

Johnson
Controls



Hog Ring Application Improvement

Auburn University Design Project
Corporation 6

Design Team

Group Members

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Johnson Controls



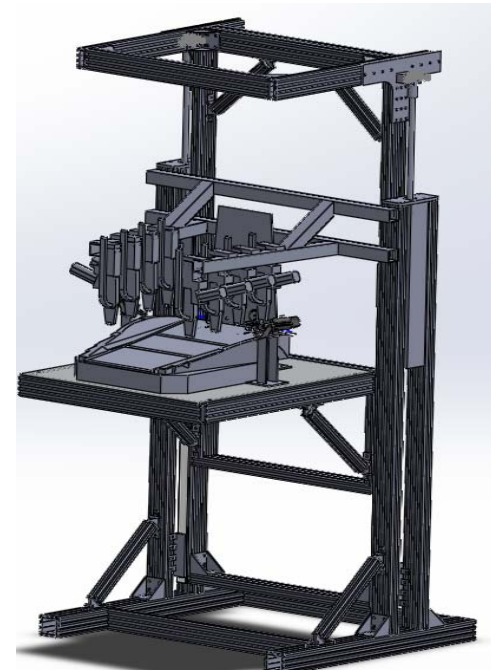
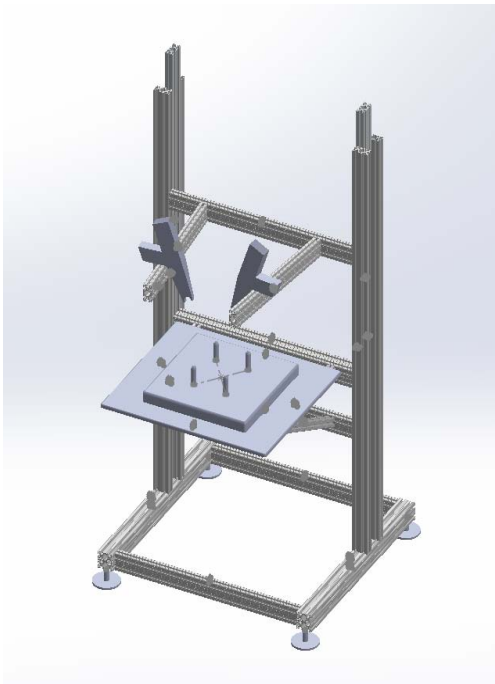
Outline

- Previous Concept Overview
- Final System Architecture
- Subsystems
- Project Management
- Future Goals
- Questions



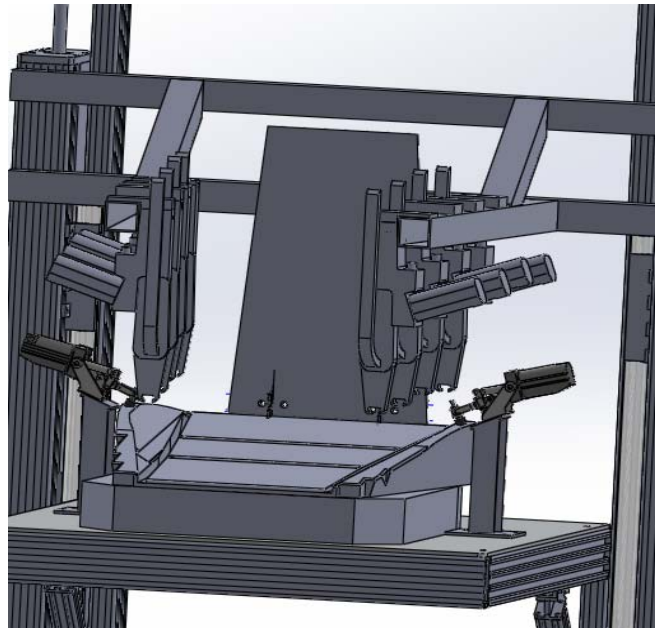
Concept Generation Overview

- Reduced required power consumption
- Eliminated unnecessary motion
- Increased durability



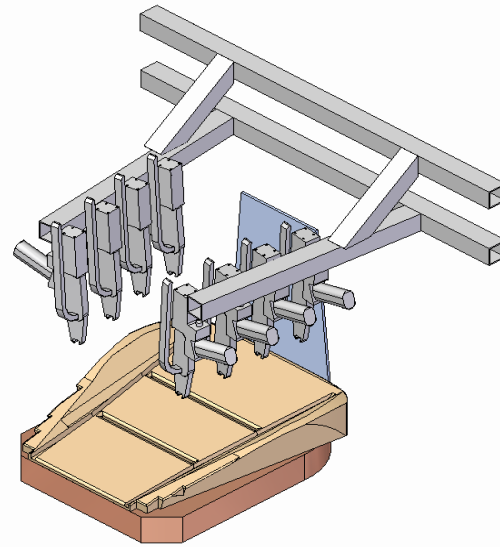
Final Concept

- 8 stationary guns in vertical positions
- Moving nest
- Toggle Clamps to suppress cushion sides



Subsystems

- Gun Triggering Actuation
- Cushion Restraints with Toggle Clamps
- Fabric Restraints
- Nest Actuation
- Safety Devices



