

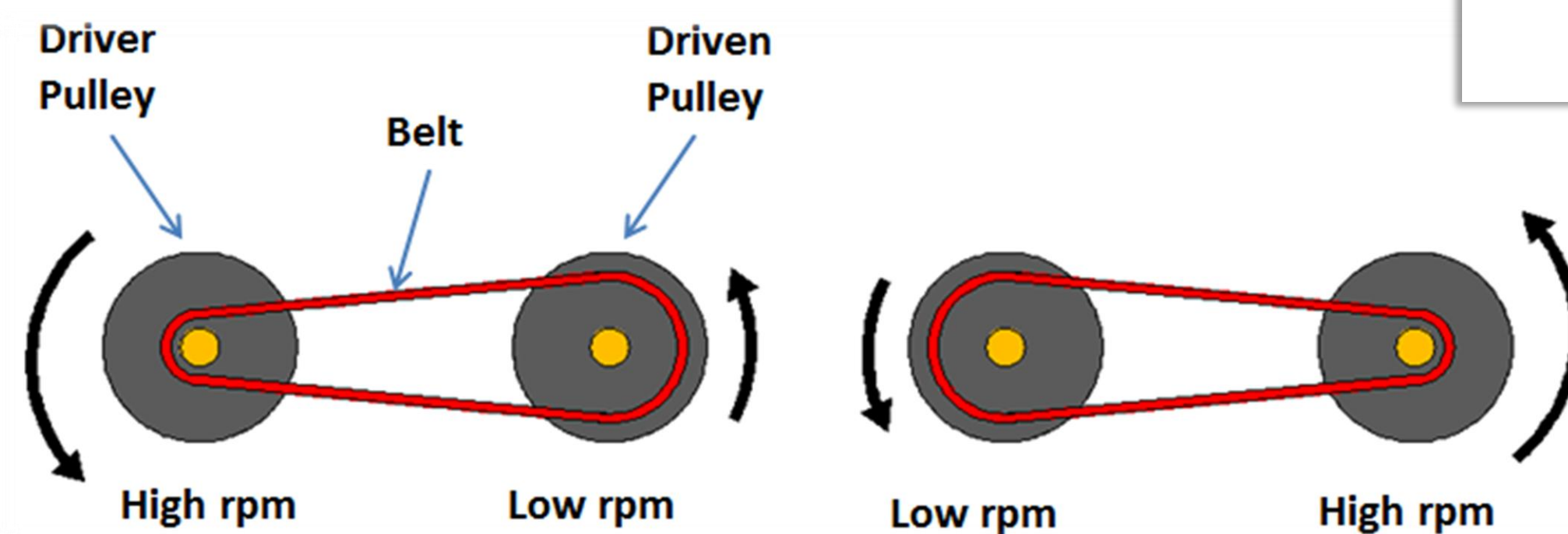
Objective

Create a new transmission system for our Ski-Doo to meet the 4 pillars of the SAE Clean Snowmobile Challenge:

- Clean
- Efficient
- Quiet
- Powerful

Background

- Continuously Variable Transmission (CVT):
 - Inertial based actuation
 - Fixed to ratio curves
 - Slow & expensive to tune



