


ILLINOIS INSTITUTE   
OF TECHNOLOGY  
PARKER HANNIFIN CHAINLESS CHALLENGE

# TEAM MEMBERS

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- Nathan Ruhl



# DESIGN OBJECTIVES

- High efficiency hydraulic system
- Lightweight energy storage
- Two wheel design
- Ergonomics

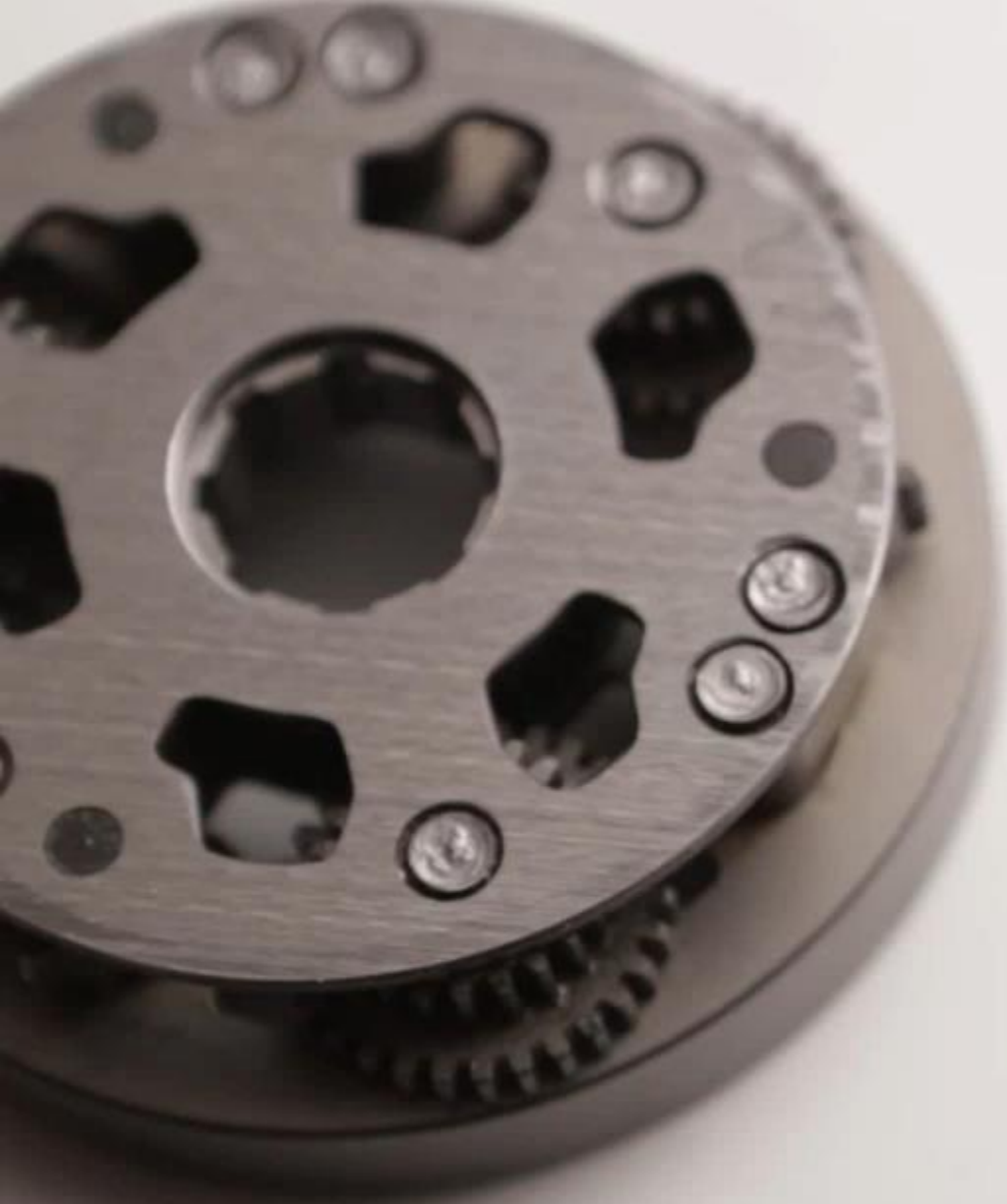


# INNOVATION

- A new method for storing energy.
- Small scale fluid power
- A marriage of design