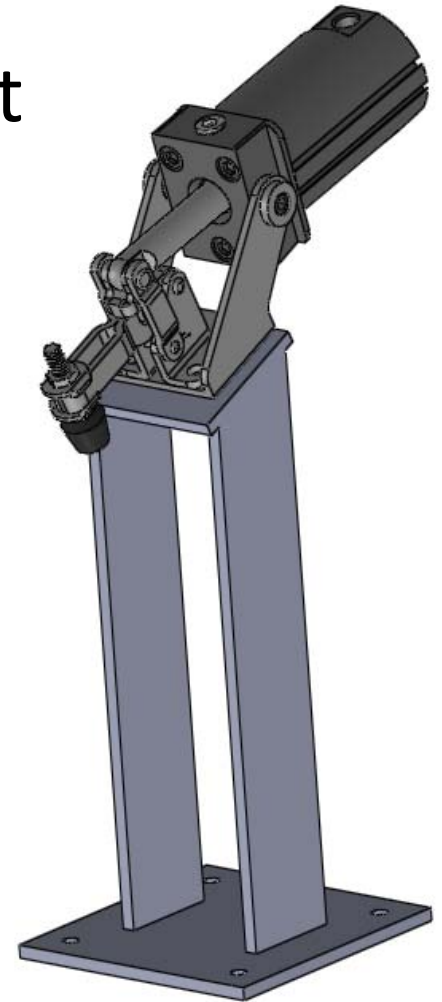
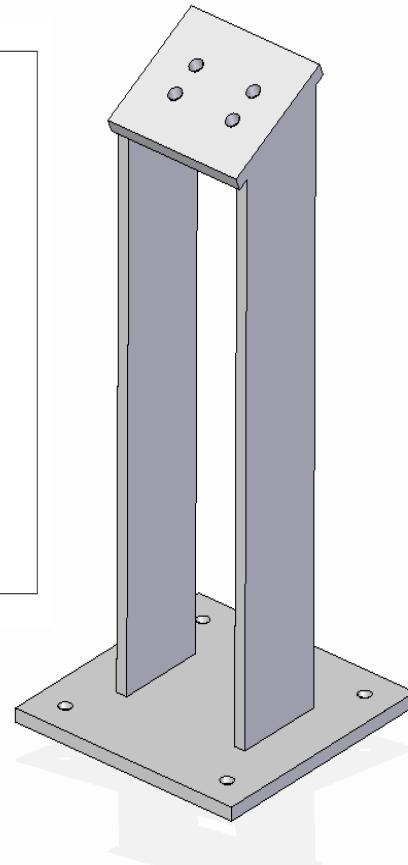
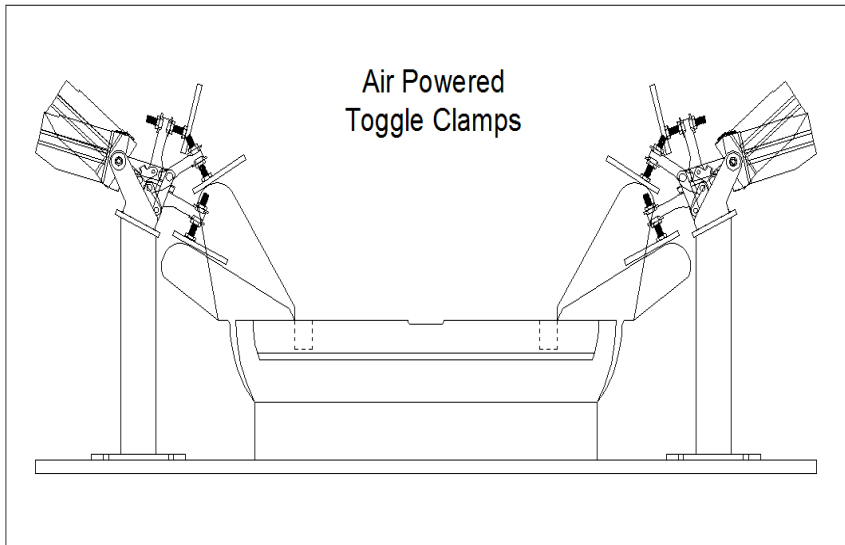
Gun Actuation

- Remove manual trigger
- Install pneumatic system
- Trigger Force Required= 8 lbs.



