CISCOR AUTONOMOUS GROUND VEHICLE

GROUP 10

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ACKNOWLEDGMENT

Project Sponsor

- Center for Intelligent Systems, Control, and Robotics (CISCOR)

Project Advisors

- Dr. Oscar Chuy
- Dr. Emmanuel Collins

PRESENTATION OVERVIEW

- Brief project overview
- Locomotion manipulation overview
- Final designs concepts
- Current project status
- Summary

PROJECT NEED

- Currently there is no off road vehicle platform for autonomous research and design in CISCOR's inventory

PROJECT GOAL

- Modify an existing all terrain vehicle (ATV) to be capable of full autonomous movement by designing, researching and manufacturing components to allow unmanned locomotion control

VEHICLE PLATFORM

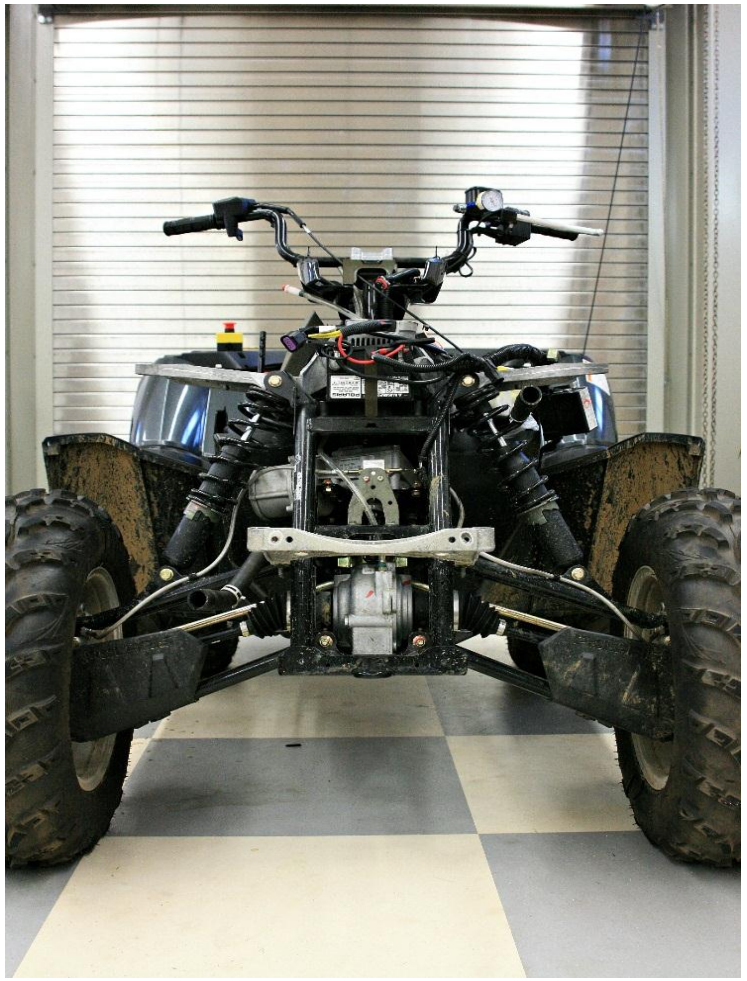
Polaris Sportsman 550 EPS

- Air Cooled Single Cylinder Engine
- Electric Power Steering
- On Demand All Wheel Drive (4x2, 4x4)
- 42 Horsepower output

