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**Sponsor**  
Magna Mirrors

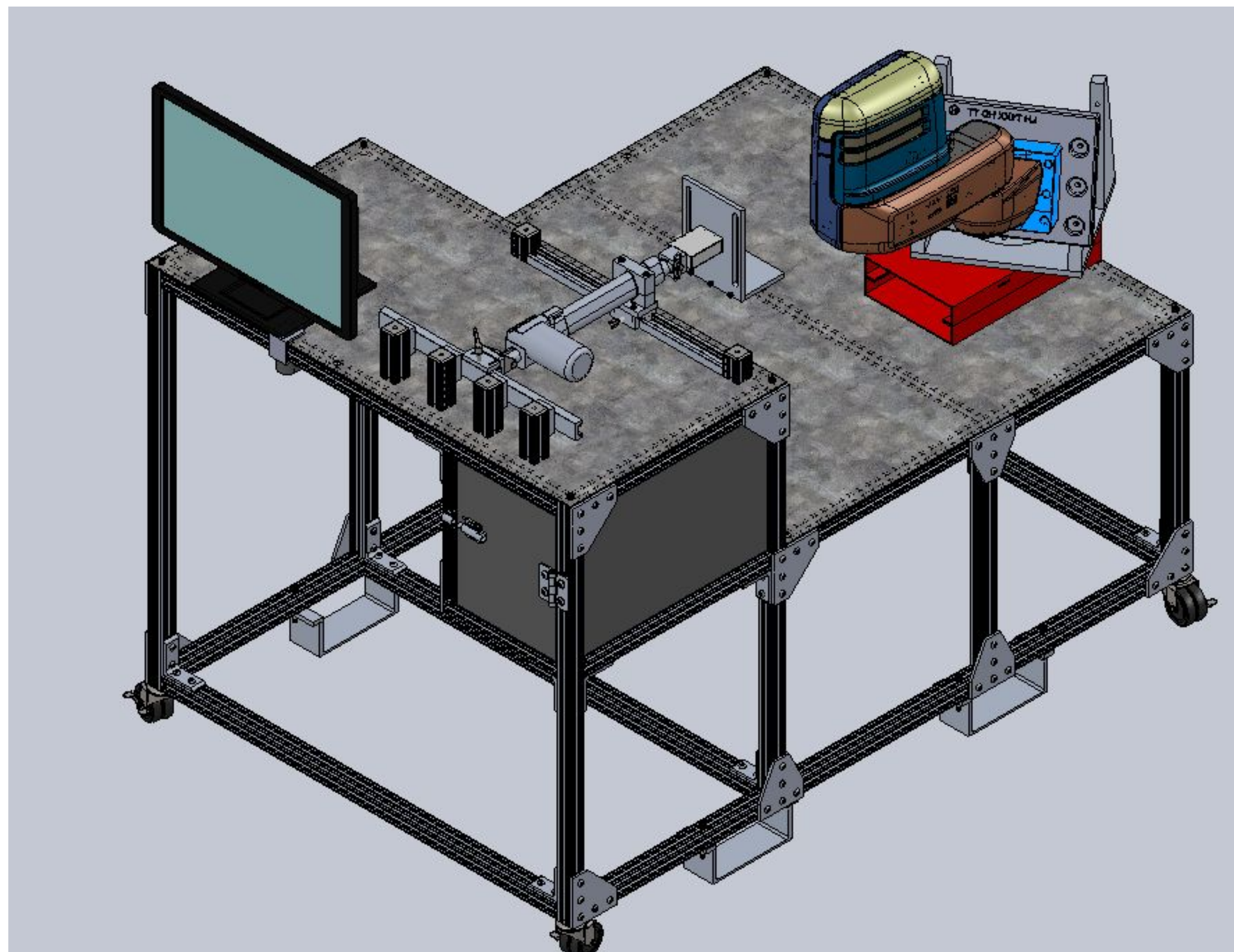
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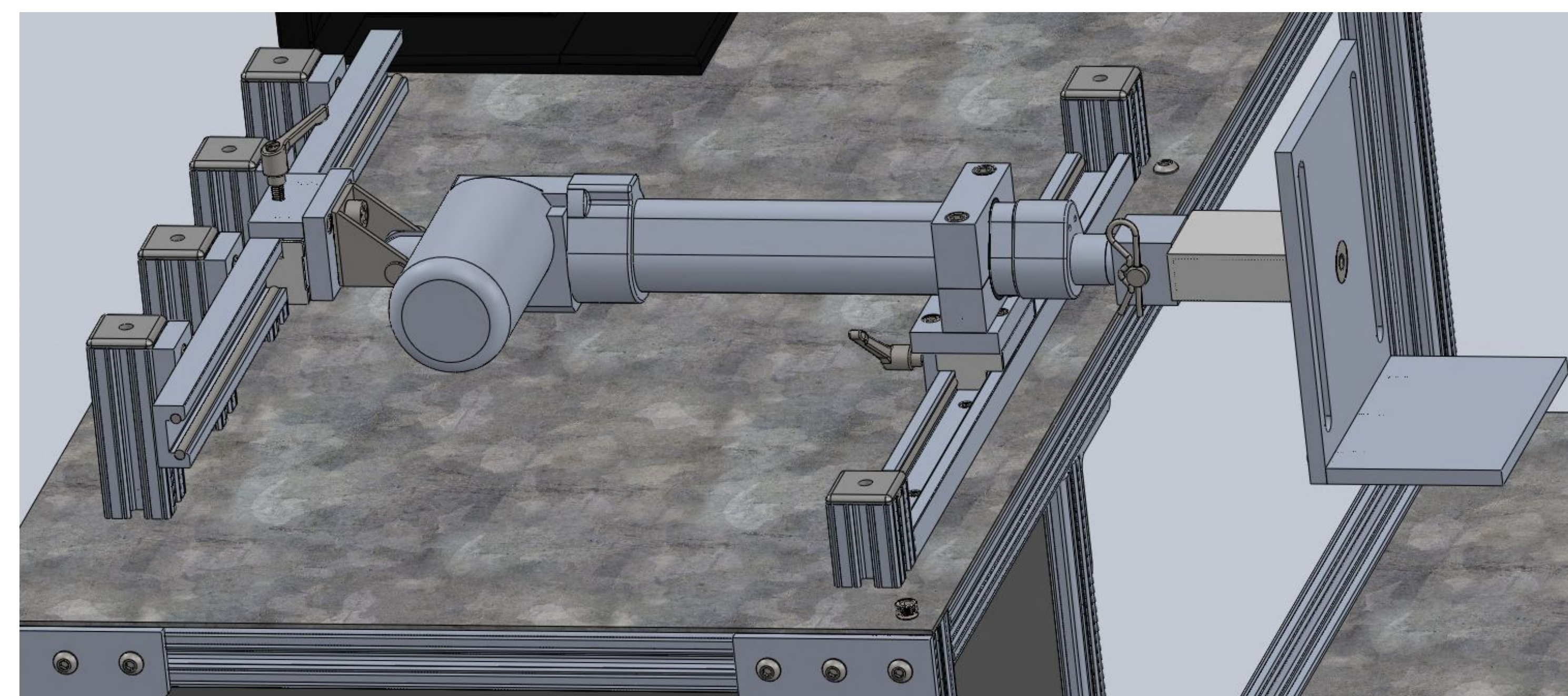
## Objective