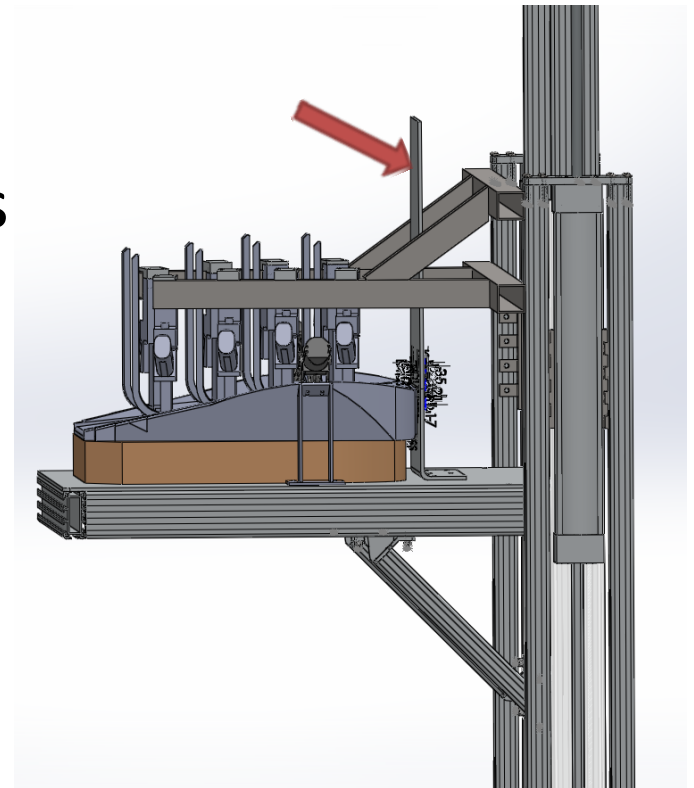
Cushion Restraints

- Pneumatic Toggle Clamps - Bracket



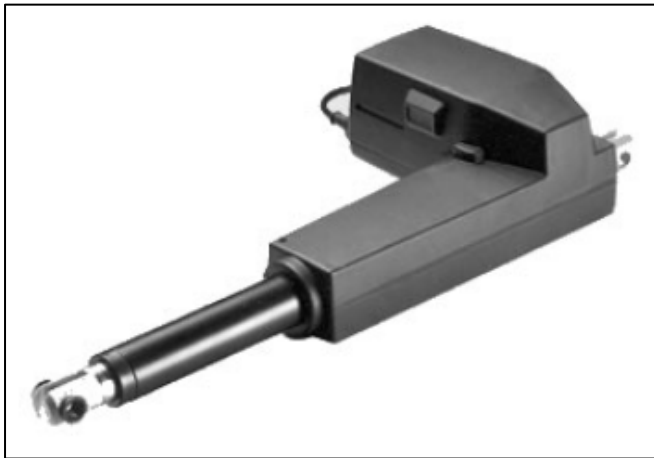
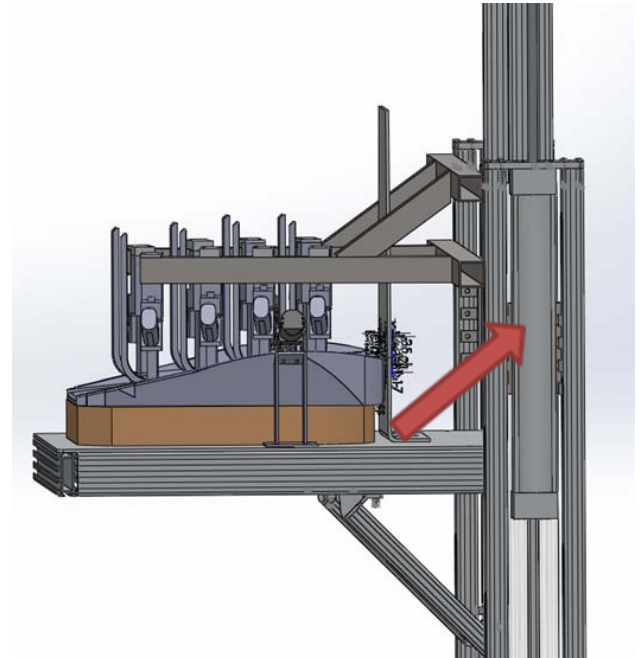
Fabric Restraints

- Clips on extruded listings
 - Alligator clips with tool balancers
- Fabric pressure plate
 - Hinged plate restrains excess



Seat Actuation

- Replace Electric Linear Actuators with Pneumatic Cylinders
- Increase speed



Max Speed: 32 mm/s
Travel Time: 12 sec



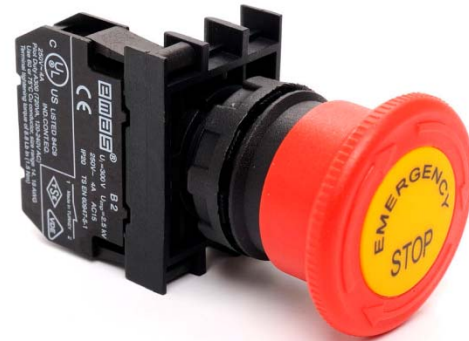
Safety Devices

Implemented Devices:

- Emergency Stop Buttons
- Finger Swipe

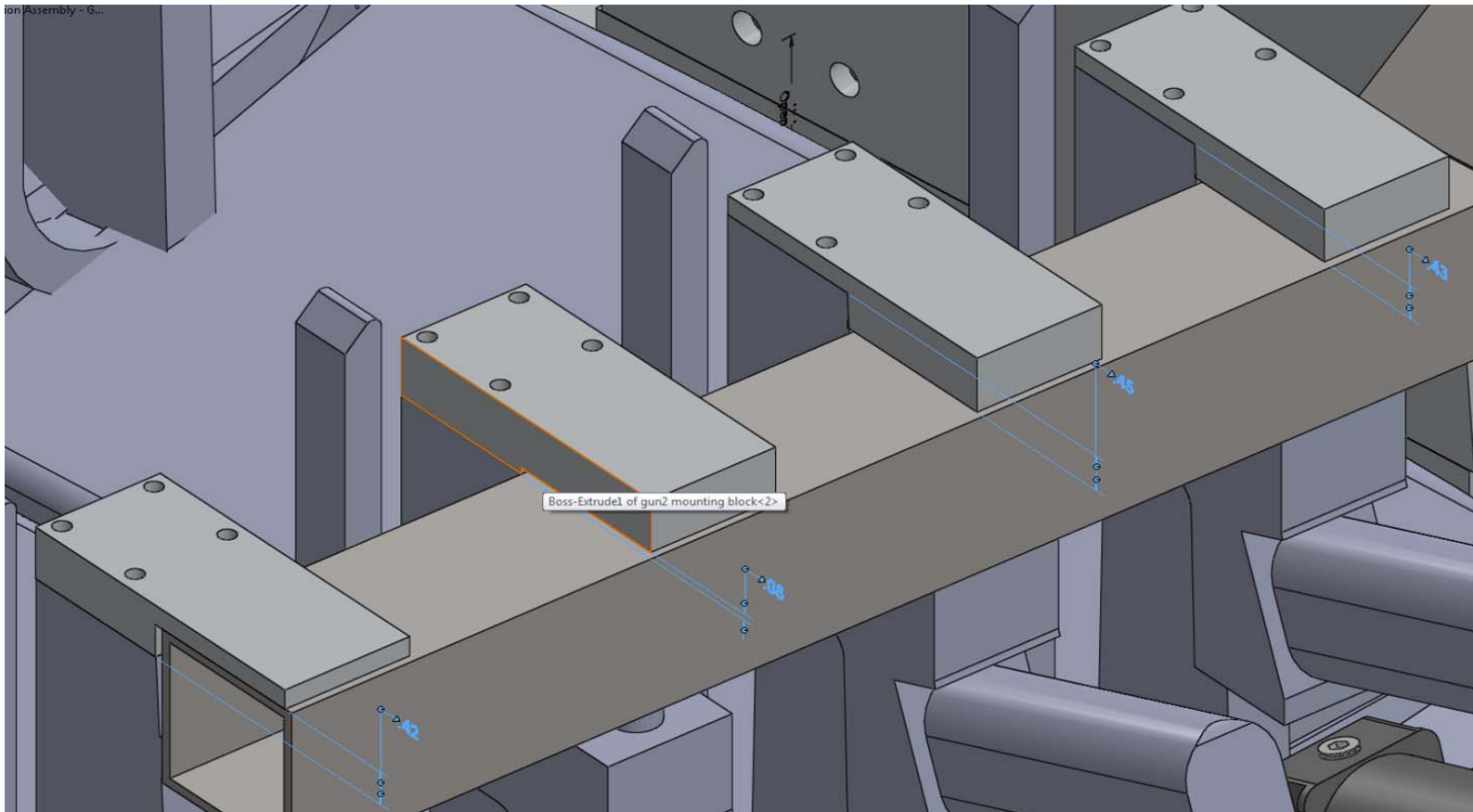
Proposed Devices:

- Guarding
- Light Curtains



Gun Placement

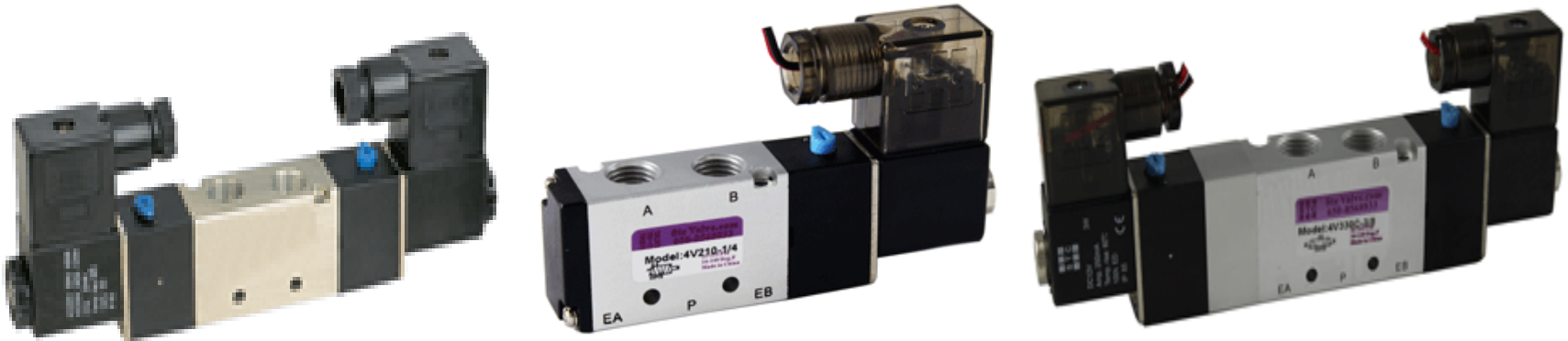
- Gun 1 and 5 mounted 0.42 in. below top of bar.
- Gun 2 and 6 mounted 0.085 in. below top.
- Gun 3,4,7 and 8 mounted 0.452 in. above top of bar.



