

OVERVIEW

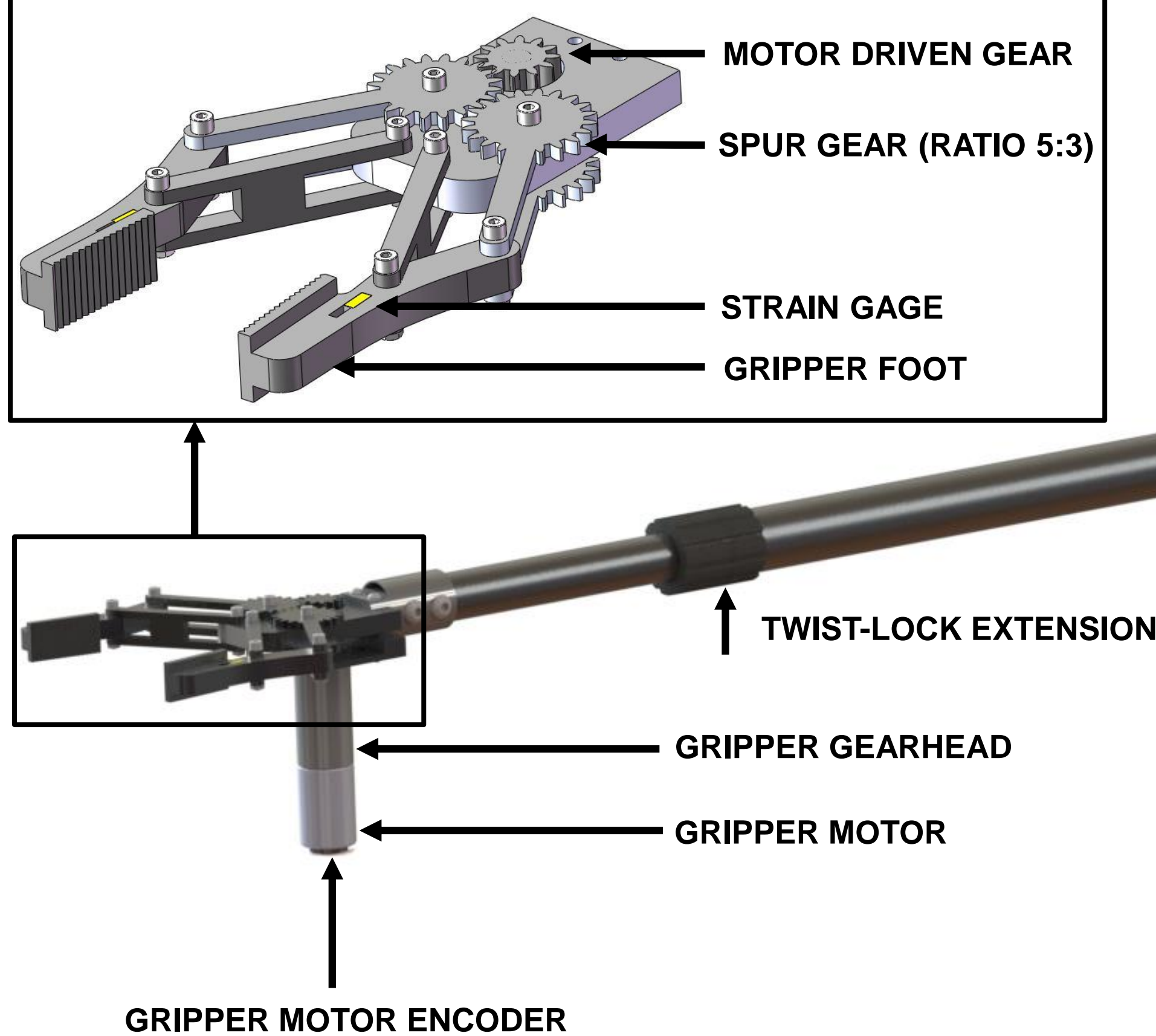
Need for a novel reacher solution to aid an elderly or wheelchair bound individual by offering:

- Variable reach extension
- Variable grip sensitivities
- Variable mechanical advantages
- Power assisted gripping
- Force feedback from object being gripped
- Gripper locking capability
- Increased dexterity