PROJECT VEHICLE NAME

G. O. L. I. A. T. H.

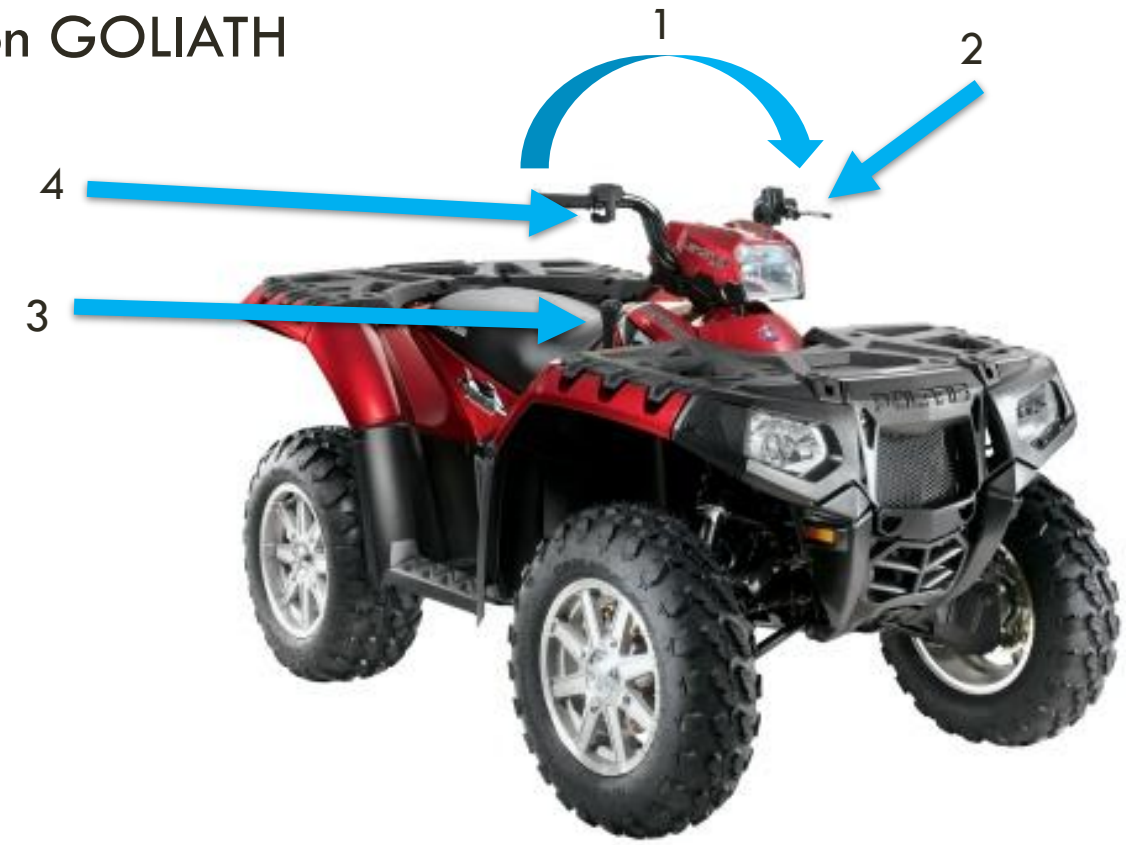
Gas **O**perated **L**and **I**ntelligent **A**ll **T**errain Ve**H**icle



LOCOMOTION OVERVIEW

Four main locomotion mechanisms on GOLIATH

1) Steering
2) Braking
3) Gear Selection
4) Throttle



FINAL SHIFTING DESIGN

System Objective

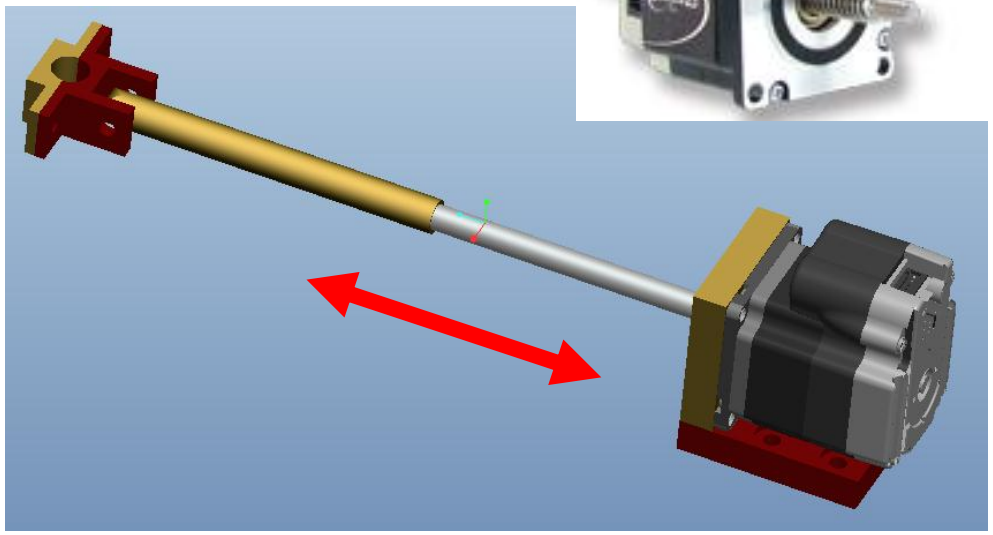
- System will provide the ability to select all 5 gears