Value Proposition

Electronically Tunable to Team Snowmobile

Noise and Emissions Reductions

Increased Acceleration and Fuel Economy

Key Requirements

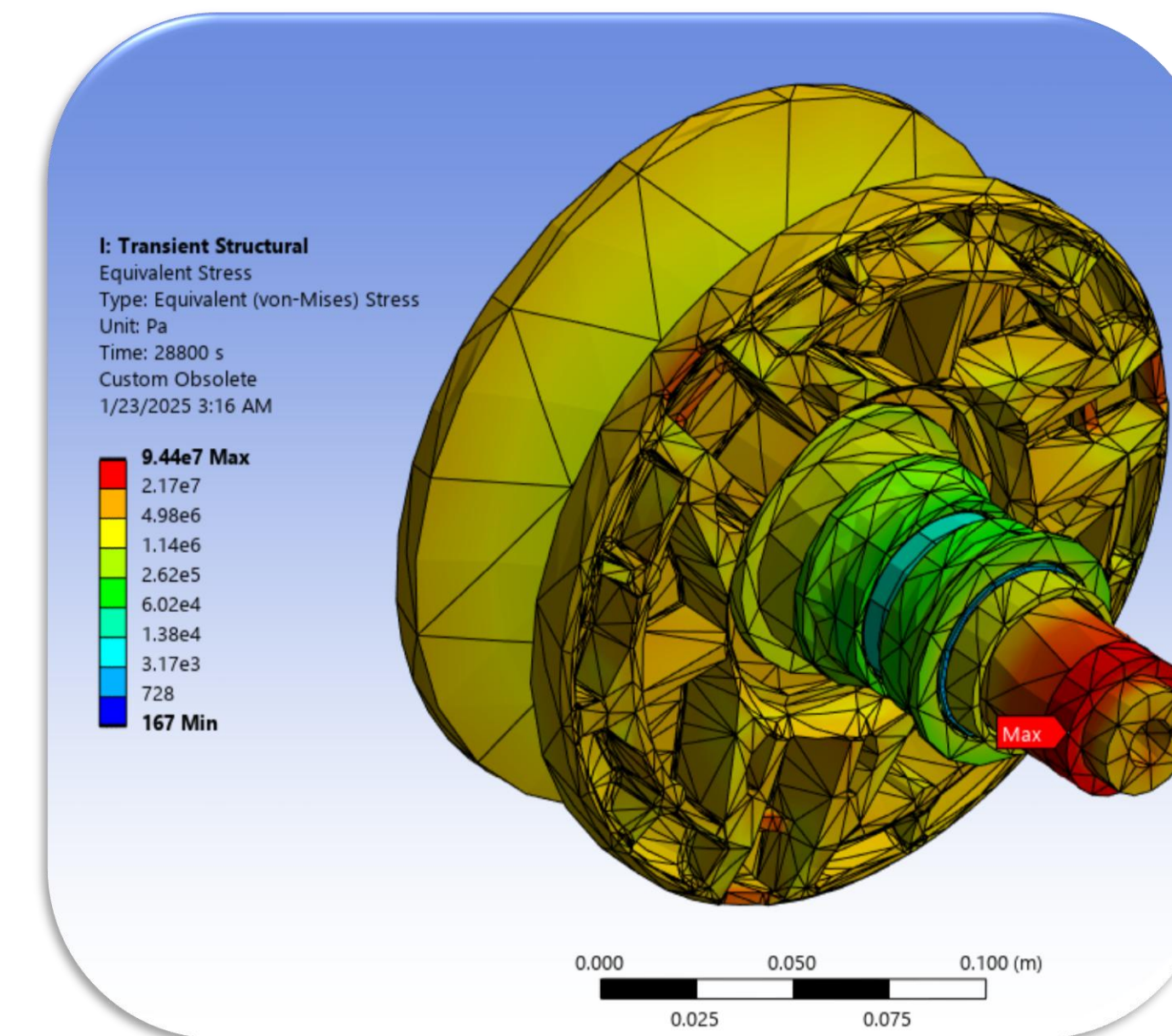
