Revision of Lockheed Martin Human Type Target for Manufacturability

Team 7

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Sponsor

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Introduction and Background

- Lockheed Martin is designing a Human Type Target System for training Law Enforcement and Military personnel as a part of their Urban Operations Training System
- Lockheed Martin is currently purchasing a competitor's product for use
- This product does not meet their standards for realism or durability
- Lockheed Martin has provided a basic prototype

Need Statement

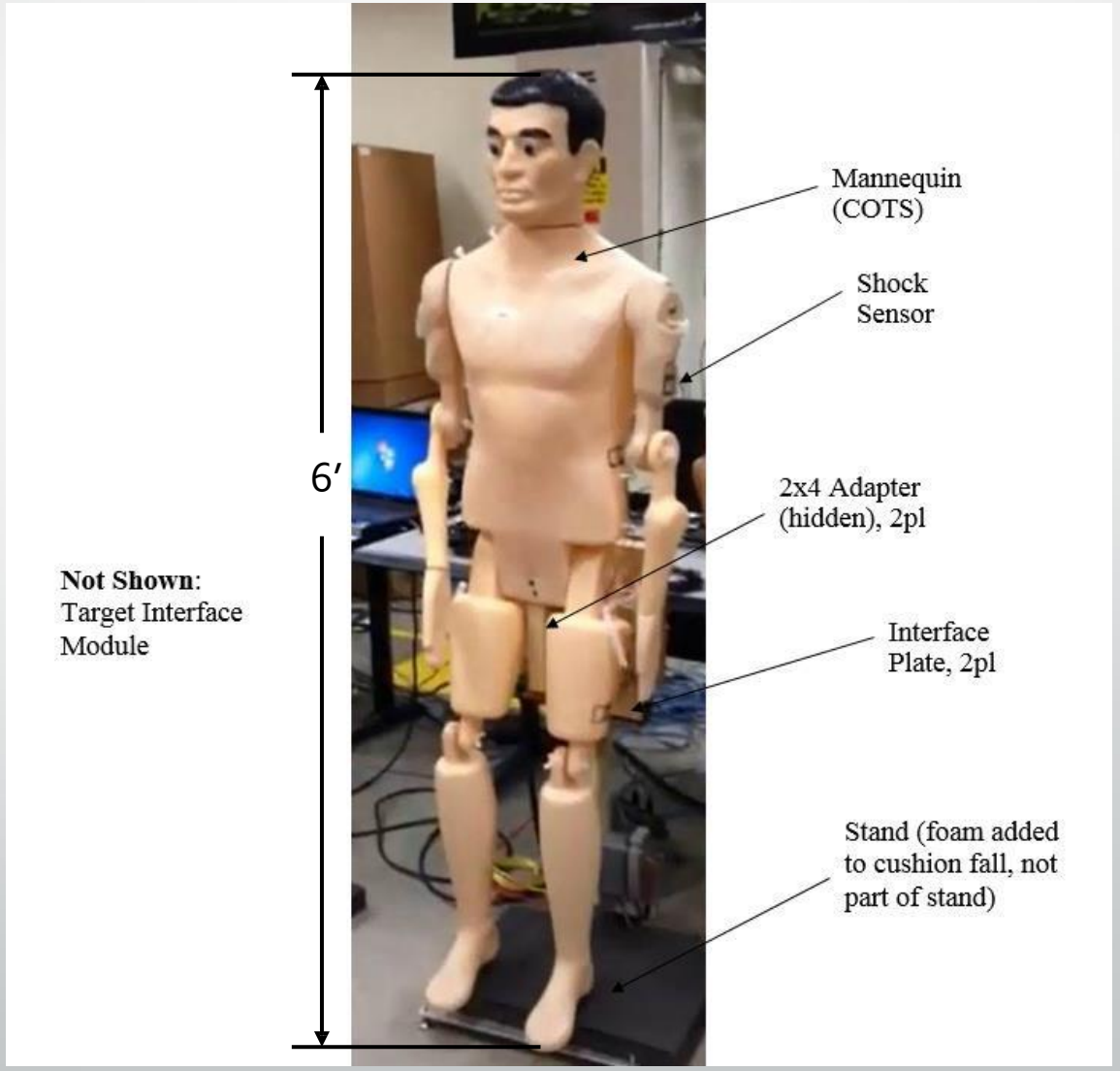
"Lockheed Martin's current human type target system is incomplete and requires further design for manufacturability and durability."

Goal Statement

"The goal of this project is to revise Lockheed Martin's current prototype and take it to a production-ready-state."