Park, Reverse, Neutral, Low, High

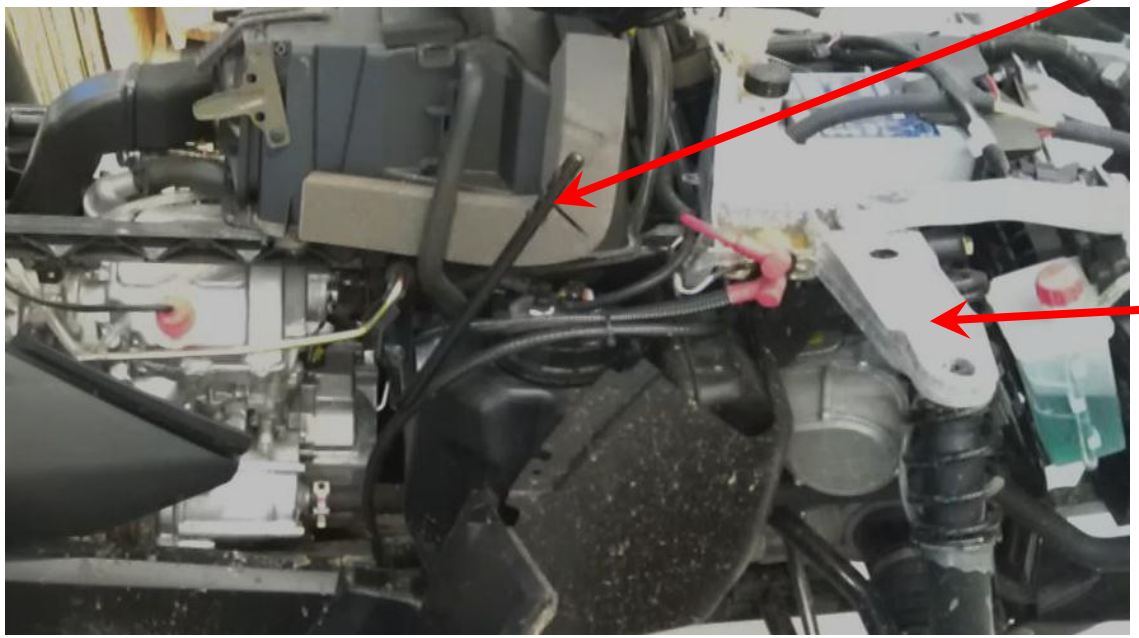
SHIFTING MANIPULATION

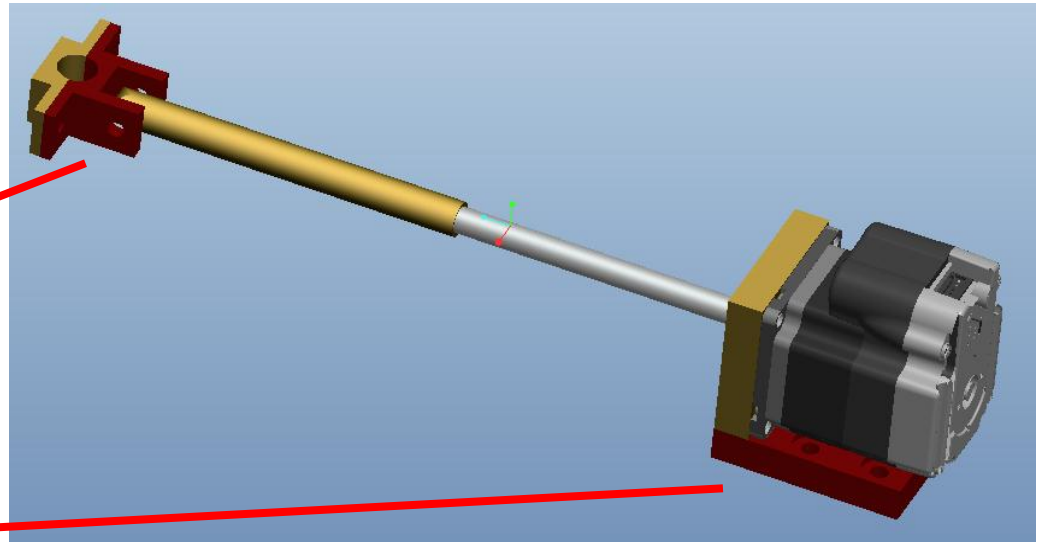
Schneider Electric M-drive 23 Hybrid Linear Actuator