The objective of this project is to create a piece of equipment that will be used to measure trailer-tow mirror extension and retraction efforts (force), head travel distance, and output this data in graph form and as raw data.



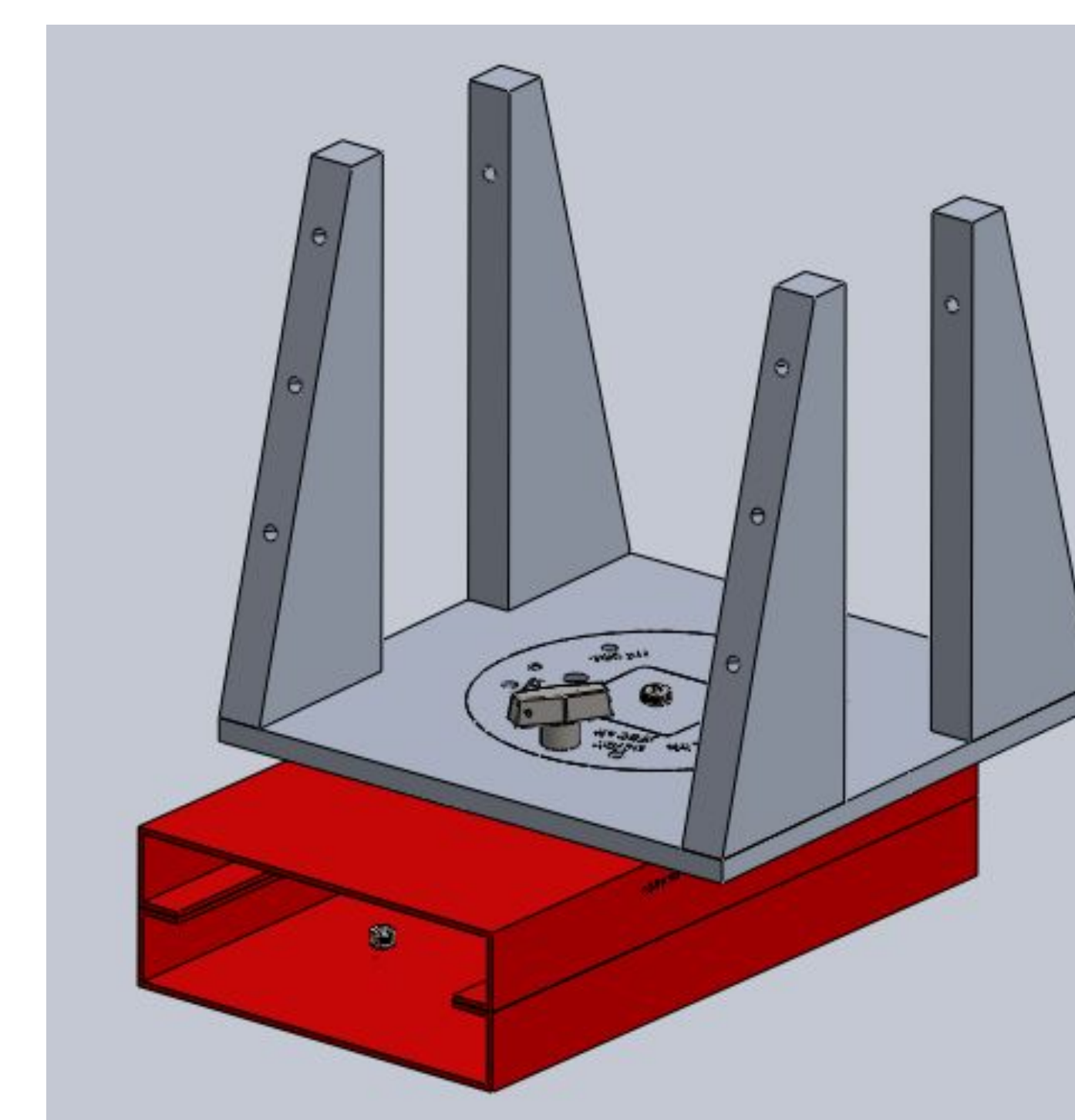
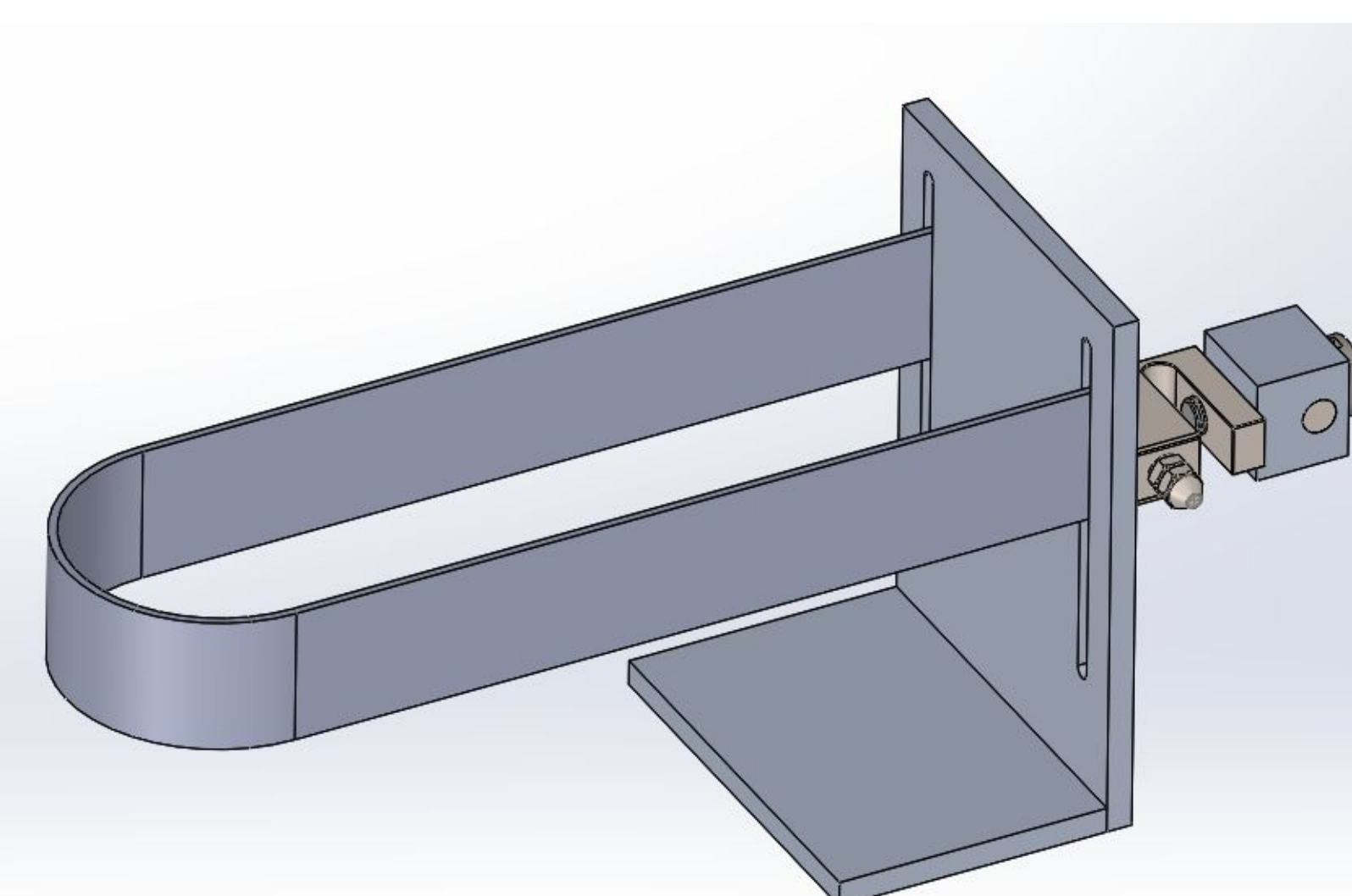
## Project Summary