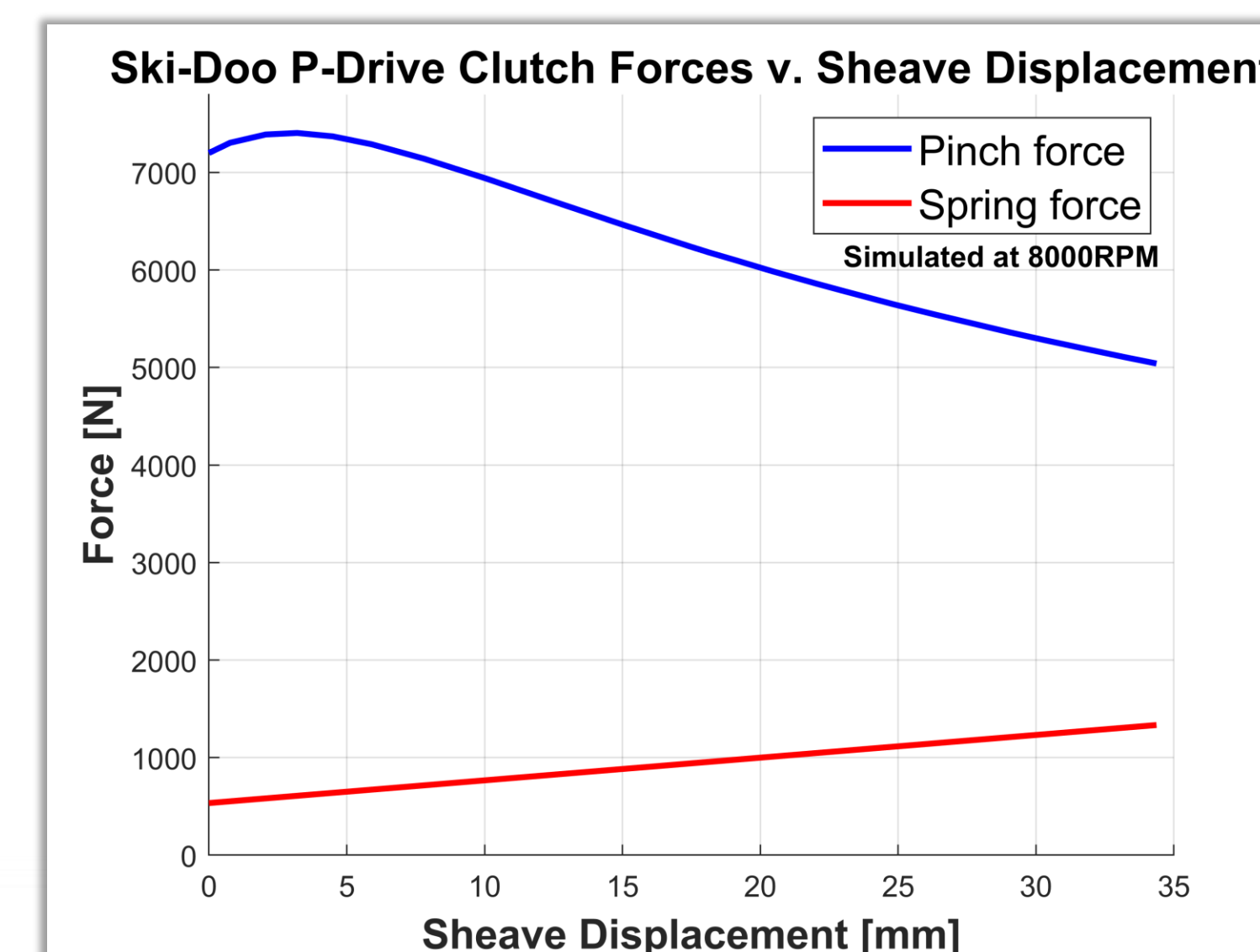
- Handle engine speeds up to 8000 RPM
- Similar response to stock CVT
- Powered by snowmobile's 12-volt power
- Safety systems for rider protection
- Within 2.25 kg (5 lbf) of stock assembly