- Non-captive shaft
- Max thrust: 100 lbf
- Accuracy: .005 inches
- Internal magnetic encoder
- Serial communication protocol



SHIFTING MANIPULATION





FINAL STEERING DESIGN

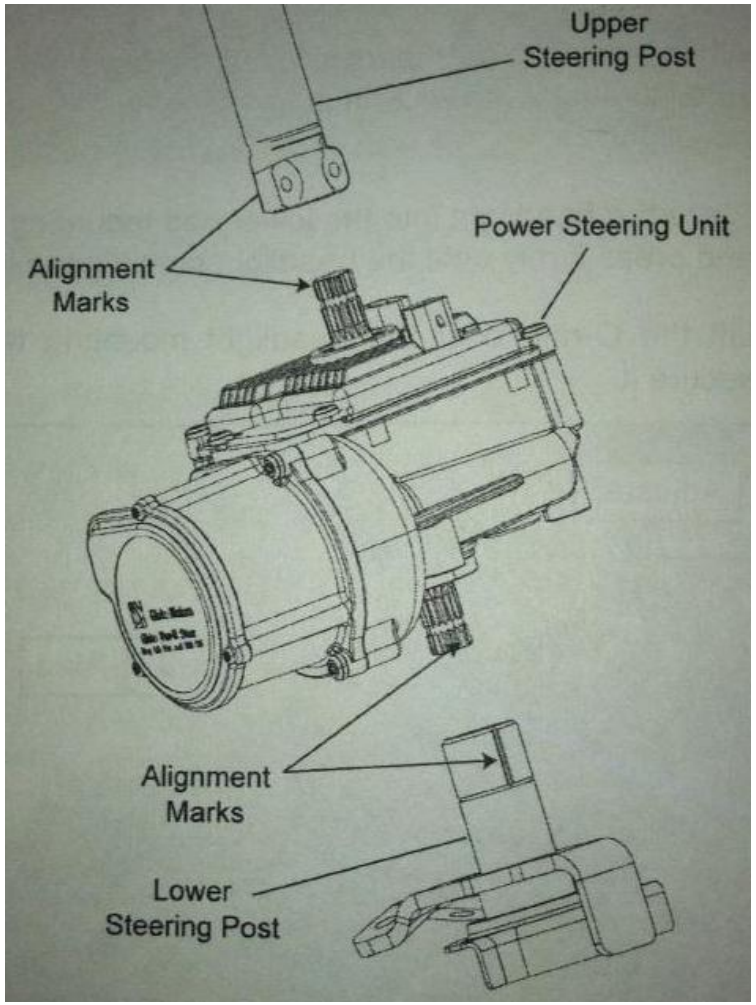
System Objectives

- System will be able to operate with full turning range
- System will be able to withstand feedback from terrain
- System will provide sufficient output power for turning at any speeds and on any terrain

STEERING MANIPULATION

Replace current power steering unit (PSU) with Global Motor's programmable PSU

- Output torque 60Nm
- Torque sensor and absolute encoder
- Exact mounting profile as current PSU
- Controller Area Network (CAN) protocol