SPECS

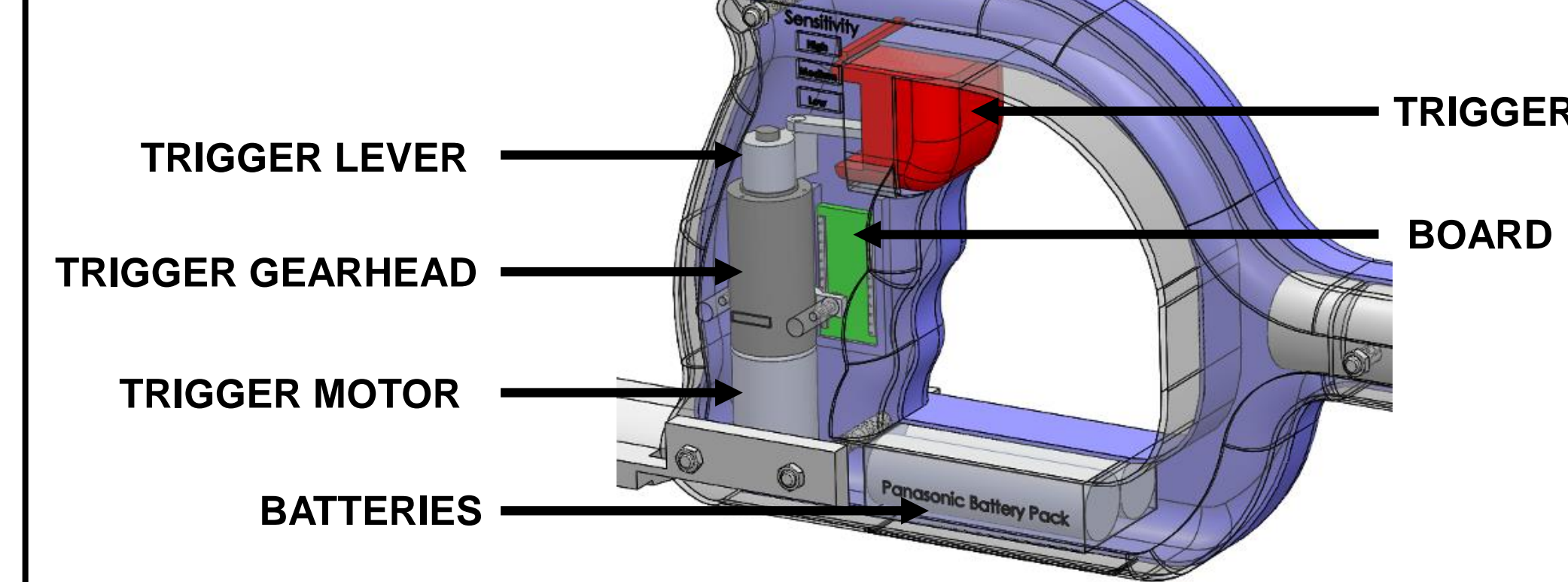
- Maximum grip distance: **4"**
- Maximum grip force: **10 lbf**
- Sensitivity settings:
 - **High** ($m = 0.5$)
 - **Medium** ($m = 1$)
 - **Low** ($m = 2$)
- Assembly weight: **3.5 lb**
- Minimum reach extension: **32"**
- Maximum reach extension: **42"**
- Gearhead ratios: **246:1**
- Motor torques: **10 mN-m**
- Gripper closing speed: **8.79 in/s**