- A linear electric actuator is used to extend and retract trailer-tow mirrors.
- Testing is automated via a programmed electric actuator.
- A tension/compression load cell allows the tester to accurately record force measurements.
- Both left and right-hand mirrors of different programs can be mounted and measured due to the pivoting A-frame assembly and the sliding/locking actuator assembly.
- The tester's user interface is controlled by a Raspberry Pi, which is connected to a monitor, keyboard, and mouse. The Raspberry Pi outputs data on the monitor and exports data via USB.
- To interface with all mirror heads, a universal strap and bracket design was implemented.
- To ensure safe operation of the machine, a stop button is available for use at any time. Personal protective equipment is also required for use.



## Key Specifications

- Tester must be able to measure and withstand 5-400 N of force.
- Force measurement must be accurate to within 5 N of force.
- Output average and maximum force.
- Output a graph of force vs. distance and distance vs. time.
- Measure the travel distance and extension/retraction time of mirror.
- Be able to test all current mirrors, left-hand and right-hand.
- Tester must be automated.



## Use Case

1. Remove the tester from storage.
2. Connect the tester to the building outlets.
3. Attach a vibration plate to the tester.
4. Mount a mirror onto the machine.
5. Create or select test parameters.
6. Activate a new test.
7. Tester extends and retracts the mirror.
8. Data is output in graph and raw data formats.
9. Extract data from the tester via USB drive.
10. Turn off the tester.
11. Remove mirror from the tester.
12. Remove vibration plates from the tester.

## GUI