Components to be Redesigned for Manufacturability

- Universal Interface Plate
- Universal 2x4 Adapter
- Stand



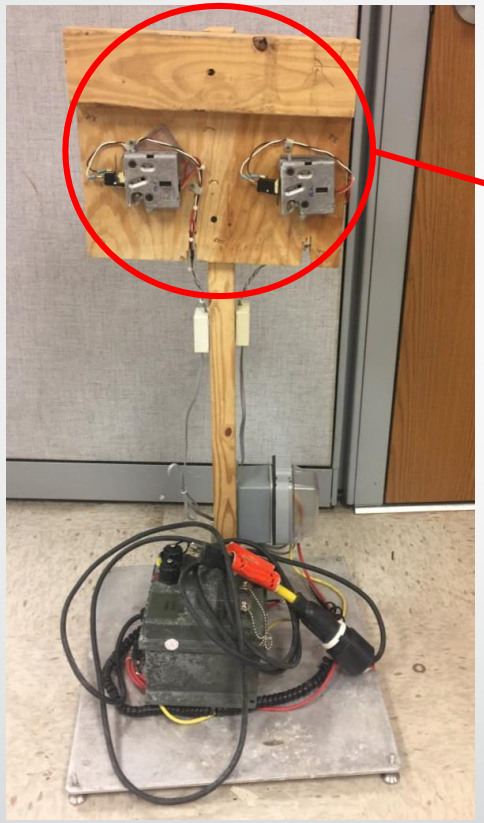
Objectives

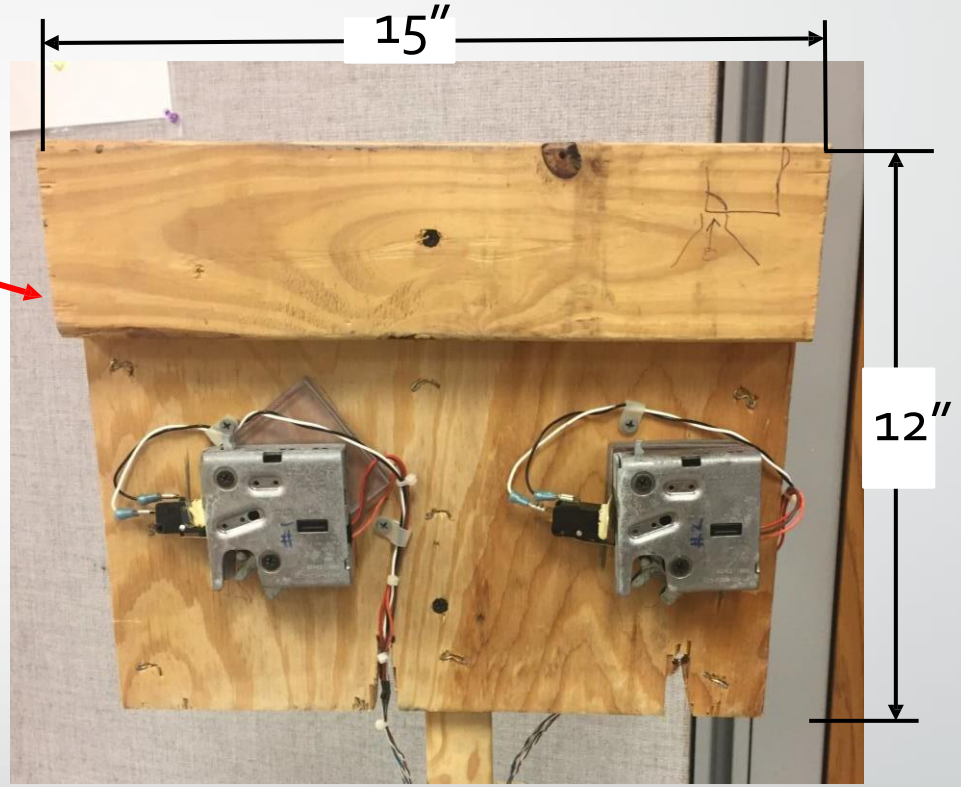
- Life span of at least 1000 drops
- Ricochet averse
- Moveable by 1 person
- Max 2 ft x 2 ft base plate
- Compatible with Lockheed Martin's current operating systems
- Operable in a variety of environmental conditions

Objectives Continued

- Target cost – batches of 100
  - Interface plates – no more than $50.00 each
  - 2x4 interface adapters – no more than $25.00 each
  - Stand – no more than $70.00, assembled