GRIPPER ASSEMBLY



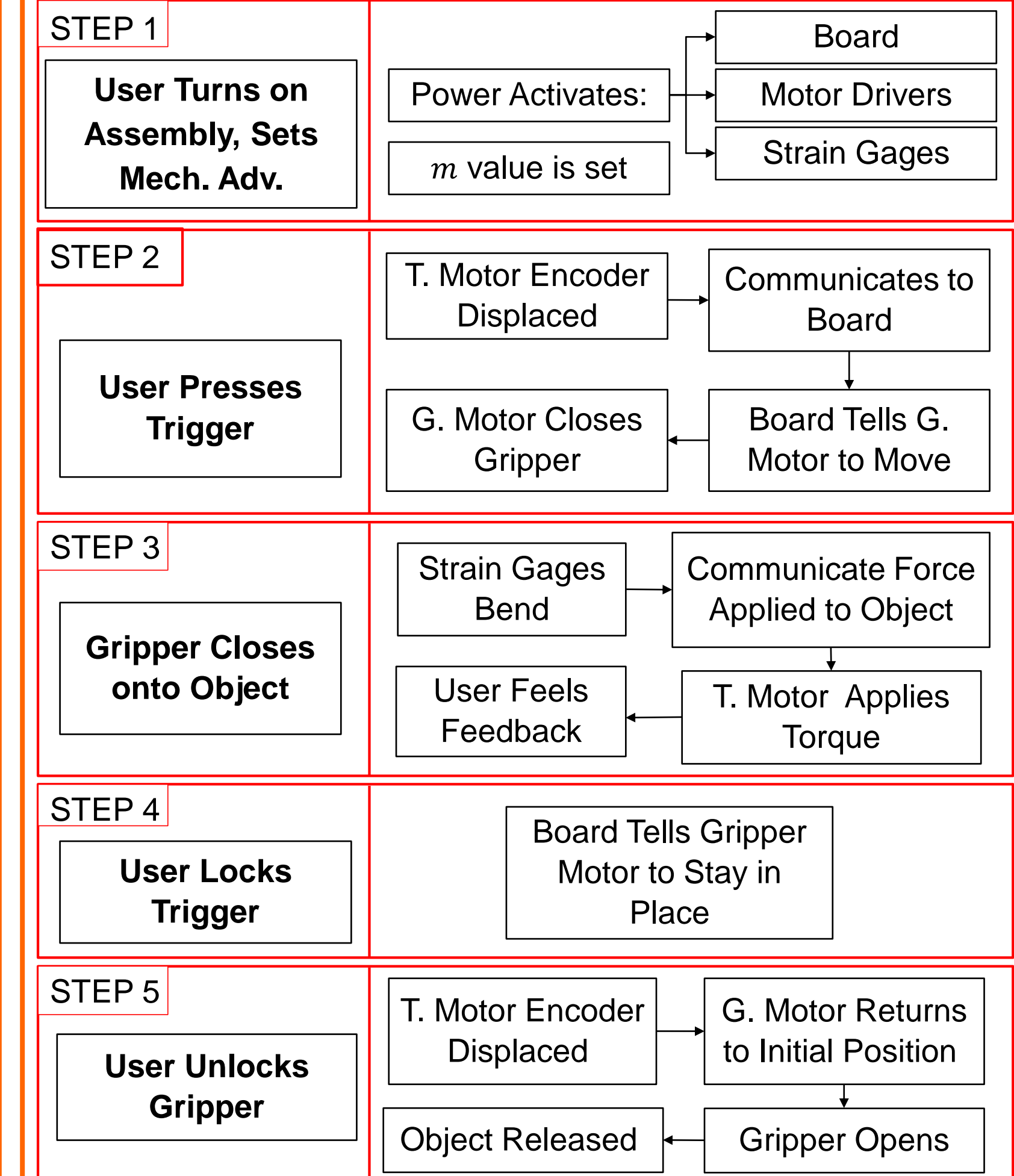
GEARHEAD REDUCTION: 246:1
MOTOR TORQUE: 10 mN-m