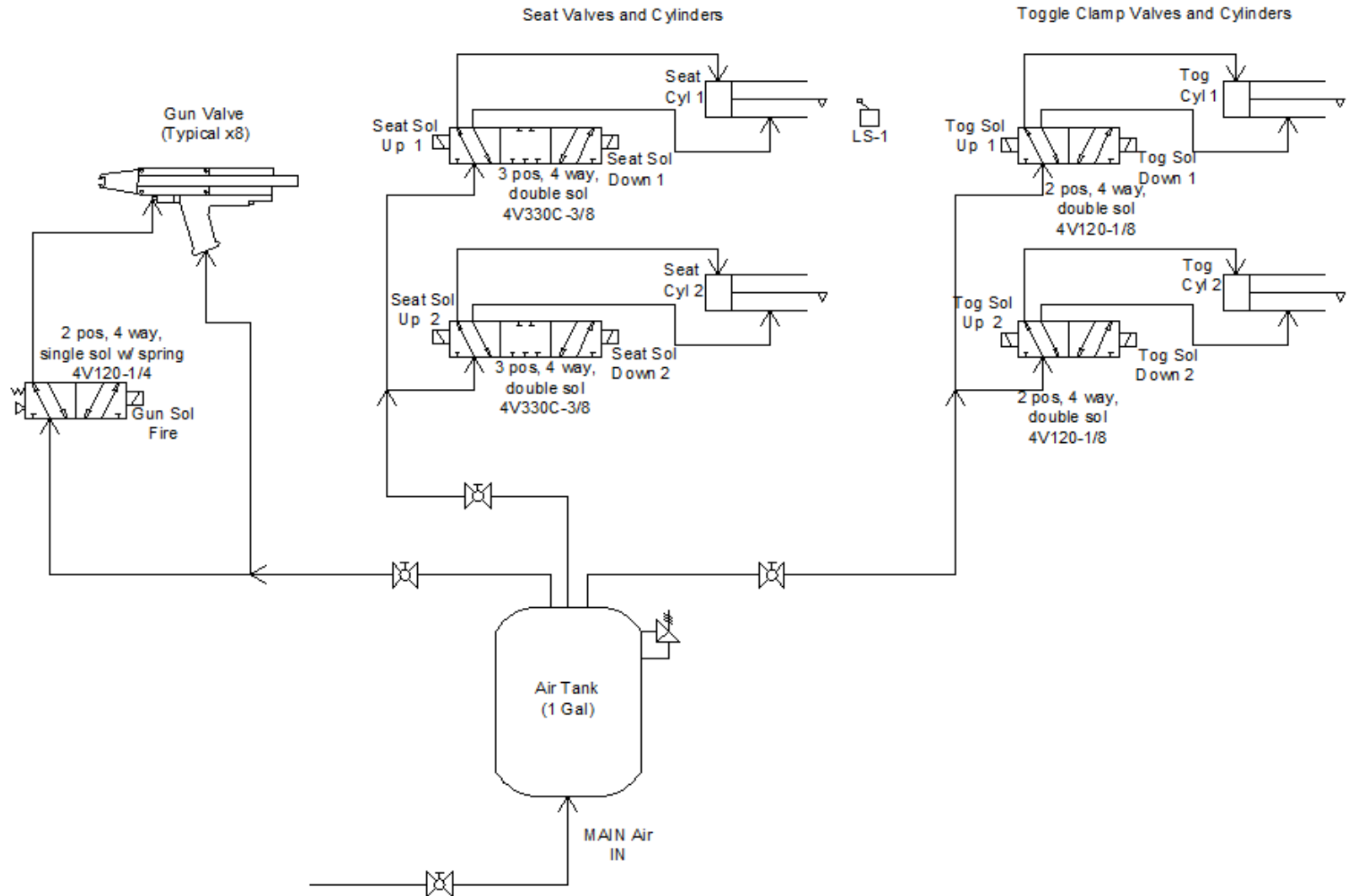
Solenoid Valves for Actuation

Valve Parts List					
Part on stand	Part Description	Valve part number	Unit Price	Port Size	Quantity
Toggle Clamps	2 position, 4-way, double solenoid	4V120-1/8	38.99	1/8 in	2
Chair	3 position, 4-way, double solenoid	4V330C-3/8	93.04	3/8 in	2
Guns	2 position, 4-way, single solenoid with spring	4V210-1/4	25.47	1/4 in	8