FINAL THROTTLE DESIGN

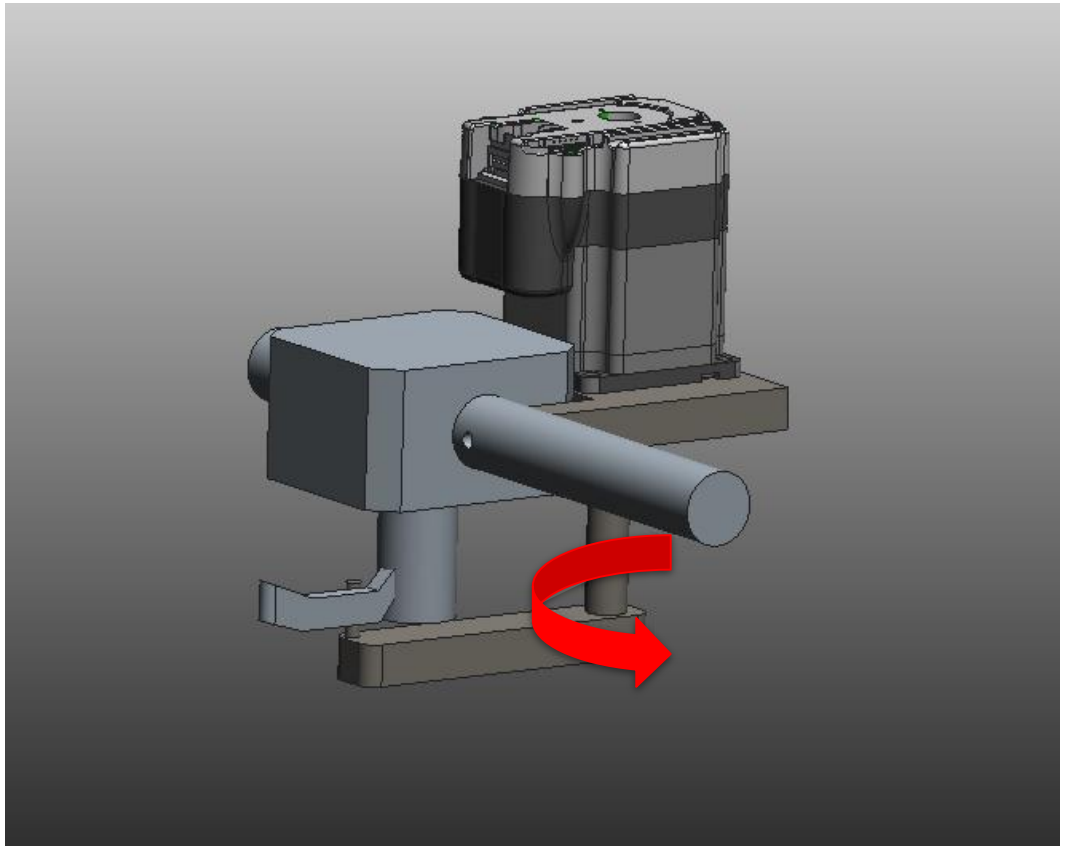
System Objectives

- System will be precise and responsive
- System will utilize full throttle travel range

THROTTLE MANIPULATION

Schneider Electric M-Drive 23 Stepper Motor

- Holding Torque: 1.60 N*m
- 20 micro step resolution from full steps to 51,200 per revolution
- Integrated motor driver
- Optical encoder
- Serial communication protocol