HANDLE ASSEMBLY



SUPPORT ARM HOOP

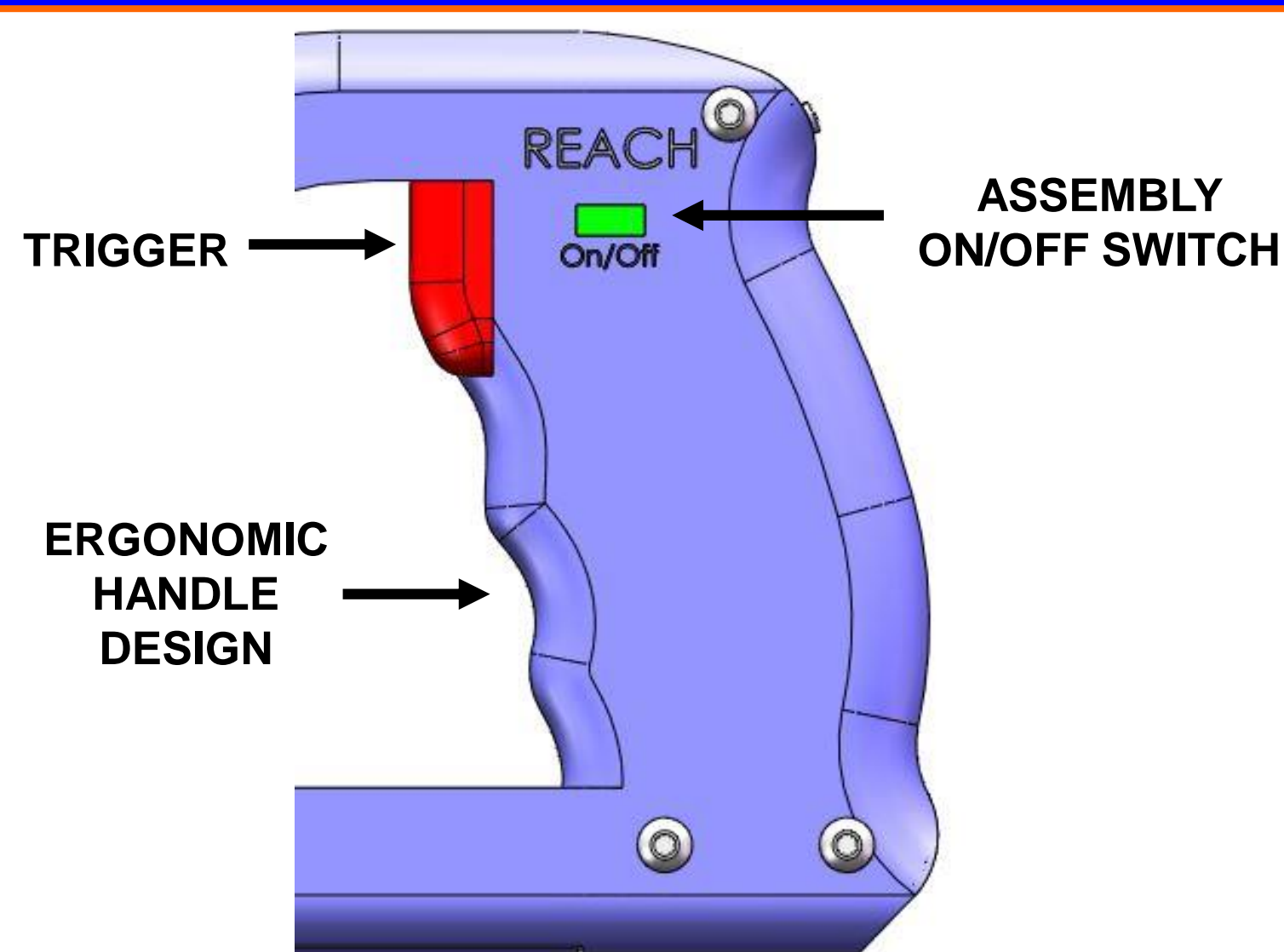
FLOW OF OPERATIONS



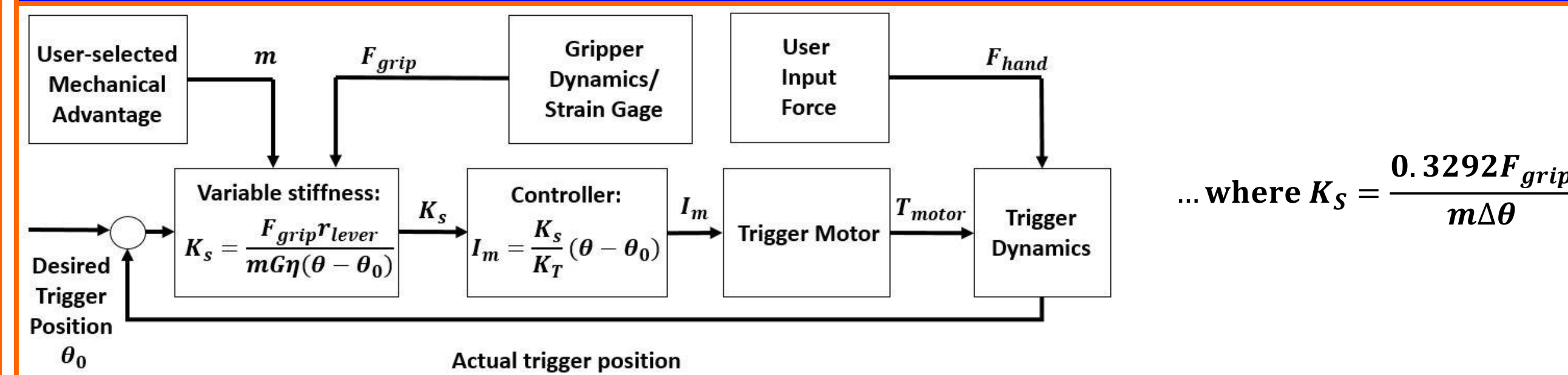
MATERIAL SELECTION

- Arm Hoop: **Aluminum 6061**
- Handle: **High Density Polyethylene (HDPE)**
- Extension Tubes: **Aluminum 6061**
- Twist Lock: **HDPE**
- Motor/Gearhead: **Steel**
- Gripper Gears: **Aluminum 6061**
- Gripper Feet: **Aluminum 6061**
- Fasteners: **Steel**
- Trigger Link/Lever: **Aluminum 6061**

