absorbers
Uses minimal space inside vehicle	
Lightweight aluminium construction	
Prevents rotation of axle	

Conclusion

The rear suspension prototype that was produced met the design constraints of being compatible with the hub motor that was produced by another student project, being easily interchangeable with the alternator motor rear suspension, being low cost, and strong. Due to time and material constraints, where parts had to be modified to fit properly, the surface finish and appearance of the rear suspension were lacking. The shock absorbers used were not strong enough to hold the weight of the vehicle and adequately function as suspension. In future, a more complex design using stronger shock absorbers would improve the function of the rear suspension.

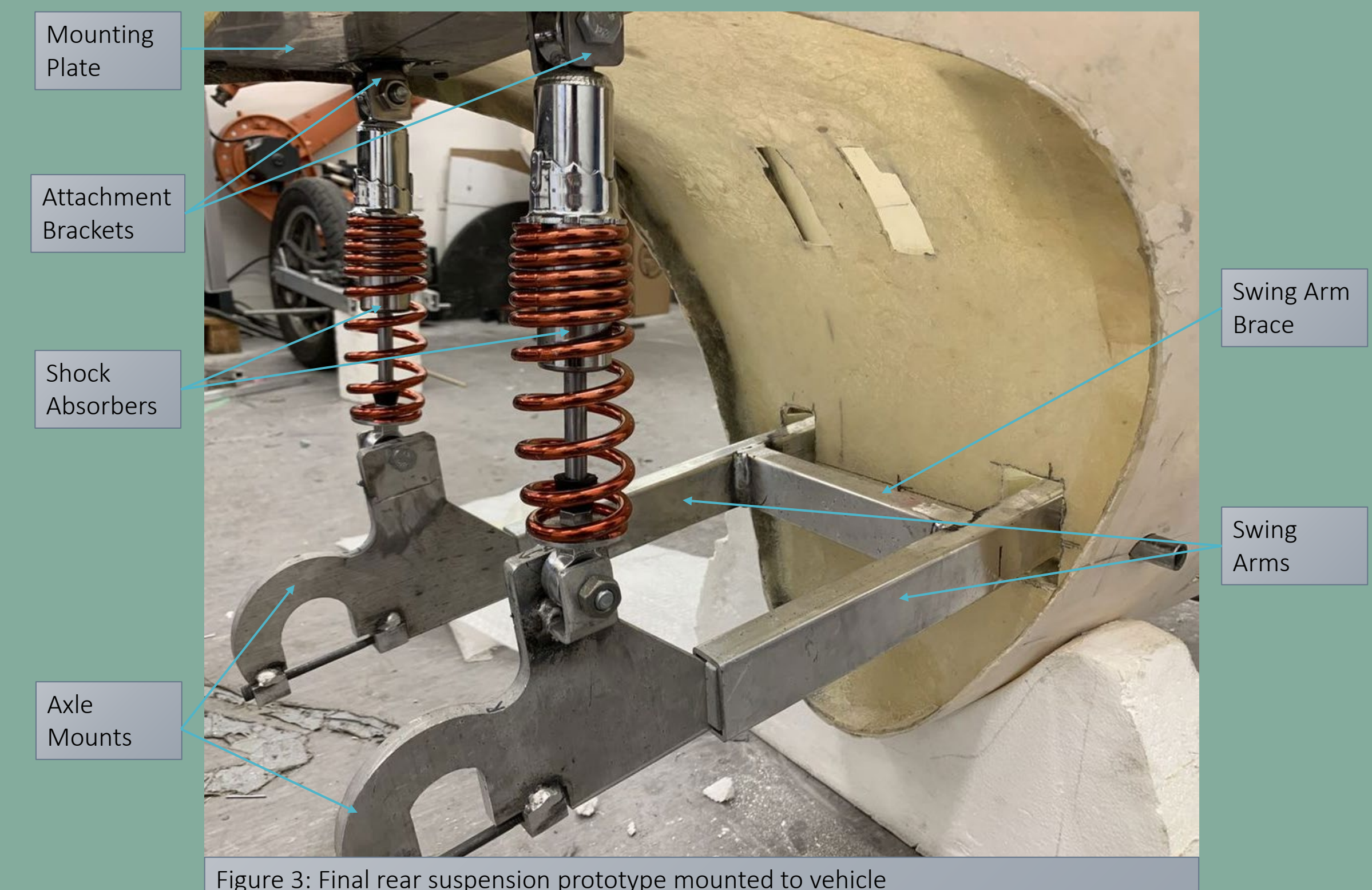


Figure 3: Final rear suspension prototype mounted to vehicle