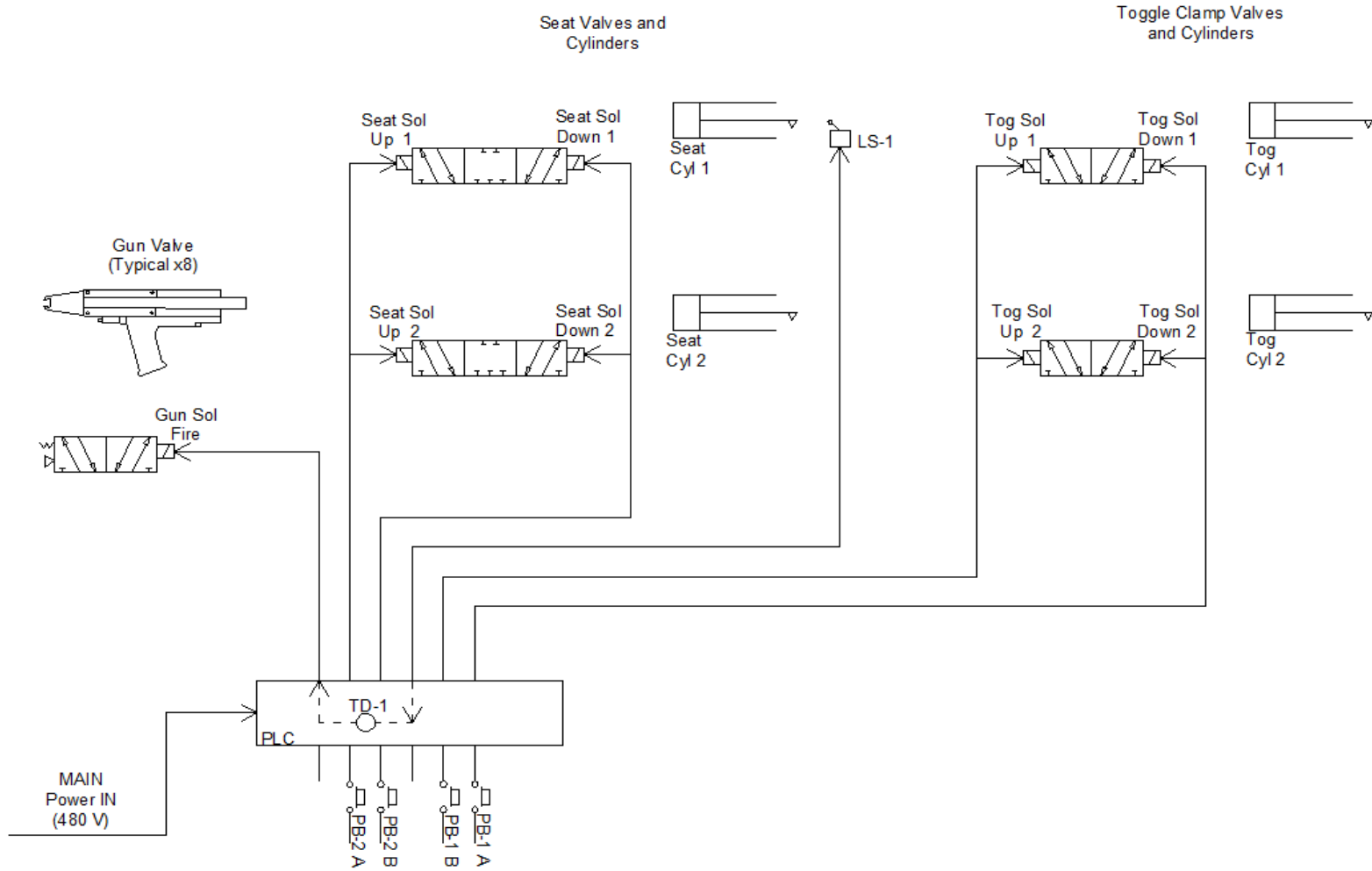
STCvalves.com



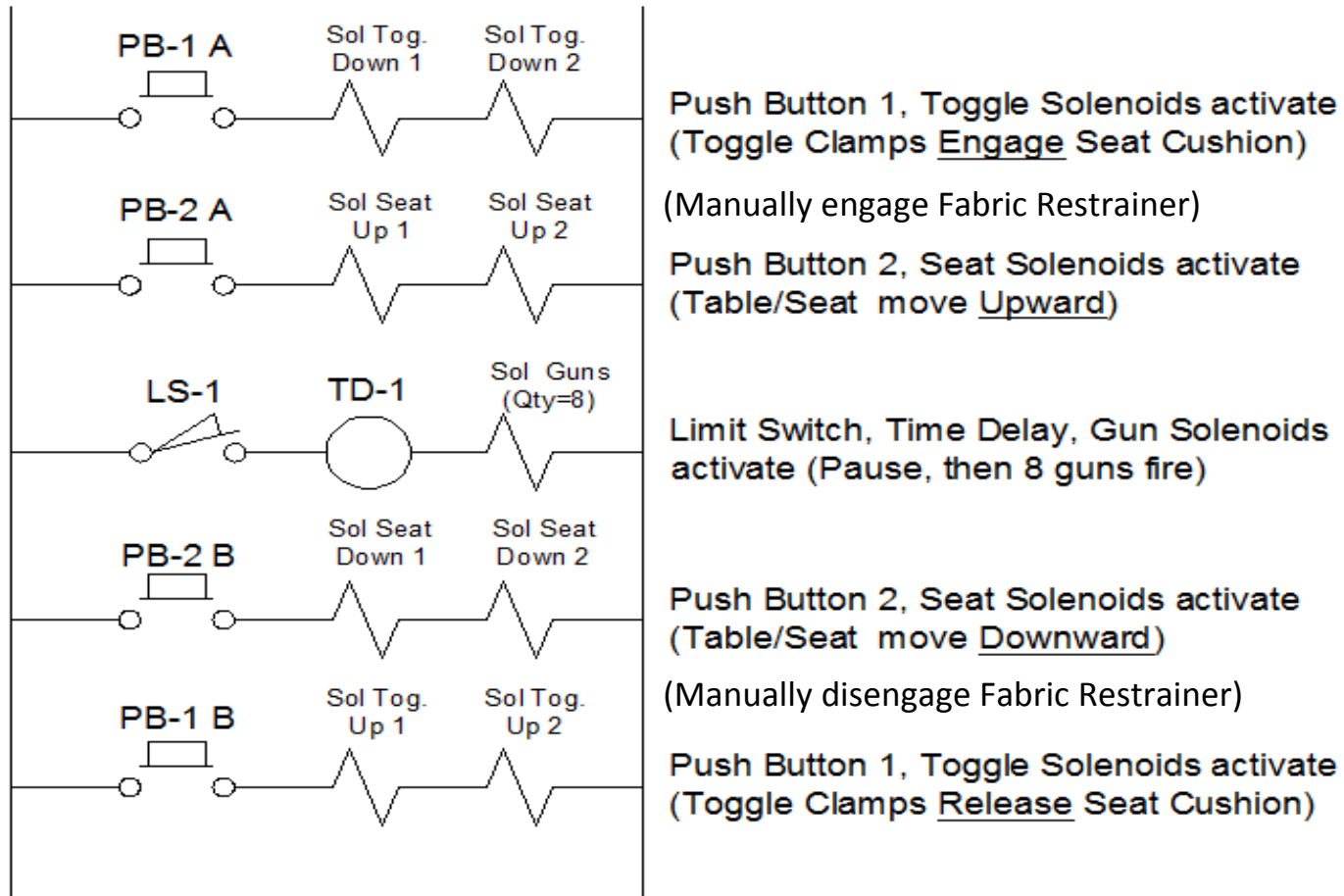
Air Schematic



Electrical Schematic



Ladder Logic

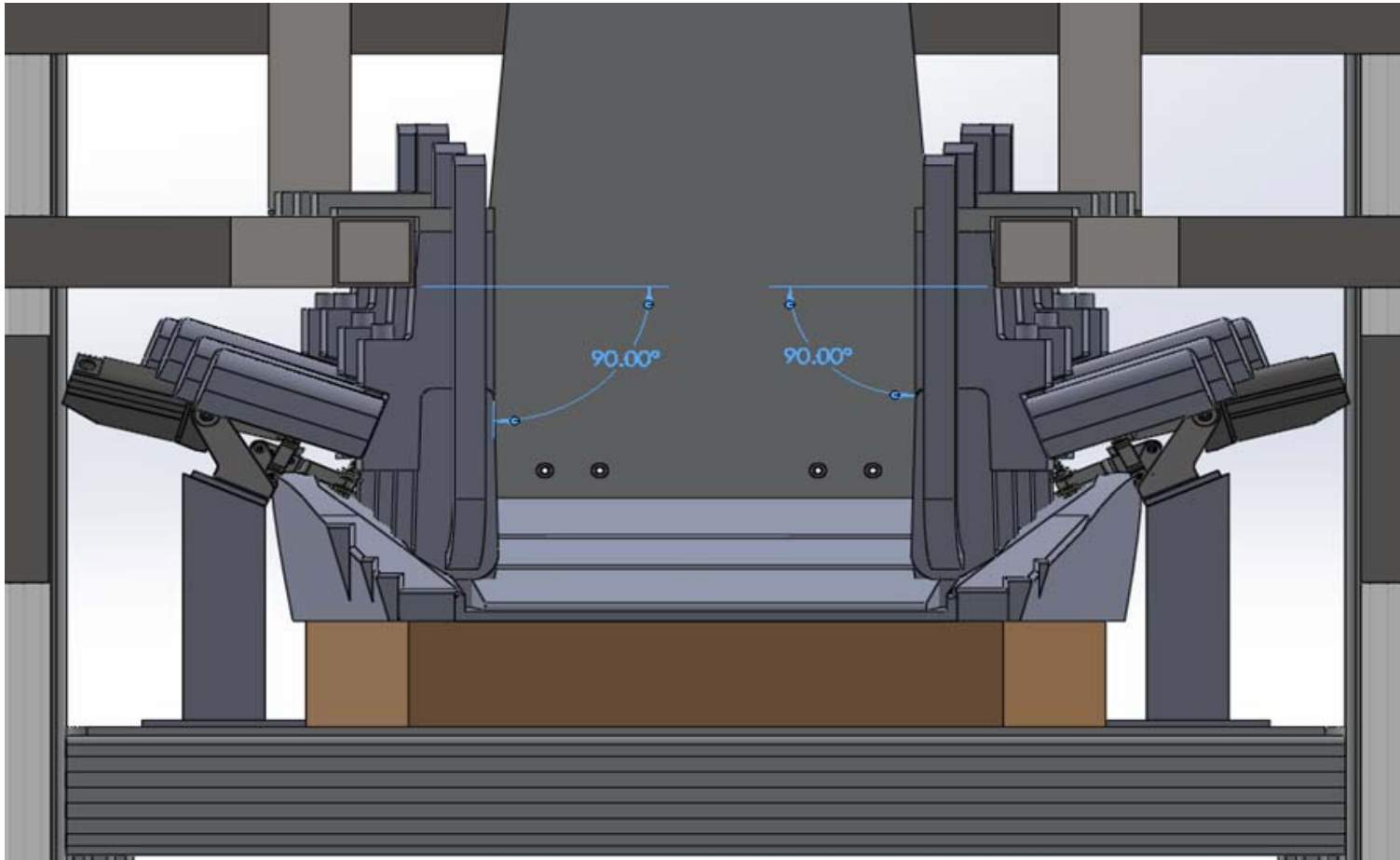


Testing Video



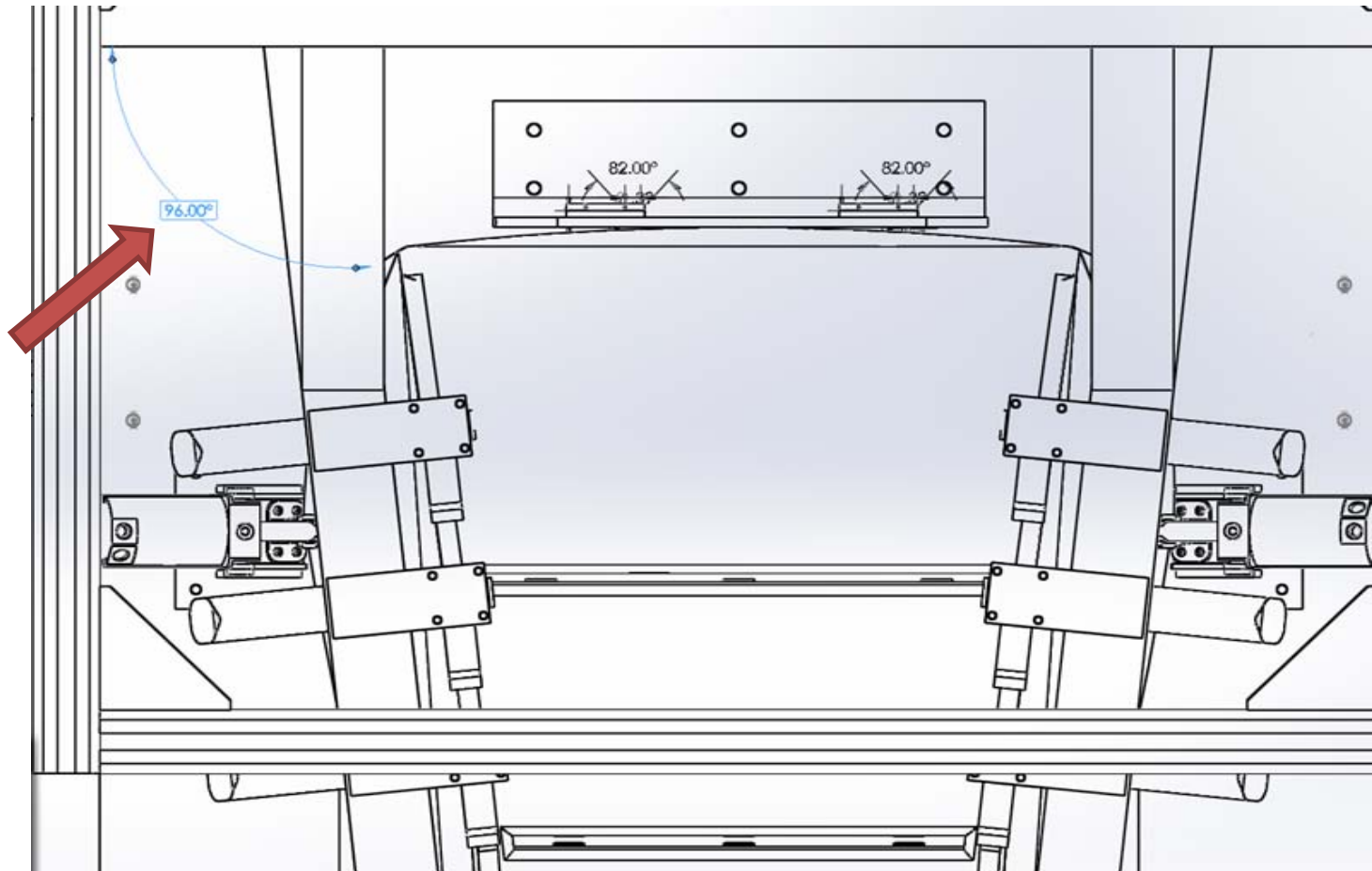
Final Concept

Gun Angle = 90 °



Final Concept

Gun Bar Angle = 96°



Bill of Materials

Subsystem	Part Description Needed	Raw Material	Part #	Quantity	Price/ea	Total Price/ Part	Company
Work Station	Work Station	Tekno Modutek		1		\$3,250.00	Teckno
	Bottom Plate 32" x 34"	Aluminum (Alloy 3003) Plating 32"x3'x 1/4"T	8973K45	1	\$154.60	\$154.60	McMaster-Carr
Toggle Clamp Bracket	Toggle Clamp Bracket	Steel Plating 2"x2'x 3/16"T		1	\$69.02	\$69.02	McMaster-Carr
		Steel Plating 4"x3'x 3/16"T	8910K584	1	\$40.03	\$40.03	McMaster-Carr
	Toggle clamp valves	2 position, 4way, double solenoid 1/8" NPT	4V120-1/8	2	\$38.99	\$77.98	STCvalves.com
	Toggle clamps 1/8"NPT		5129A21	2	\$108.55	\$217.10	McMaster-Carr
Fabric Restrainer	Fabric Restrainer L-Bracket 10"x12"x 3/16"T	Steel Plating 10"x12"x 1/4"T	9143K725	1	\$42.68	\$42.68	McMaster-Carr
	Fabric Restrainer Plate 12"x2'x 3/16"T	Aluminum Plate (6061)12"x2'x 3/16"T	89015K32	1	\$56.25	\$56.25	McMaster-Carr
	Fabric Restrainer Hinges	Black- Painted Zinc- Steel Pin	2190A12	2	23.32	\$46.64	McMaster-Carr