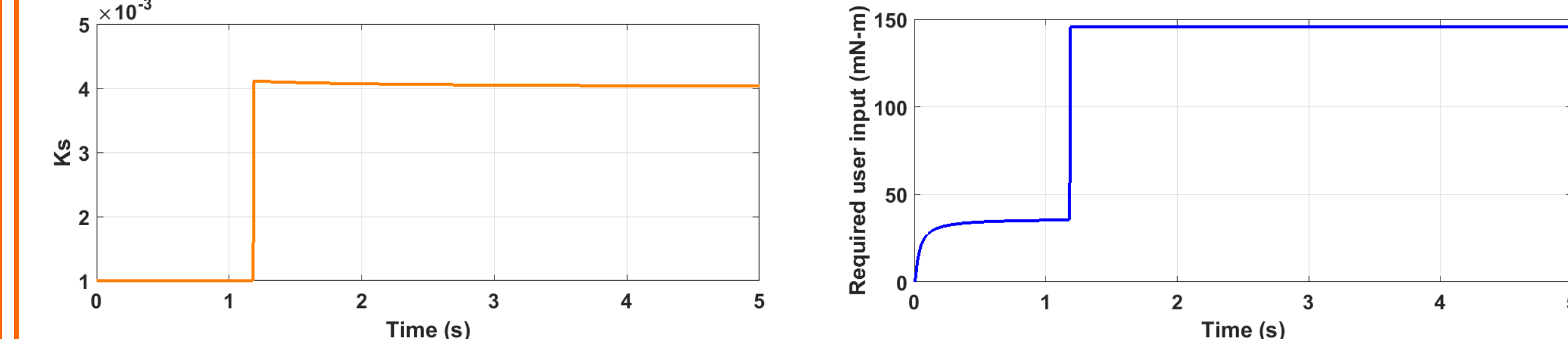
USER INTERFACE



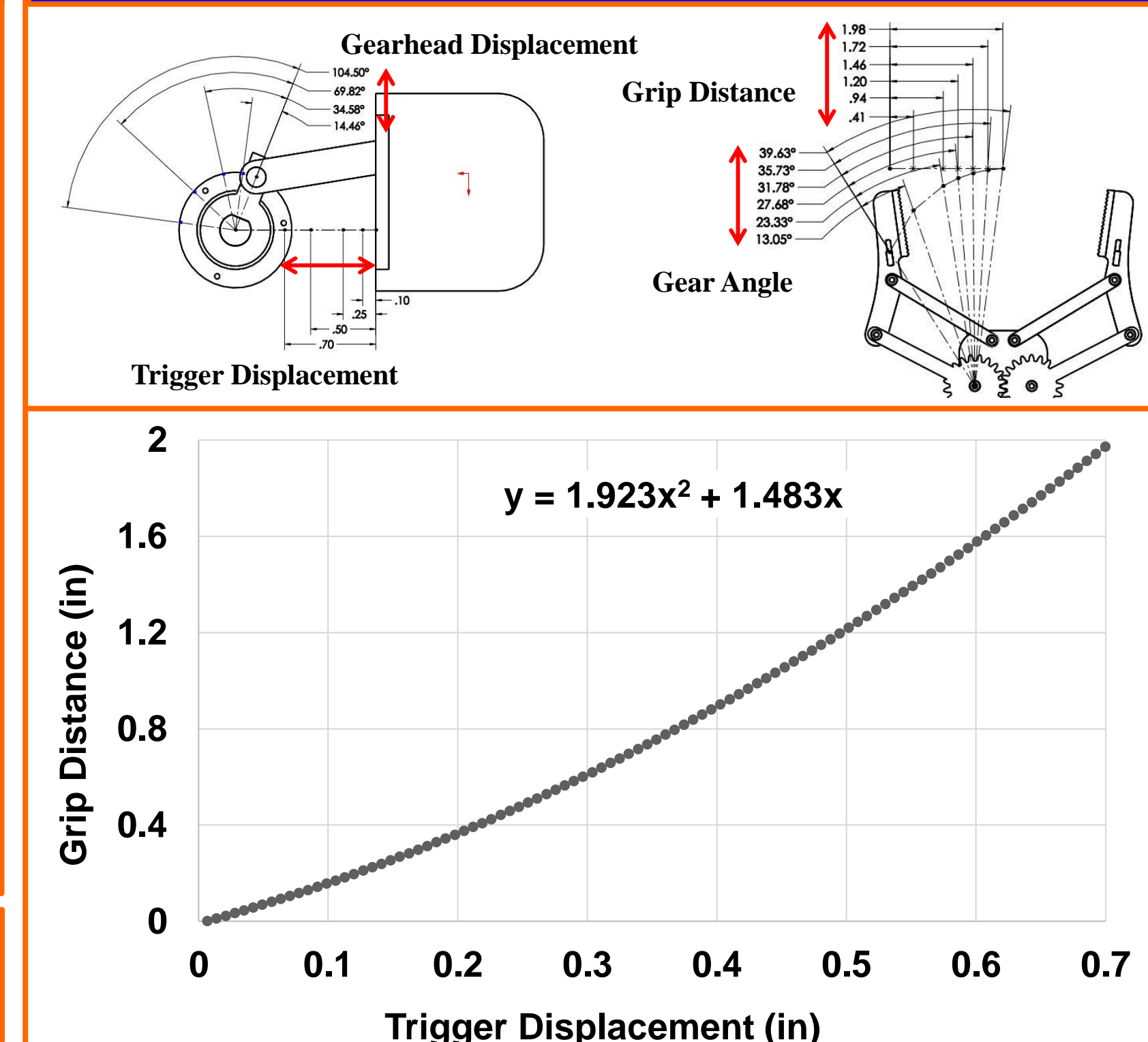
CONTROLS



MATLAB SCENARIO: USER INPUT SIMULATION



MECHANICAL ANALYSIS



COST

Cost analysis was conducted assuming a production schedule of 25,000 reachers per month:

- Cost of materials per reacher: **\$934.84**
- Assembly time per reacher: **8.29 minutes**
- Cost of direct labor per reacher: **\$4.89**
- Landed costs per month: **\$23,870,559**
- Total cost per month: **\$23,995,352**

