

EXPO AUTOMATED RING/MOUNT CROSSBOLT PRESS

engineering ▲ design

Objectives

- Automate the alignment and pressing of crossbolts into rings/mounts
- Reduce process time
- Decrease operator input
- Minimize defective products

Value Proposition

In response to rising demand for Nightforce products, automation is needed to improve manufacturing efficiency. This project aims **to replace a time and labor-intensive process** by designing and prototyping a purpose-built machine to **automate pressing cross bolts into rings/mounts**, increasing efficiency, safety, and reliability while reducing operator input.

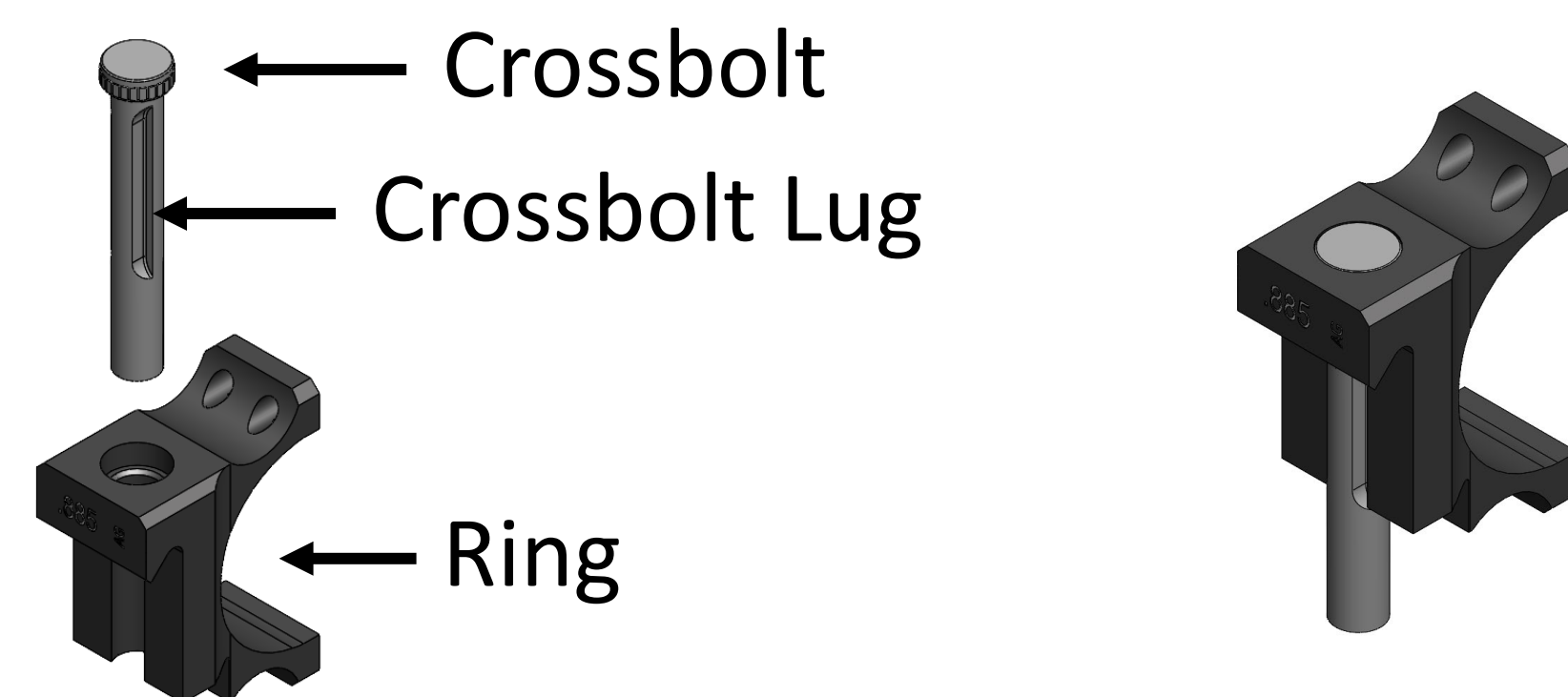
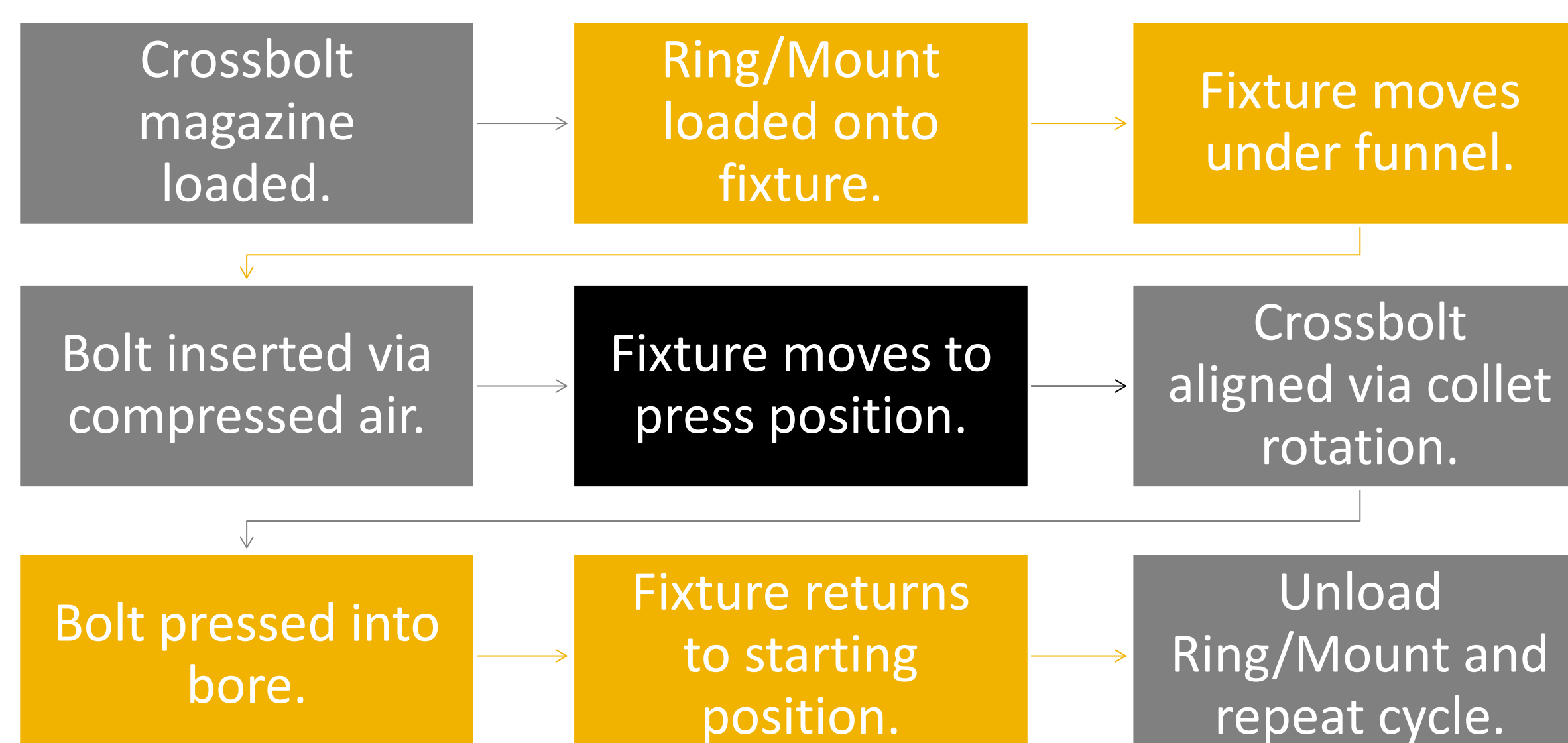


Fig. 1 – Crossbolt and Ring disassembled (left) and assembled (right).