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2015

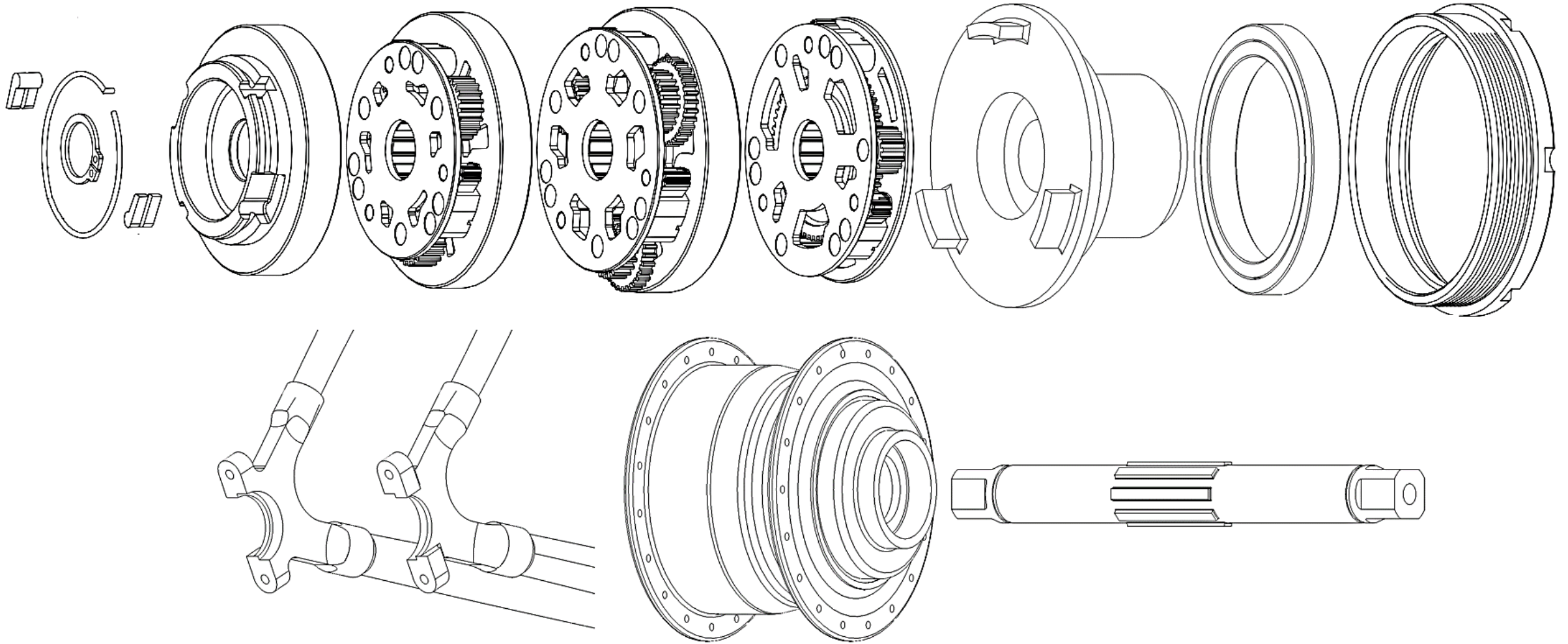
CHAINLESS CHALLENGE