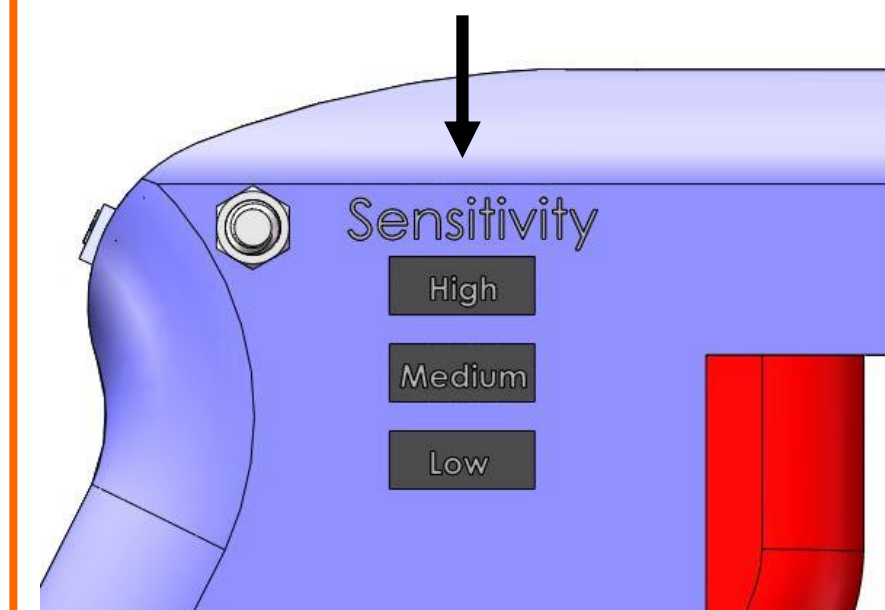
TOTAL COST PER REACHER: **\$939.72**

SUGGESTED MSRP: **\$999.99**

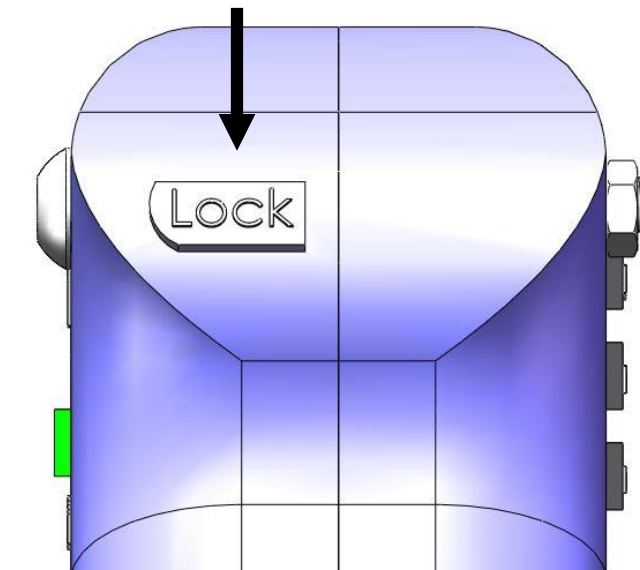
NORTHROP GRUMMAN



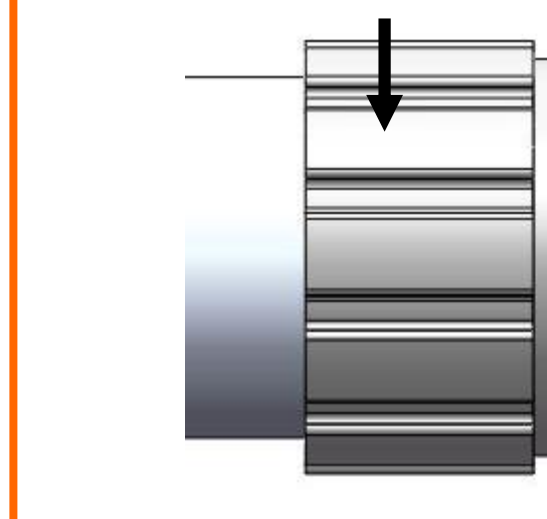
USER CONTROLLED SENSITIVITY