Automation Cycle



Hardware Design

- 8020 rigid frame
- Compressed air **bolt propulsion**
- Strong “mill” like **linear table**
- Belt-driven **bolt rotation** uses “collet” to grip bolt head
- Compact **alignment block** with laser sensor

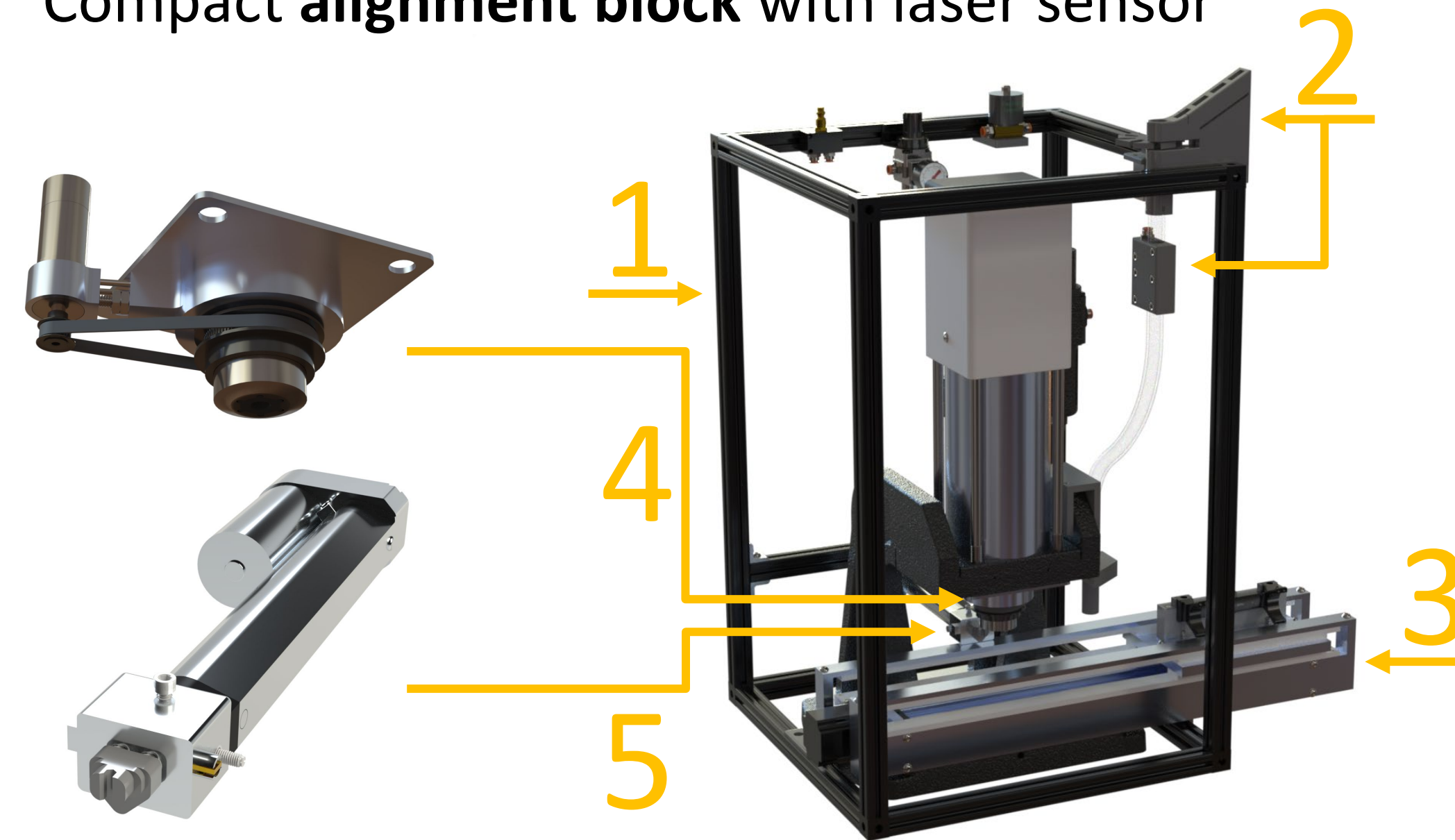
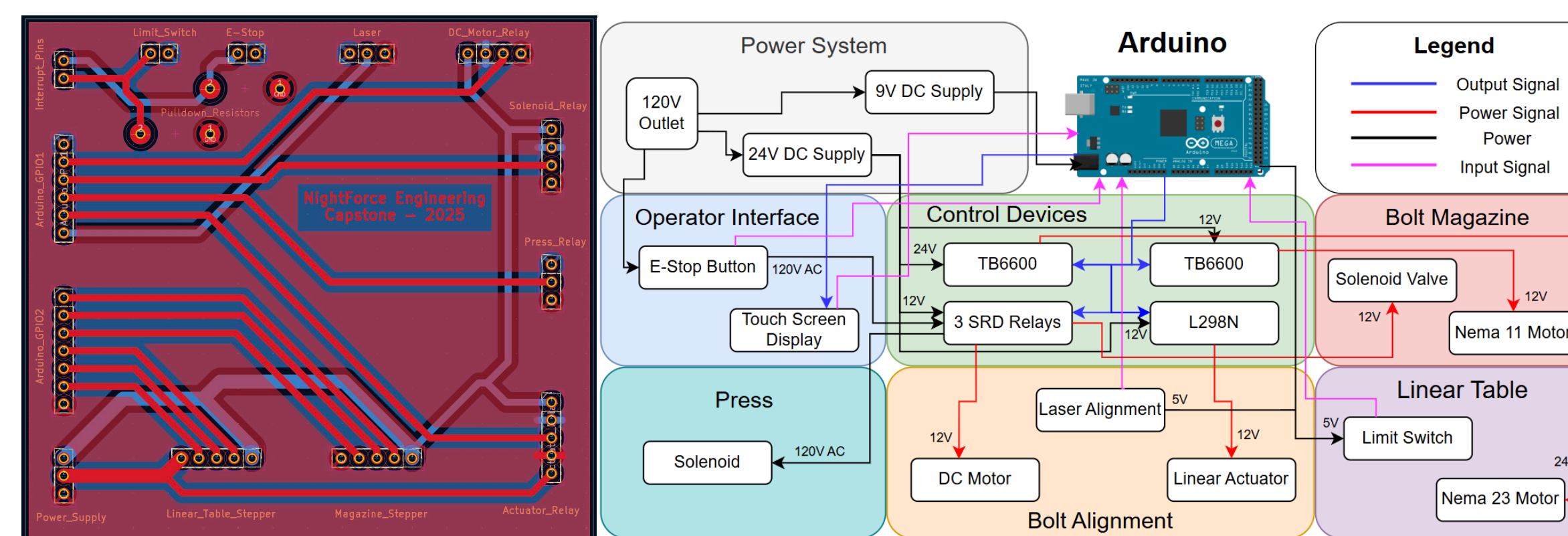