# DESIGN HIGHLIGHTS

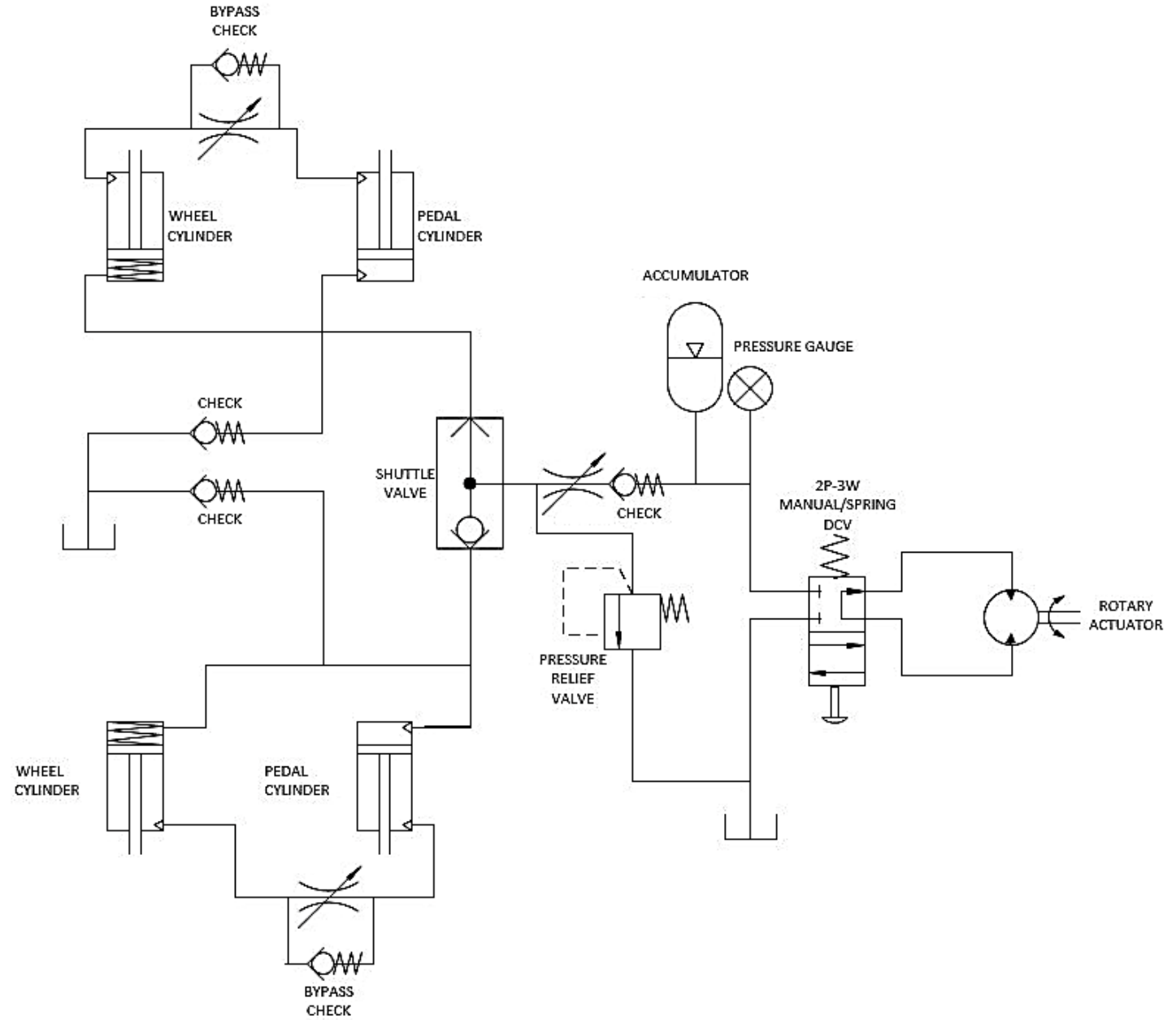
- Bike like feel and ride
- Siphoned fluid energy
- Riding discharge
- Internally geared rear hub