Lockheed Martin Provided Prototype

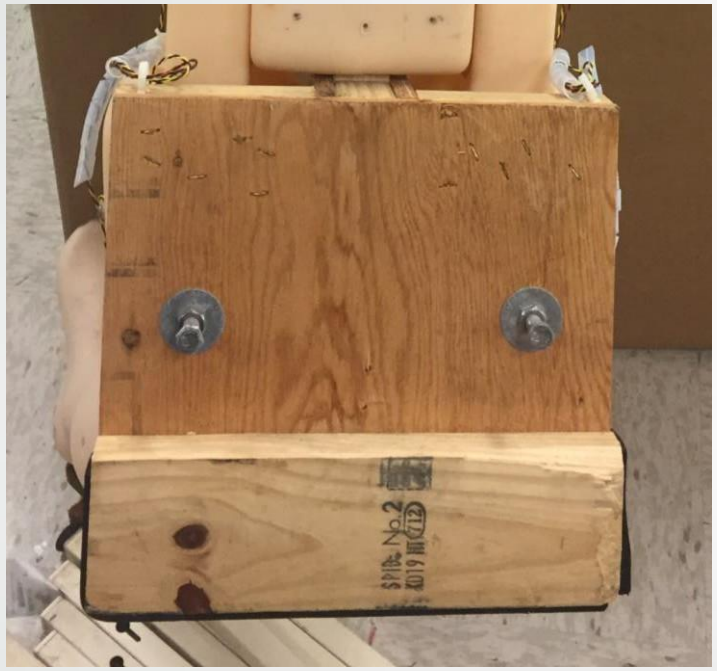


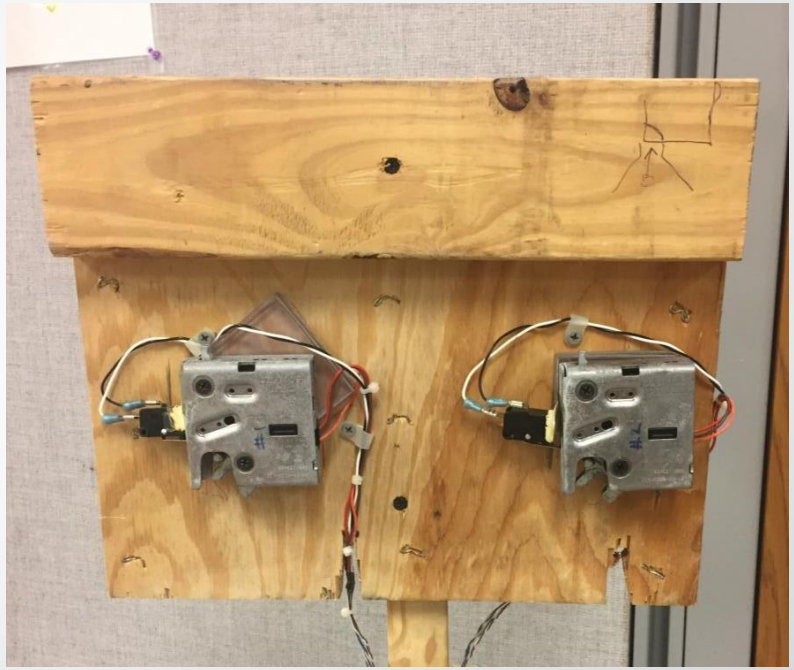


- Not able to be mass produced
- Difficult to reset
- Issues with binding on clamps

Ray Lessig

Lockheed Martin Provided Prototype (Cont.)

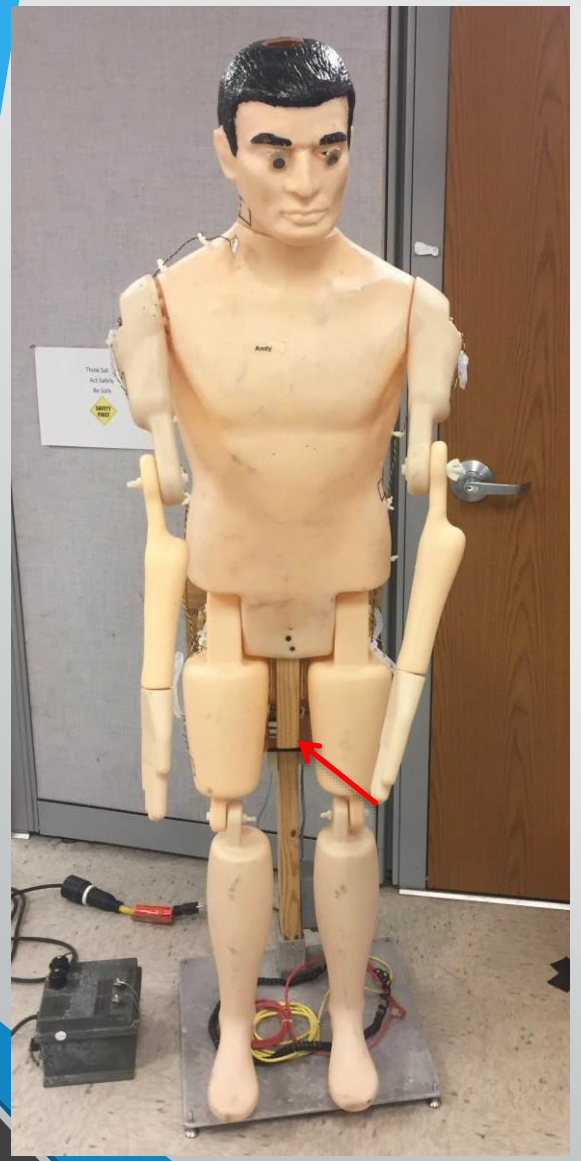




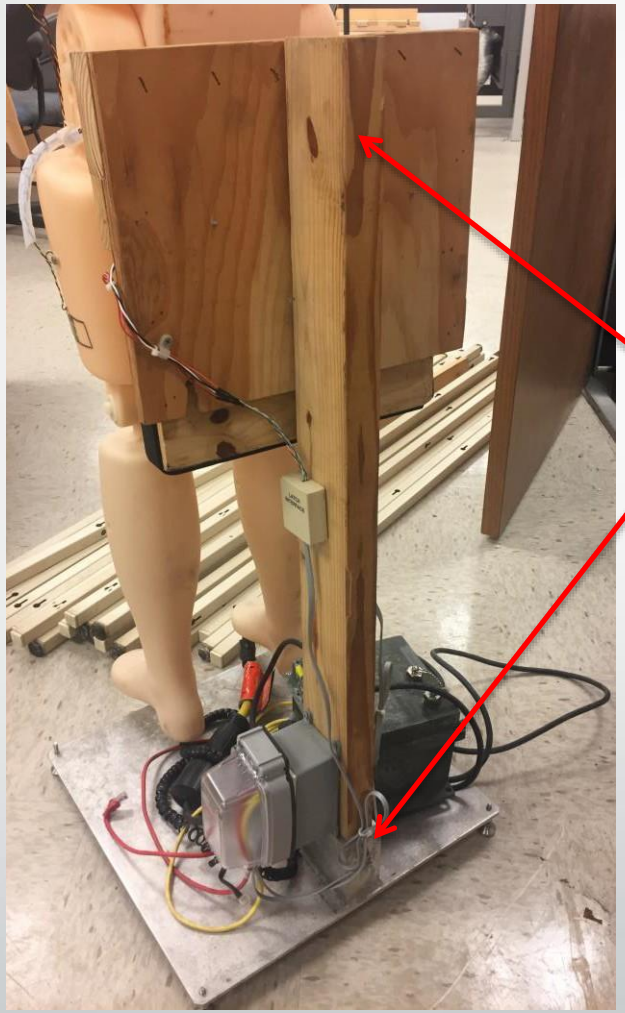
Interface Plate Goals:

- Design one Interface Plate to be used in both plate locations
- Design Interface Plates which require minimal assembly
- Design for injection molding

Lockheed Martin Provided Prototype (Cont.)



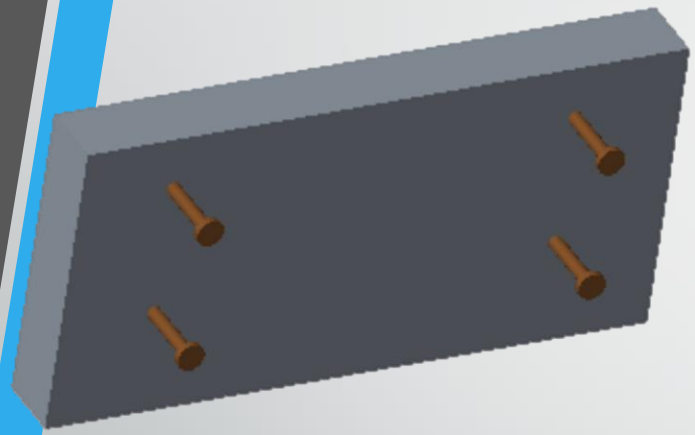
Ray Lessig

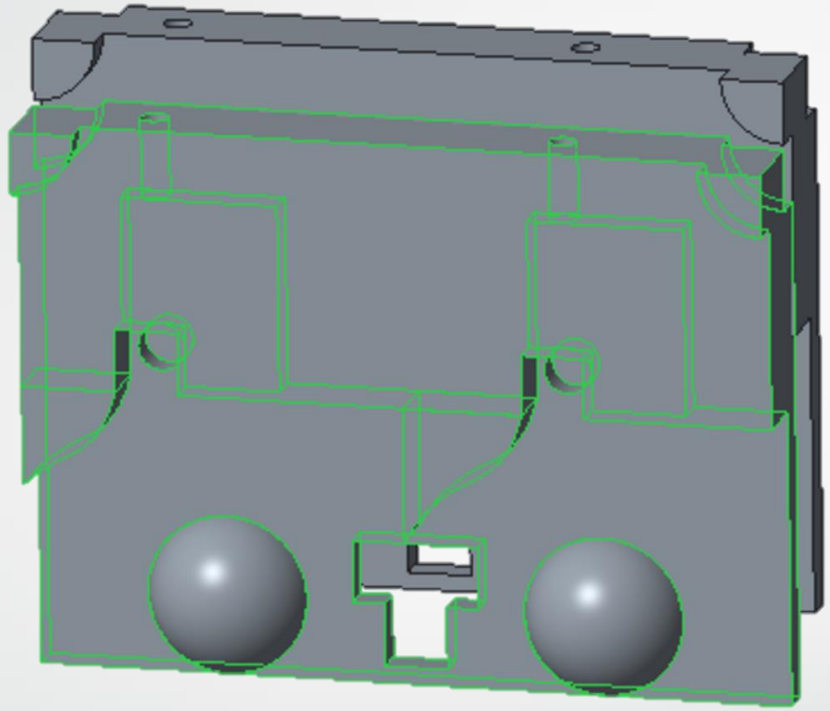


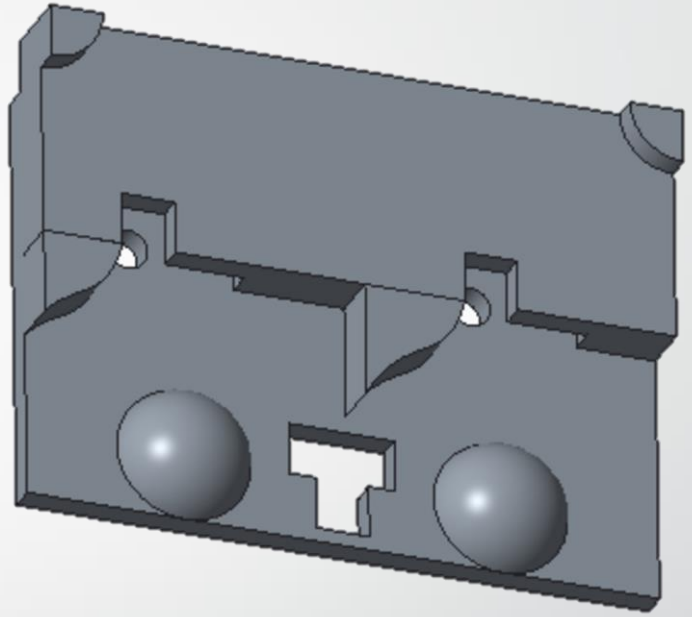
2x4 Adapter Goals:

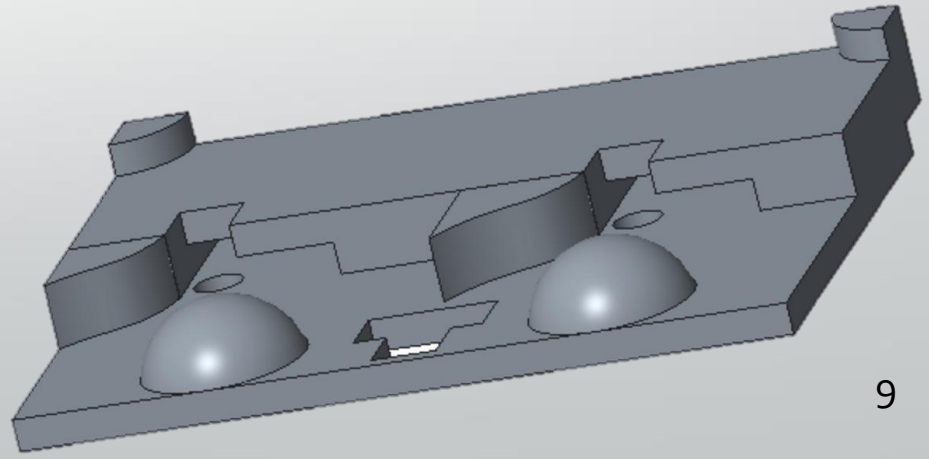
- Design a single 2x4 adapter to be used in three different locations for attaching 2x4 to device components
- Design for injection molding