FINAL BRAKING DESIGN

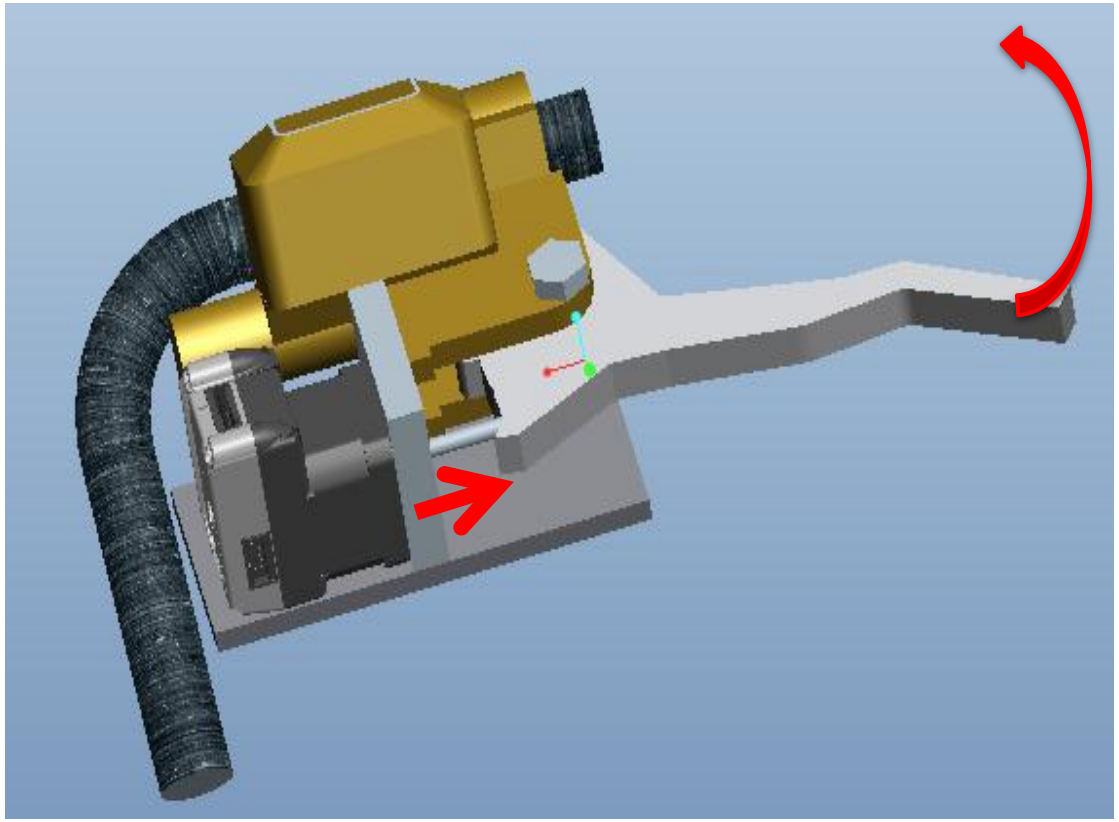
System Objectives

- System will have the same response time for braking as a human would
- System will be able to hold a braking position
- System will be able to utilize full braking range

BRAKING MANIPULATION

Schneider Electric M-Drive 17 Linear Actuator

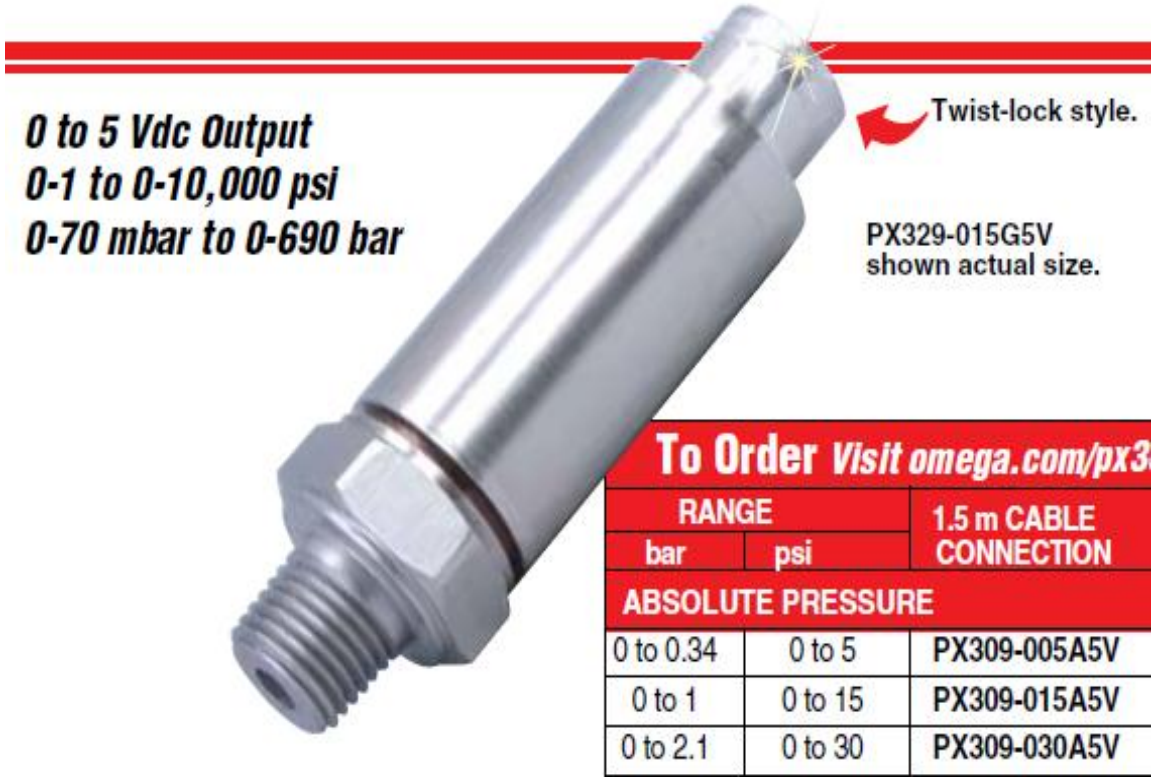
- Max thrust: 50 lbf
- 3 inches of linear travel
- Accuracy: .005 inches
- Internal magnetic encoder
- Serial communication protocol



