

Bike Frame Load Test Machine: Final Design

Team 108: Bike Loading Gang

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Design Process - Linkage Iterations



- 1st Prototype made with plywood with first set of pistons
- Increasing the flywheel would increase the stroke used in the pistons.

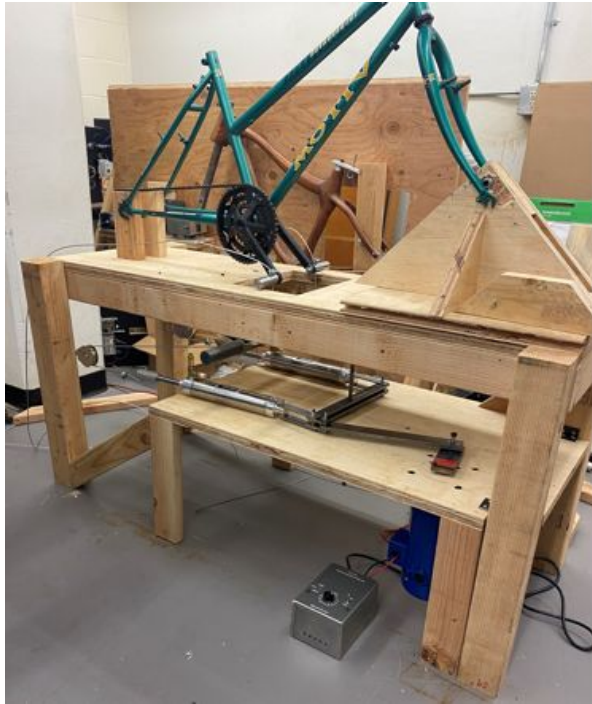


- 1st Prototype for Steel components
- Support beam vertical to avoid axial loading.
- New, larger pistons, would crash into the vertical support beam before reaching the stroke necessary to create the appropriate force.



- Laid on its side and use cables to redirect the forces to the pedals.
- Increased the length of the cantilever in order to achieve the stroke needed using the new eight inch pistons.
- The upper left hand image showcases a small transfer bar but the piston extenders were not hard linked at both joints.
- The right hand side image shows the piston extension bars were hard linked to mitigate the end of the piston from clashing with the linkage.
- The bottom left hand image shows the final linkage design with a larger transfer bar to prevent steep angle binding in the system.
- After testing, there was still some binding and odd rotation, so the team added guiders to keep the pistons in line.

Design Solution



- $\frac{3}{4}$ horsepower, 90 volt dc motor electric motor driven system turns rotational motion into linear motion using a four-bar-linkage to actuate pneumatic pistons.
- The pneumatic cylinders are double acting. Pressure builds as they extend, which pulls on the cables to pull on the pedals.
- Check valves allow air to refill the cylinders on the compression stroke to repeat the cycle.
- The pneumatic cylinders are 2 inch bore, 8 inch stroke that are capable of outputting 300 lbs using about 7 inches of stroke
- Used the Instron machine to calibrate blow off valves
- The team believes a more capable motor is needed to run the machine



Thank you for listening!