Initial Concepts

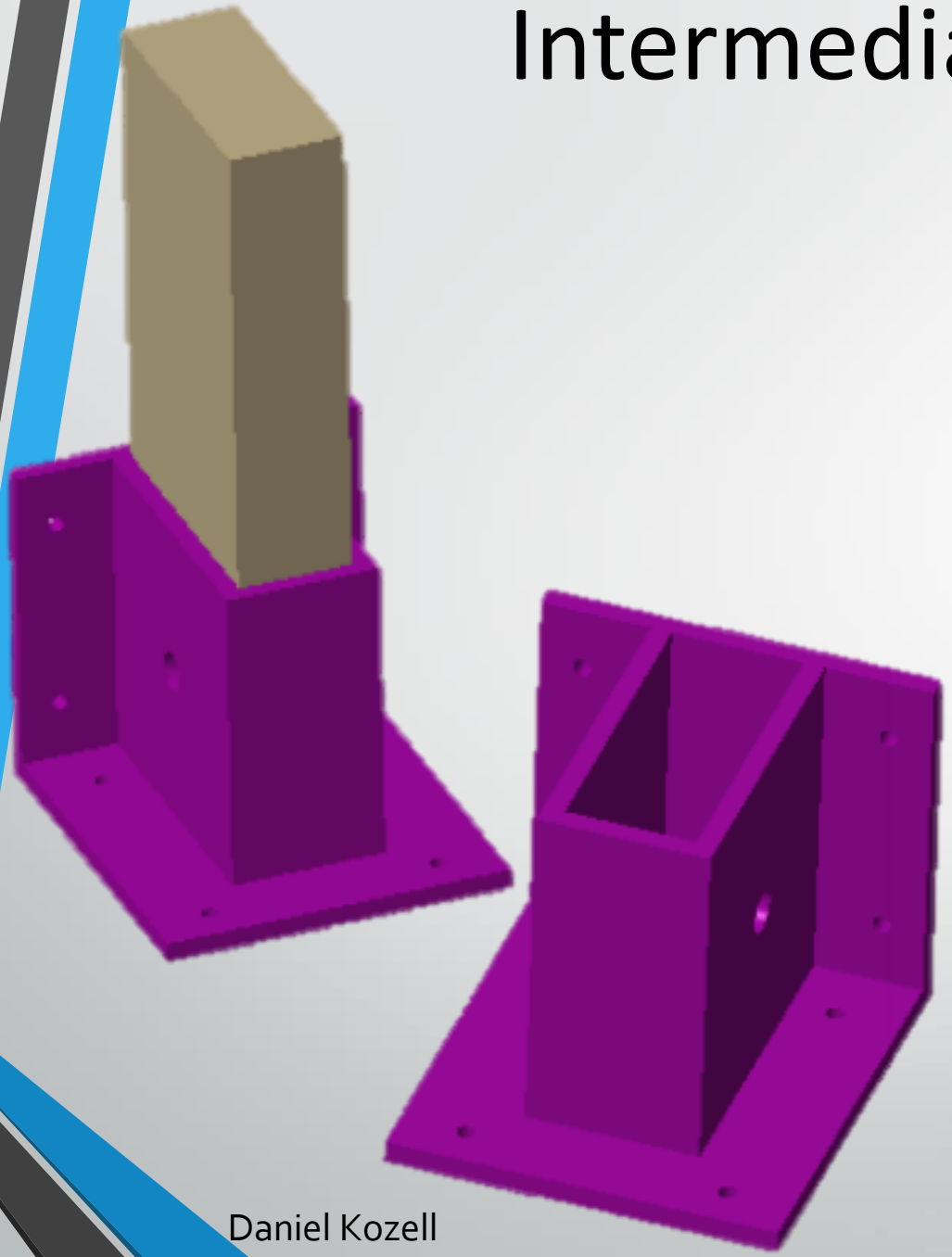


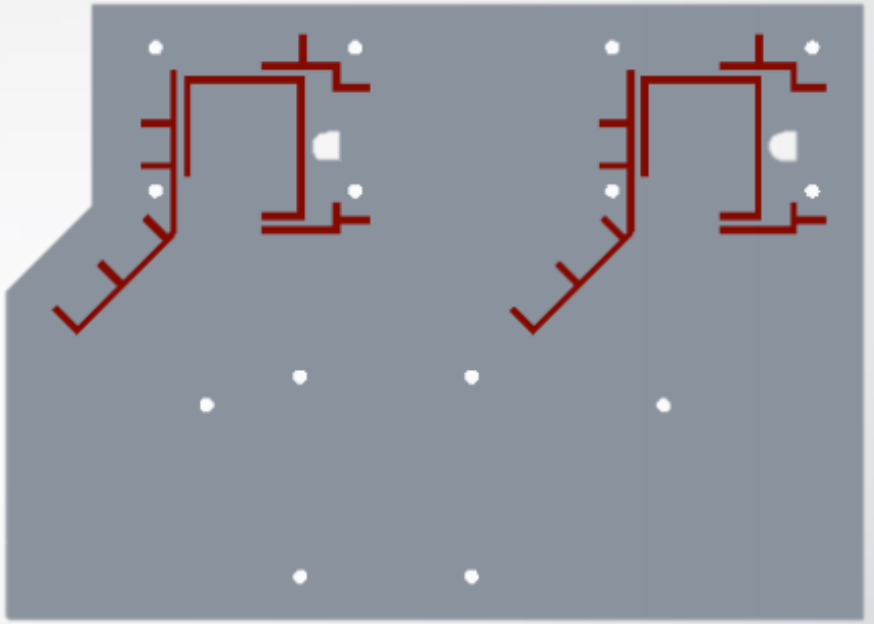


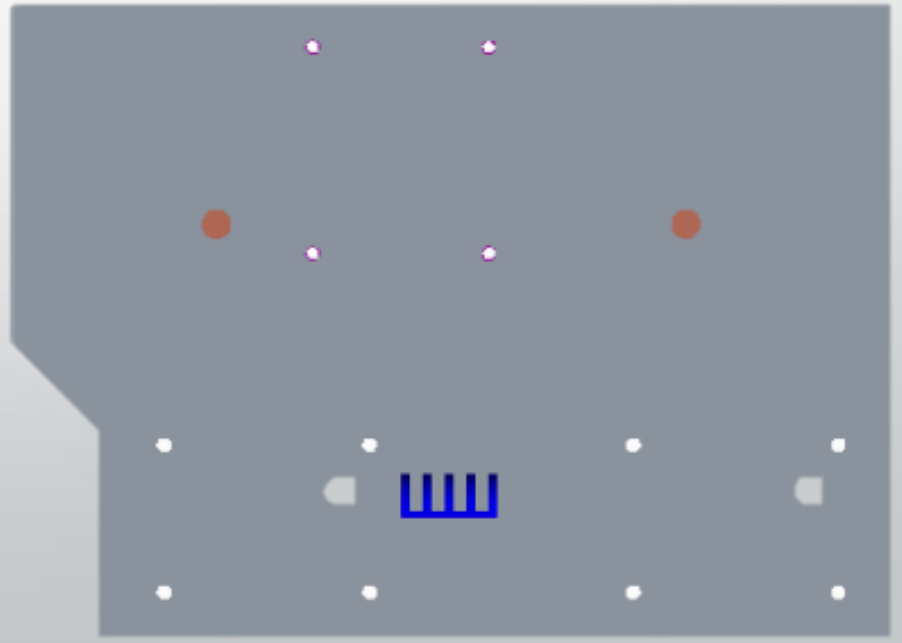