Acknowledgements:

Special thanks to Dr. Cordon, Dr. Kumar, Dr. Hess, Brian Petty, Charles Cornwall, UI Clean Snowmobile Challenge Team, Alex Fuhrman, UICSC Alumni, BRP, Wagstaff, and ODrive

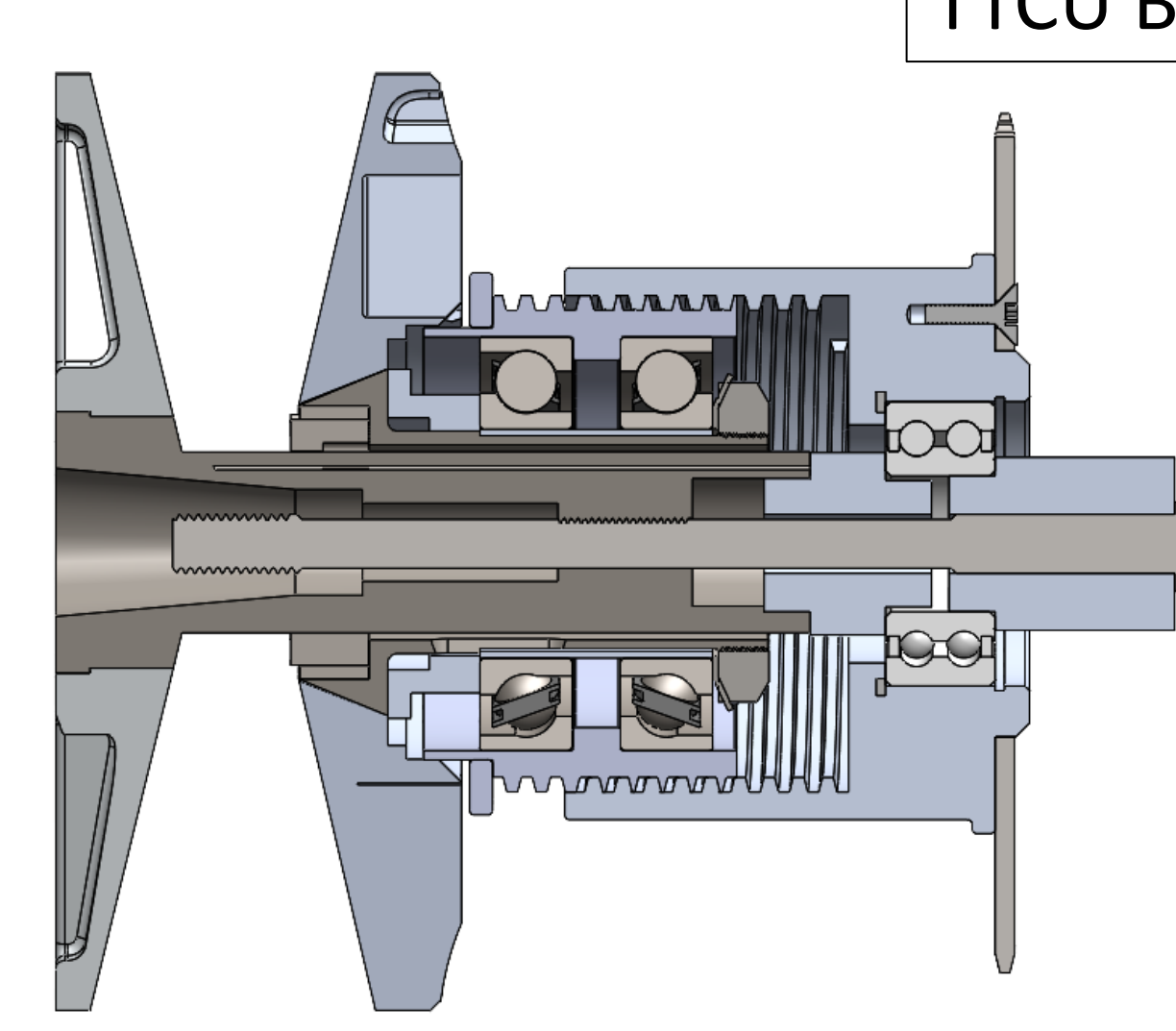
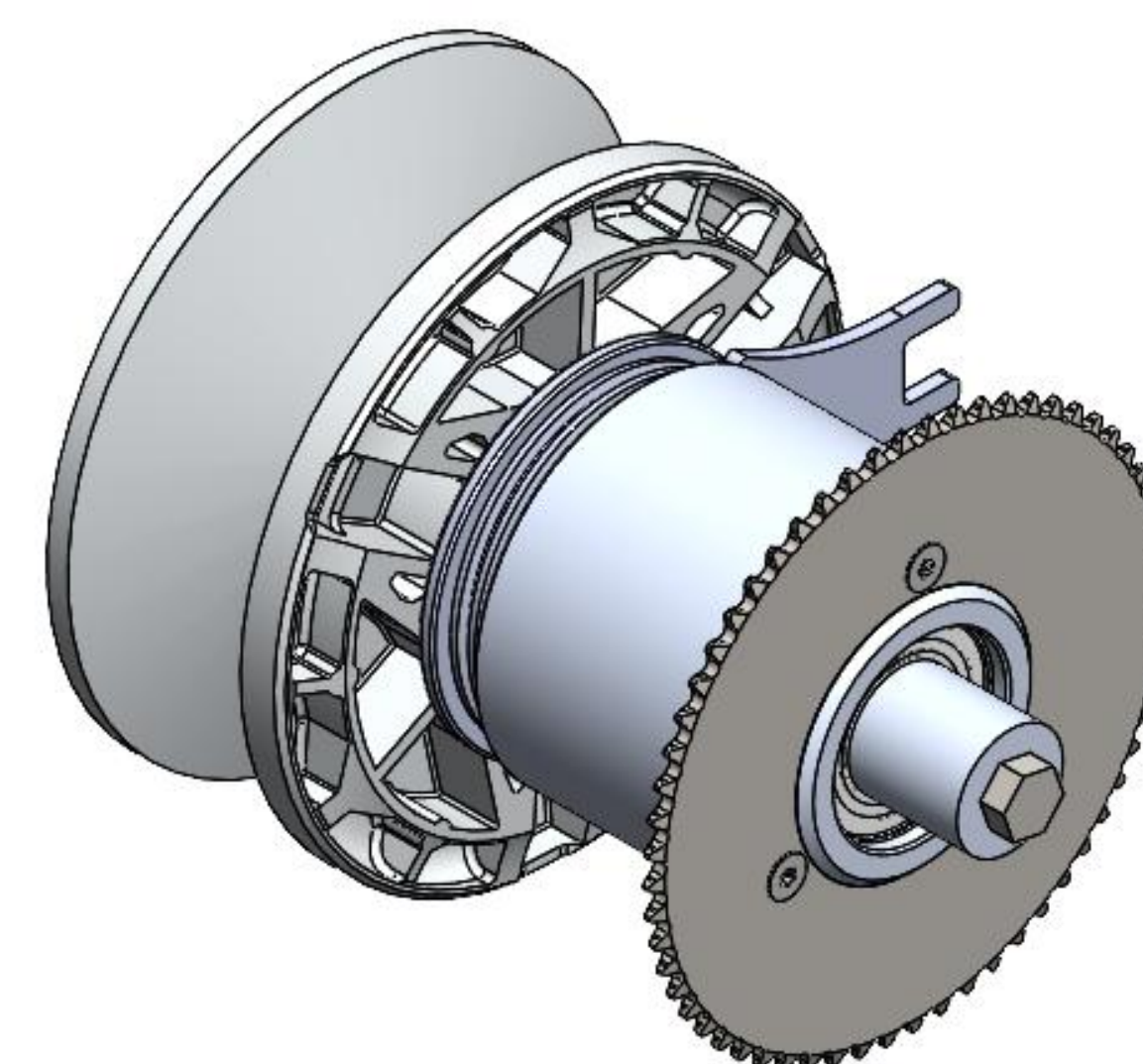
Concept Development