# REAR HUB



# FLUID CIRCUIT

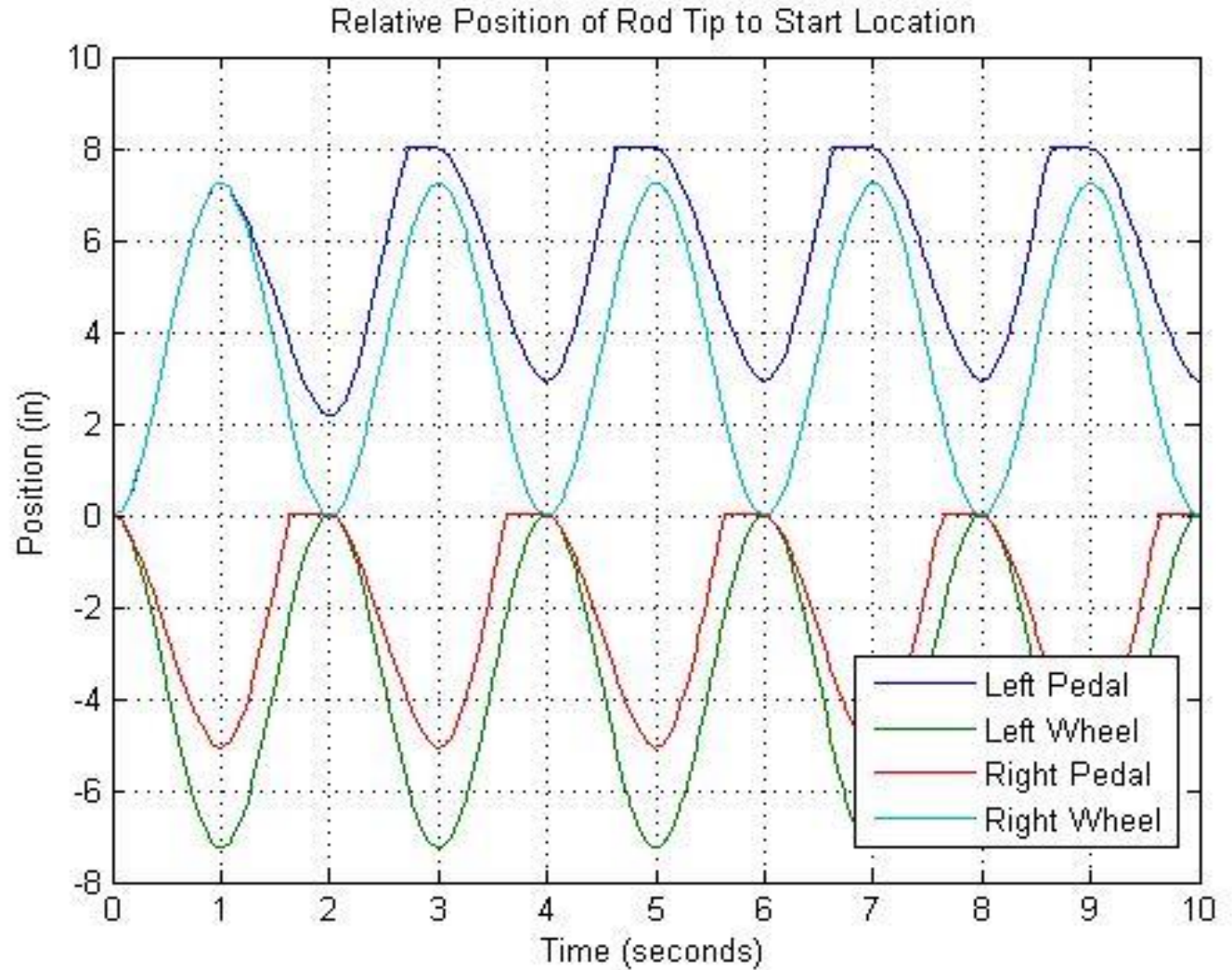




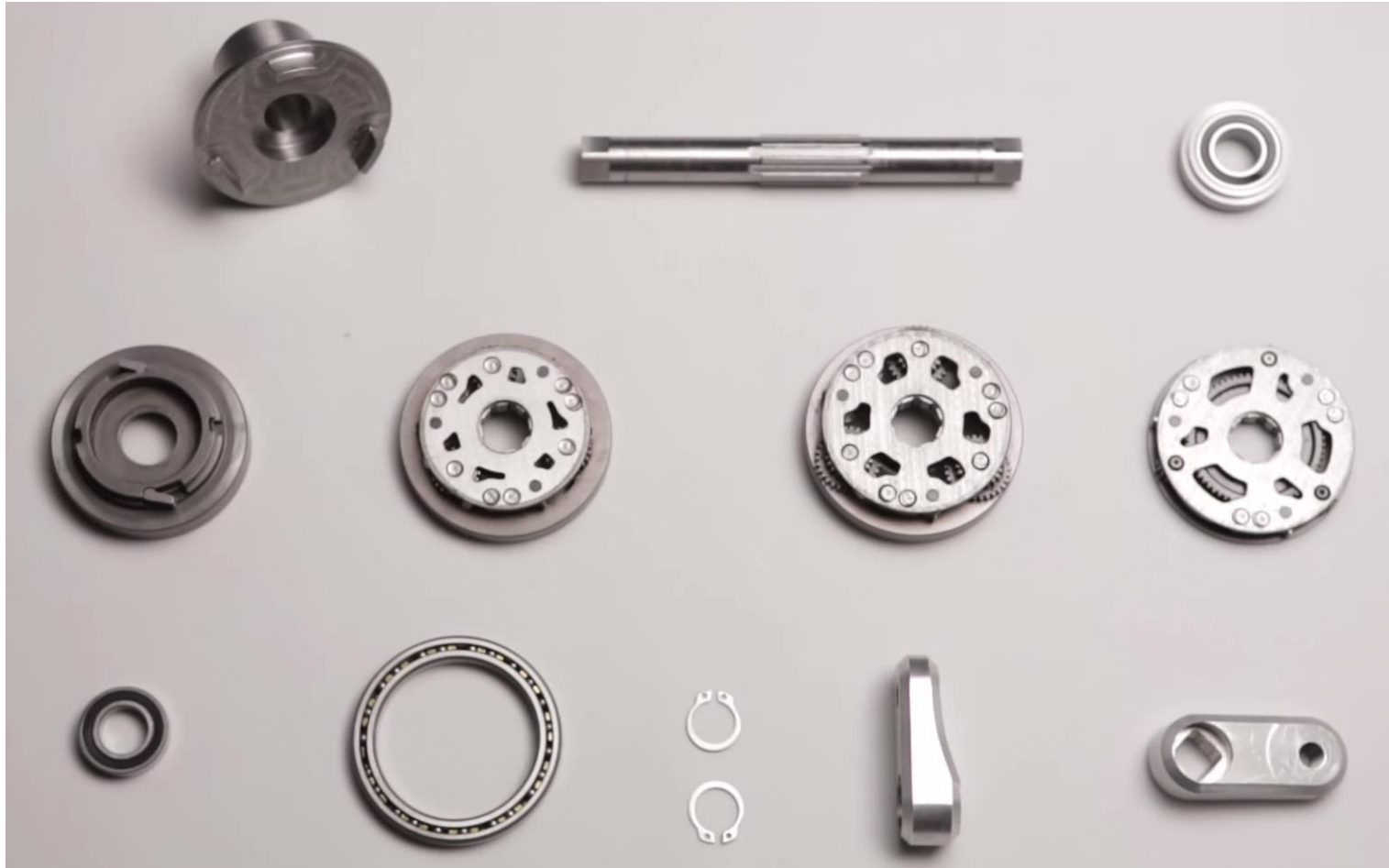
# TESTING

DEVELOPED A  
MATLAB SIMULINK  
MODEL

COMPARING  
PRACTICAL AND  
EXPERIMENTAL TESTS

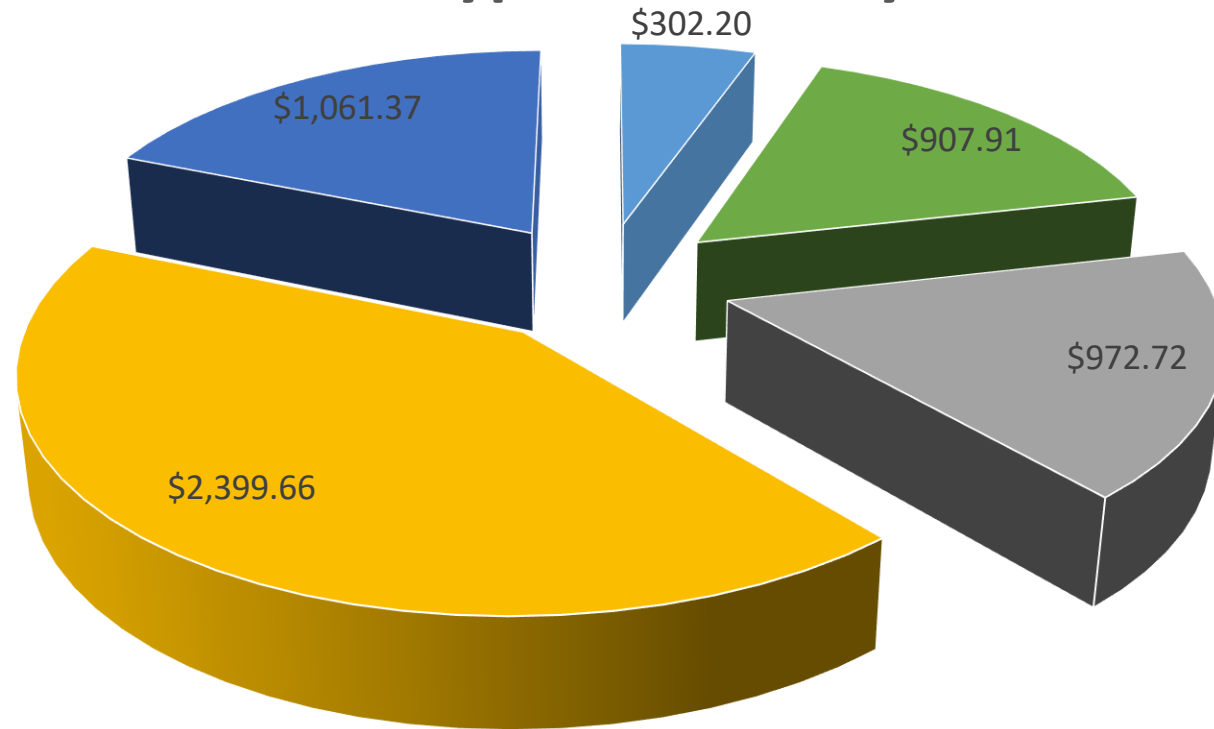