BRAKE PRESSURE SENSOR

Omega Engineering PX309-1KG5V

- Provides feedback for braking actuation
- Range of 0-1000 PSI
- .25% Static Pressure
- 0-5 VDC output



RANGE		1.5 m CABLE CONNECTION
bar	psi	
ABSOLUTE PRESSURE		
0 to 0.34	0 to 5	PX309-005A5V
0 to 1	0 to 15	PX309-015A5V
0 to 2.1	0 to 30	PX309-030A5V

CURRENT PROJECT STATUS

- Major locomotion components have been purchased
- All motor mounts are ready for machining
- Machining material is in stock and ready for use
- Project is proceeding as scheduled

For completion in Spring semester

- Mount and install locomotion components
- Design and manufacture sensor/computer mounts

SUMMARY

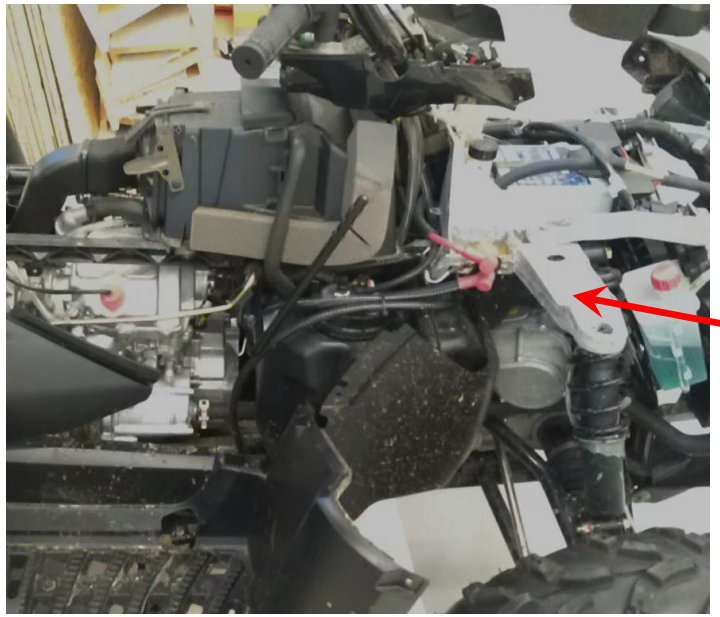
Locomotion Mechanism

1. Steering
2. Braking
3. Gear Select
4. Throttle

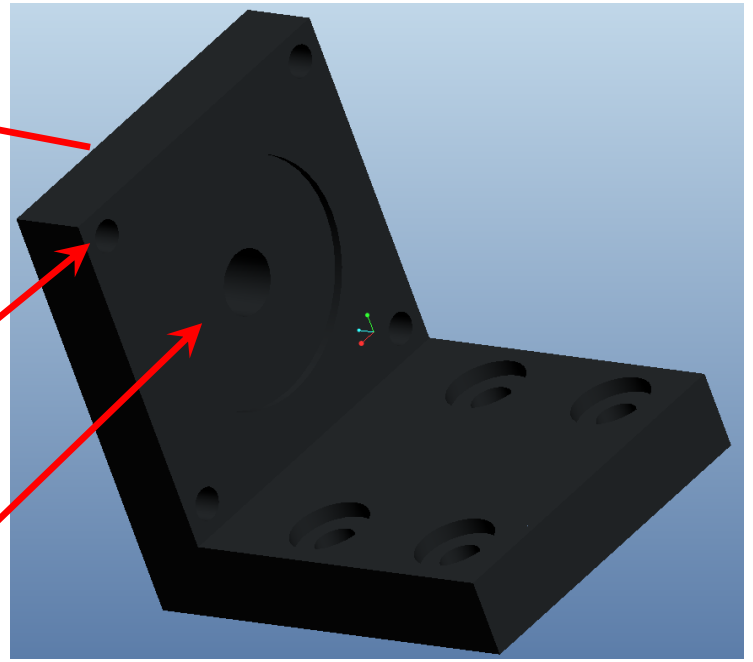
QUESTIONS?