- ANSYS dynamic simulation verifies safe operation at 8000 RPM and under belt clamping forces



E-CVT Driver Pulley Design

- ACME threaded linear screw actuation
- Changes gear ratio based on engine speed and throttle position
- Anodized 6061 aluminum to steel threading to reduce galling
- Driven by REV NEO brushless motor via chain drive
- Uses stock driven pulley



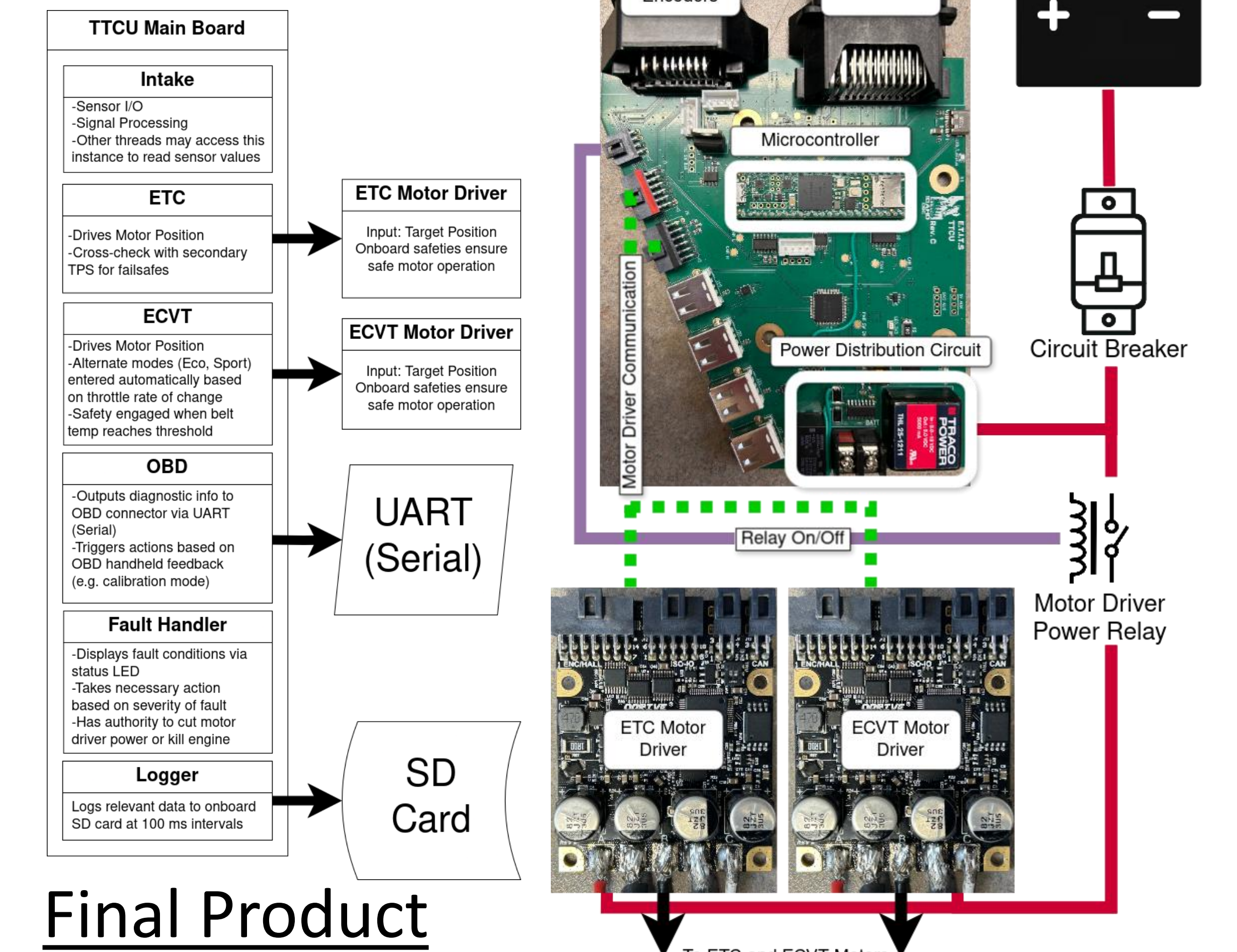
Electronic Throttle Control

- Belt-driven replacement of stock cable throttle
- Mounted onto jackshaft tower
- High-resolution encoder for position sensor
- Driven by REV NEO motor to maintain similarity between systems