Fig. 2 – Numbered sub-assemblies. 04-00 and 05-00 are also shown separately.

Electrical Design

Component	System
Stepper Motor	Bolt Magazine
Solenoid	Bolt Propulsion
Stepper Motor	Linear Table
Linear Actuator	Alignment Block
DC Motor	Bolt Alignment

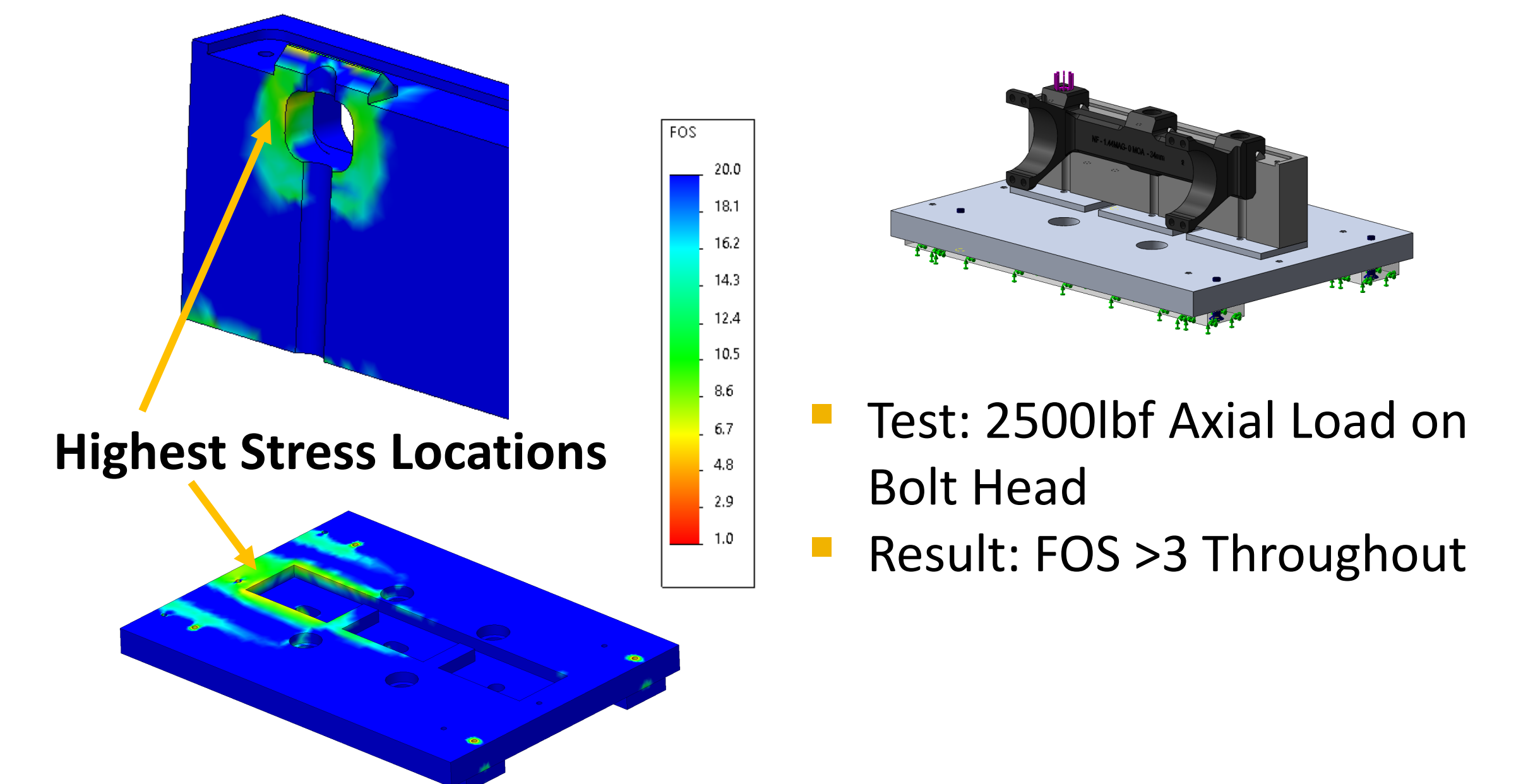


Acknowledgements

- Nightforce Optics – Client
- Christopher Bitikofer – Lead Instructor
- Brian Petty – Shop Manager

Validation

Requirements	Been Tested?	Resolution / Result
Operator Safety	✓	Emergency Stop Button
< 26 s Cycle Time	✓	~40 s
< 85 dB Noise Restriction	✓	Press: 85 dB @ 80 psi Bolt Prop.: 85 dB @ 45 psi
No Anodizing Marring	✓	Delrin Insert
< 5 min Fixture Change	✓	~1 min
2° Angular Tolerance	×	
98% Product Reliability	×	



Future Work

- Extend table travel range:
 - Load more rings/mounts improving cycle time
- Add a full safety enclosure:
 - High-impact polycarbonate door and walls
- Improve bolt rotation grip:
 - Twist-lock collet or actuated arms
- Automate loading:
 - Robot arm for rings/mounts
 - Bolt sorting machine
- One size fits all fixture:
 - Fixture that works for all products, removing need for swapping



2025 Capstone Project