Seat Actuator	Actuator mounting plate 4"x 2' x 1/2"T	Aluminum Plate (6061) 4"x 2' x 1/2"T	8975k216	1	\$49.34	\$49.34	McMaster-Carr
	Actuator lifting plate (Side Support)	Steel Plating 1'x4'x1/4"T	1388K182	1	\$208.33	\$208.33	McMaster-Carr
	Actuator lifting (Block) 2"x2"x6"	Steel Block (Square Rod) 2"x2"x6"	9143K25	1	\$25.71	\$25.71	McMaster-Carr
	Cylinder Clevis Male 1-1/4"Dia, 8"L	Steel (Round Bar) 1-1/4"Dia, 8"L	8920K271	1	\$17.15	\$17.15	McMaster-Carr
	Clevis Pin 1/2"Dia, 2-12"L, 2-1/4"	Zinc-Plated Steel 1/2"Dia, 2-12"L, 2-1/4"	97245A721	1	\$7.00	\$7.00	McMaster-Carr
	Tie Rod Air Cylinder		6491K815	2	\$300.43	\$600.86	McMaster-Carr
	Seat valves	3 position, 4way, double solenoid 3/8" NPT	4V330C-3/8	2	\$93.04	\$186.08	STCvalves.com
Gun Parts	Air cylinder -Trigger Actuator	Bimba 1-1/2" Bore Air Cylinder	171	8	\$32.50	\$260.00	Bimba
	Horizontal Gun Bars 24"L x 2	Steel Tubing 2"x2"x 0.120" WT x 6' L	6527K334	1	\$47.10	\$47.10	McMaster-Carr
	Angled Gun Bar Supports 15"L x 2	Steel Tubing 2"x2"x 0.120" WT x 6' L	6527K334	1	\$47.10	\$47.10	McMaster-Carr
	Rear Bar Supports 42"L x 2	Steel Tubing 2"x2"x 0.120" WT x 6' L	6527K335	2	\$47.10	\$94.20	McMaster-Carr