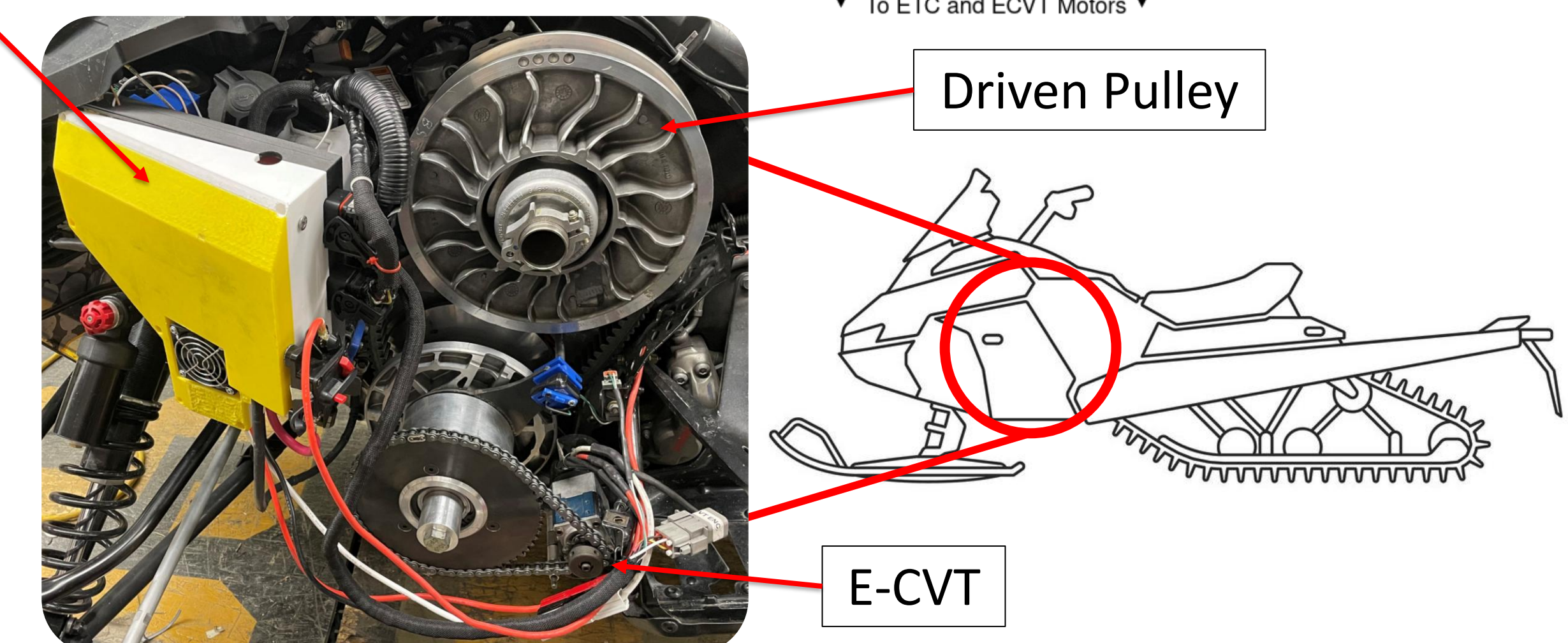


Throttle & Transmission Control Unit

- Integrates motor control, sensor I/O, and power management in one box
- Custom PCB as main board



Final Product



Conclusions and Recommendations

- Switch electronic throttle control to a linear actuator, update final PCB, and replace E-CVT keyway with a spline fit