# MANUFACTURING



# COST ANALYSIS

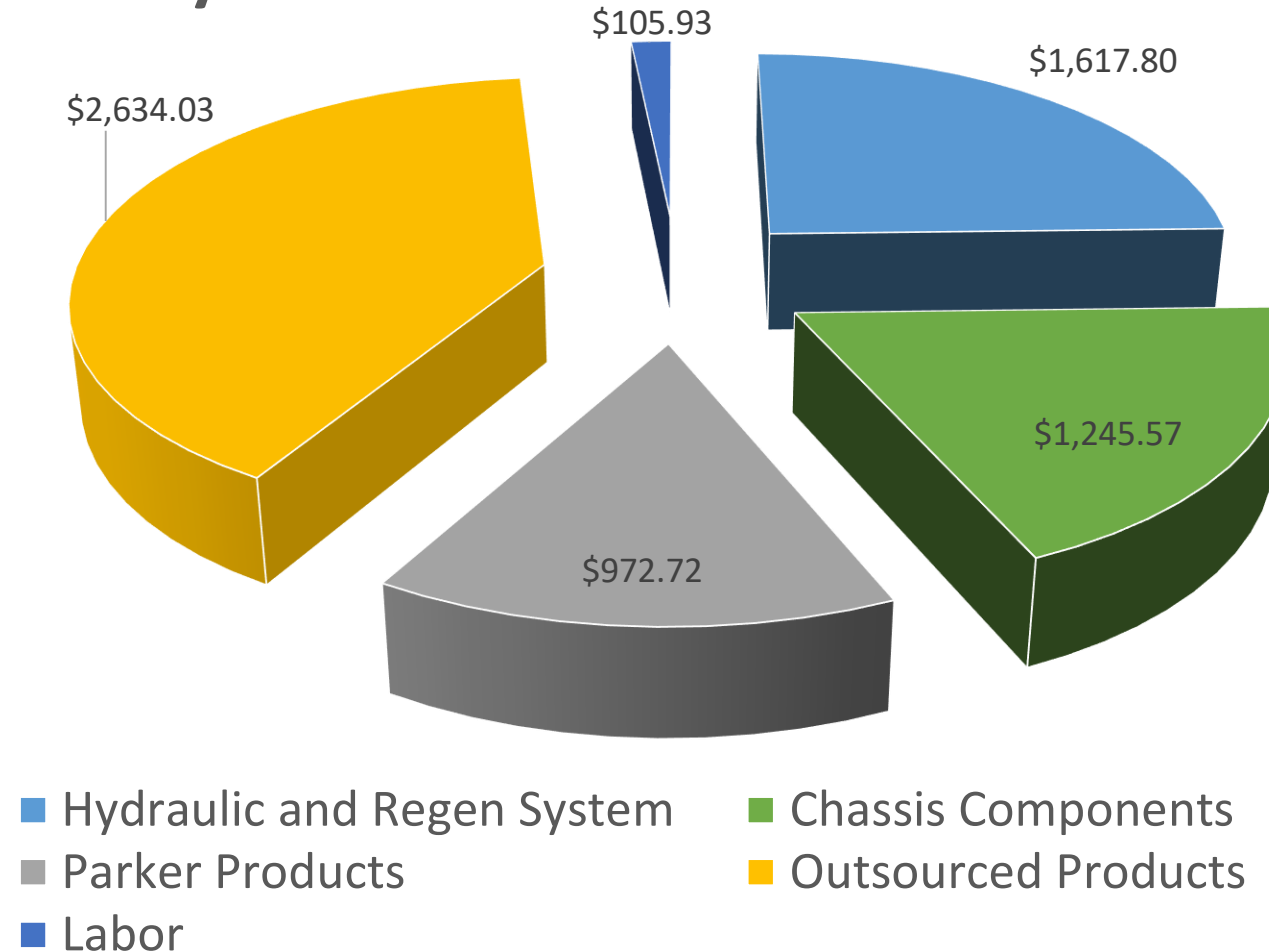
## Prototype Cost Analysis



- Hydraulic and Regen System
- Chassis Components
- Parker Products
- Outsourced Products
- Miscellaneous

# COST ANALYSIS

## System Costs for Mass Production



# RACE DAY

- Air trapped in system at the start of day
  - Fixed after Sprint Race
- Efficiency Race went as planned
- Finished one lap during Endurance Race before mechanical fault
  - Could have been completed in under 60 minutes



# IMPAIRMENT



# LESSONS LEARNED

- Evacuating air in our system could be accomplished using a fluid vacuum
- Having appropriate fasteners to improve dependability
- Managing orders directly to maintain our schedule