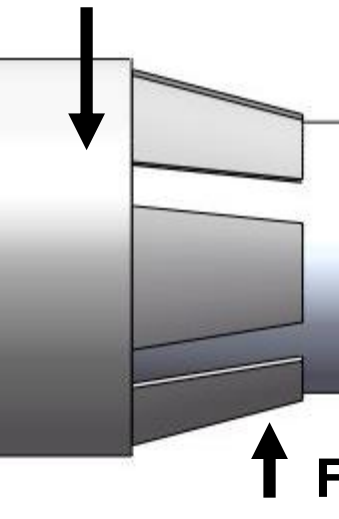
GRIPPER LOCKING TOGGLE



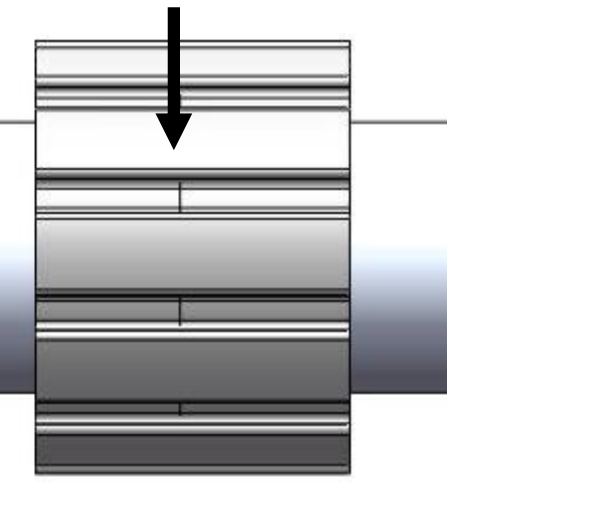
MALE TWIST-LOCK



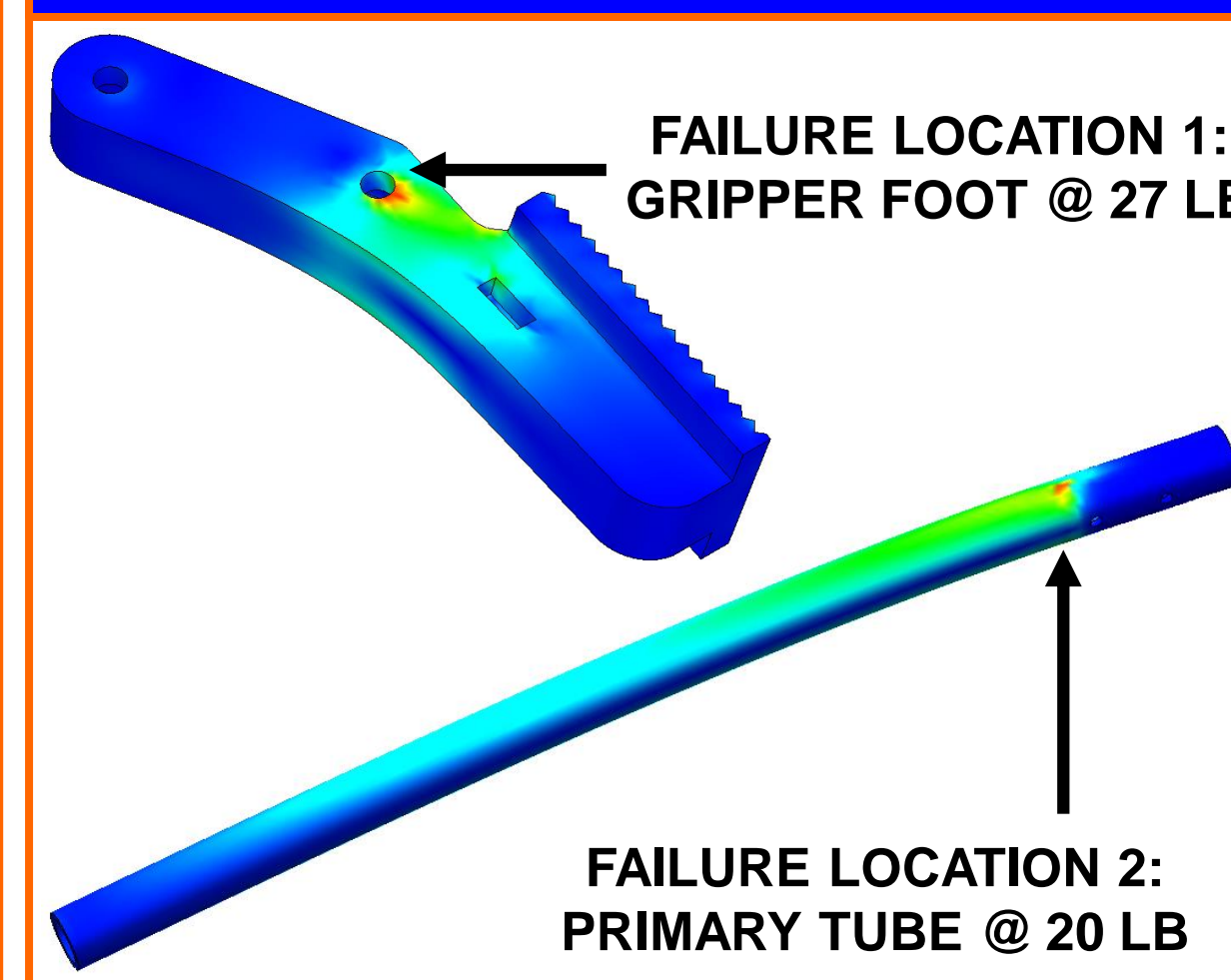
THREADS



FEMALE TWIST-LOCK



FAILURE ANALYSIS



ELECTRONICS