ADDITIONAL SLIDES

SHIFTER ACTUATOR MOUNT



Mount the linear actuator on the body

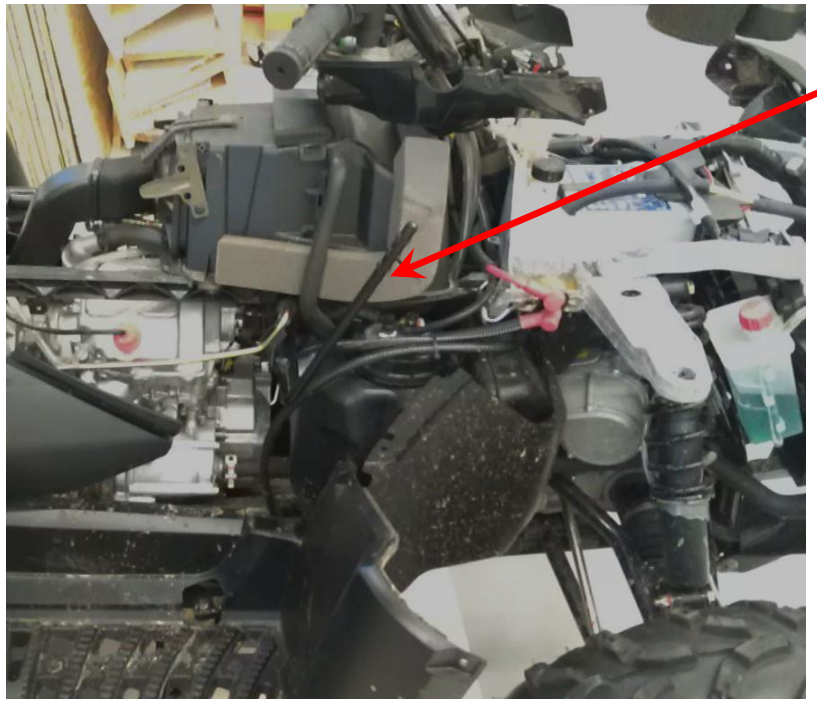


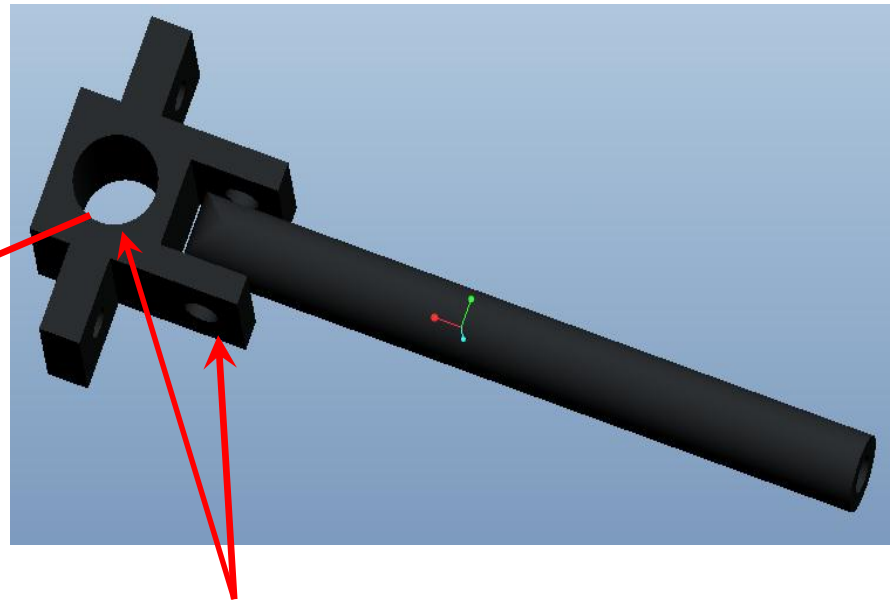
Linear Actuator Mount Holes

Non-captive Shaft Hole

SHIFTER COUPLER

- Coupler: connects linear actuator to the shift arm





Coupler works as a pin and slider joint to transform an arc into linear motion

THROTTLE MOUNT

Dark Brown Denotes Machined Parts

1. Motor mount
2. Shaft extender
3. Throttle actuator