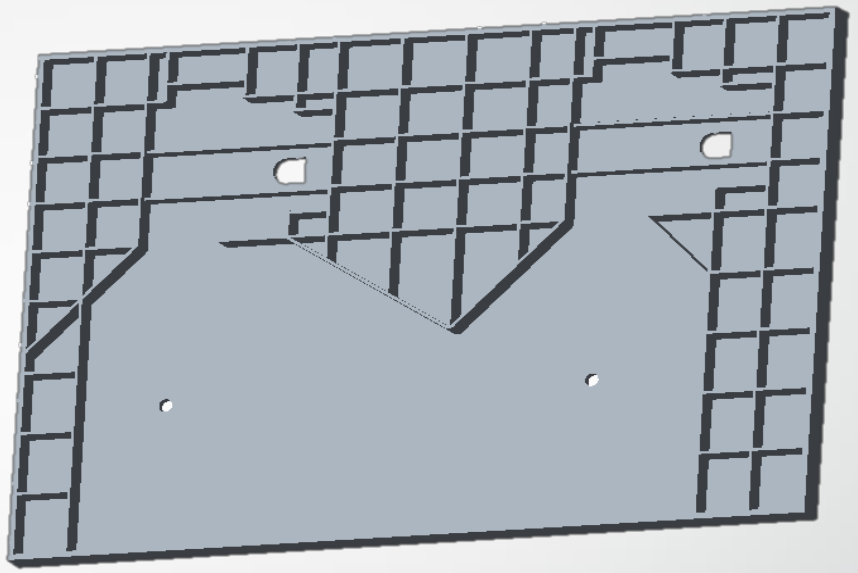
Intermediate Concepts

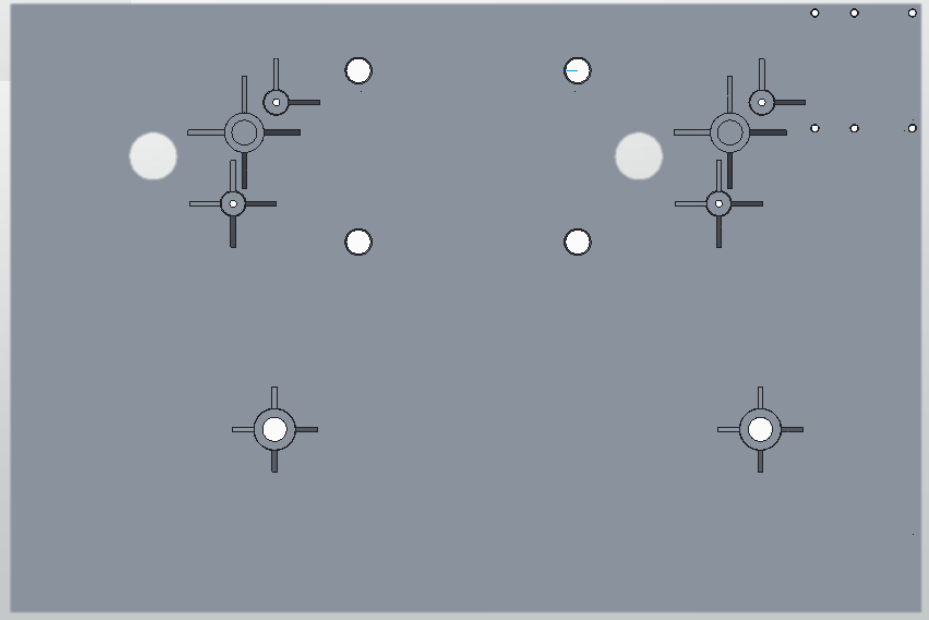




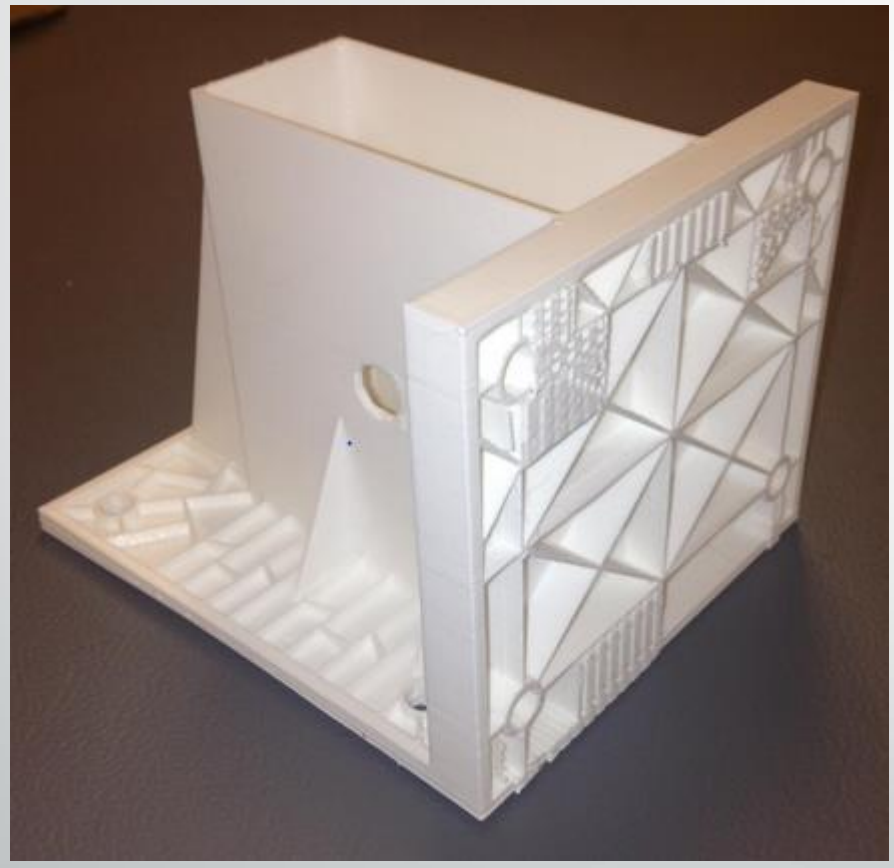