	Gun Support (mounting block) 4"x2'x1"T	Aluminum Plating (6061) 4"x3'x1"T	8975K243	1	\$90.54	\$90.54	McMaster-Carr
	Gun valves	2 position, 4way, single sol w/ spring 1/4" NPT	4V210-1/4	8	\$25.47	\$203.76	STCvalves.com

Total Cost: \$5,791.47

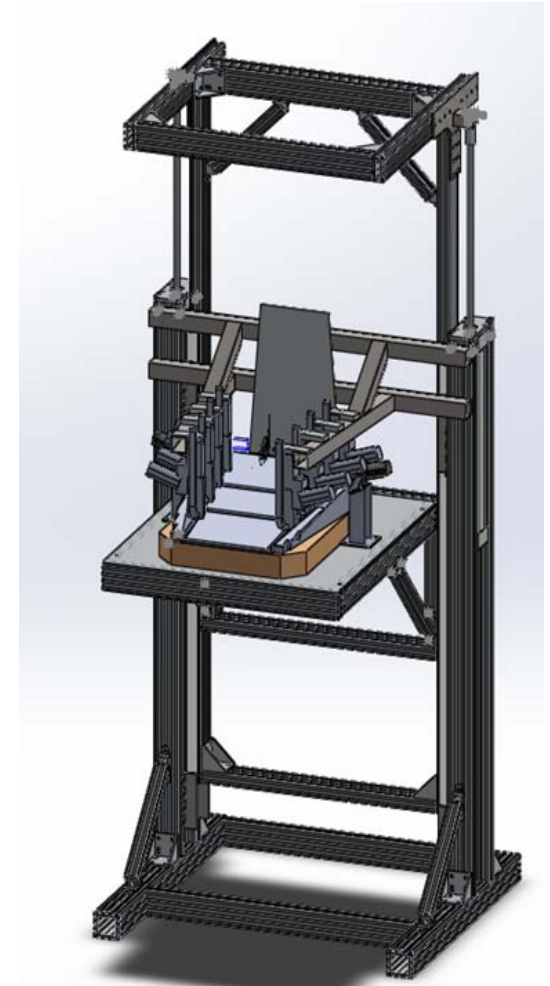
Future Goals

Task:

1. Manufacture the Gun Support subsystem
 - a. Fabricate and assemble constitutive parts including:
 - i. Steel Tubing (Cut & welded)
 - ii. Tubing Brackets (Welded to tubing & bolted to Modu-tek)
 - iii. Gun Brackets (Drilled, machined, & bolted to gun)
2. Manufacture the Fabric Restrainer subsystem
 - a. Fabricate and assemble constitutive parts including:
 - i. Aluminum & Steel Plates (Cut, drill, & bolt to hinges and table)
 - ii. Hinges (Bolt to Plates)
3. Manufacture the Toggle Clamp Mount subsystem
 - a. Fabricate and assemble constitutive parts including:
 - i. Steel Plates (Cut, drill, weld, & bolt to toggle clamps and table)
 - ii. Toggle Clamps (Bolt to Toggle Clamp Mount)
4. Mount the Pneumatic Cylinders (move the table up/down)
5. Modify Hog Ring Guns
 - a. Remove Trigger
 - b. Attach Adapter and Cylinder
6. Mount and route the following electrical and pneumatic parts:
 - a. Solenoid Valves
 - b. Limit Switches
 - c. PLC

Measure of Performance:

Interfacing Plan:



Questions