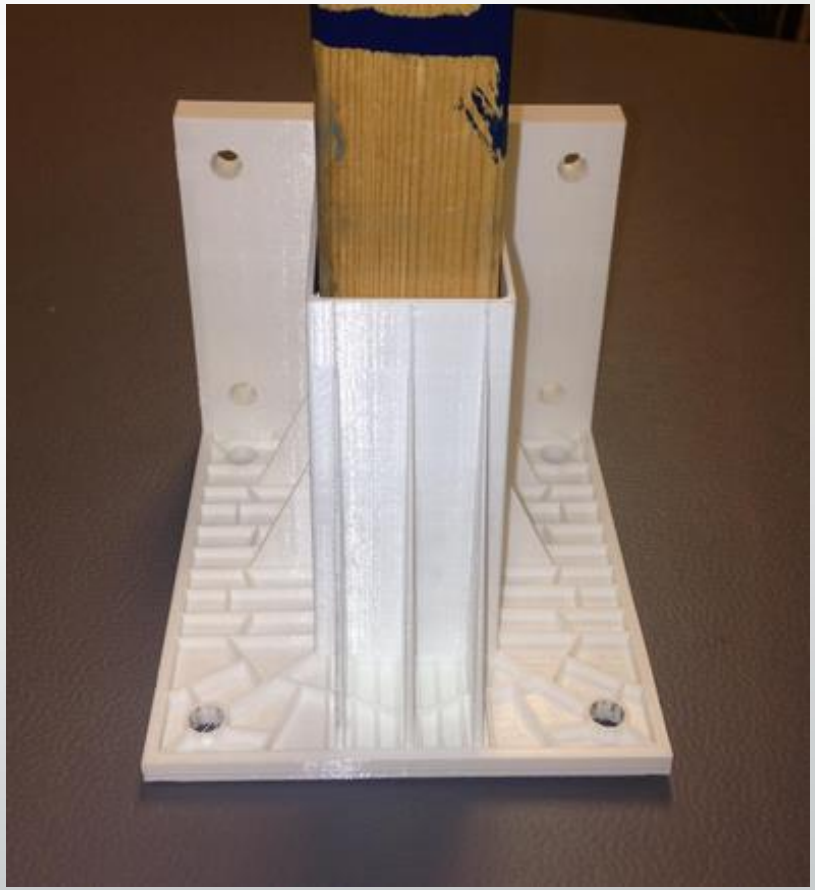
Intermediate Concepts (Continued)



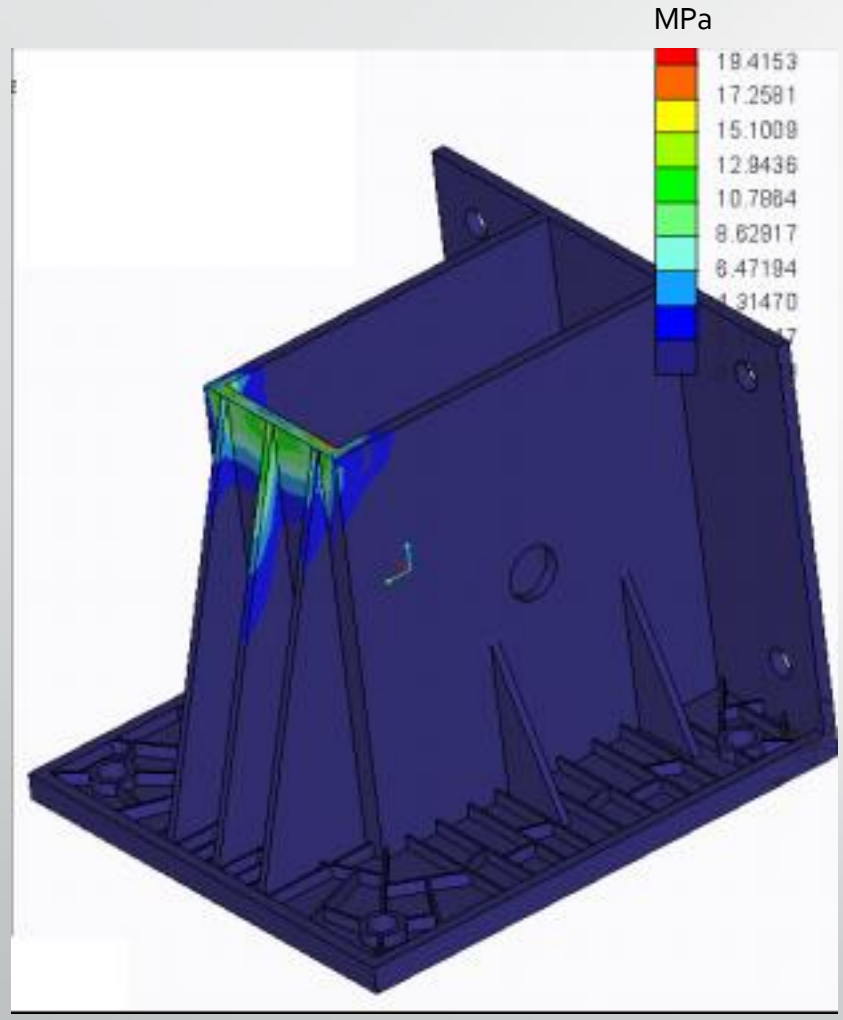


Final 2x4 Adapter Design





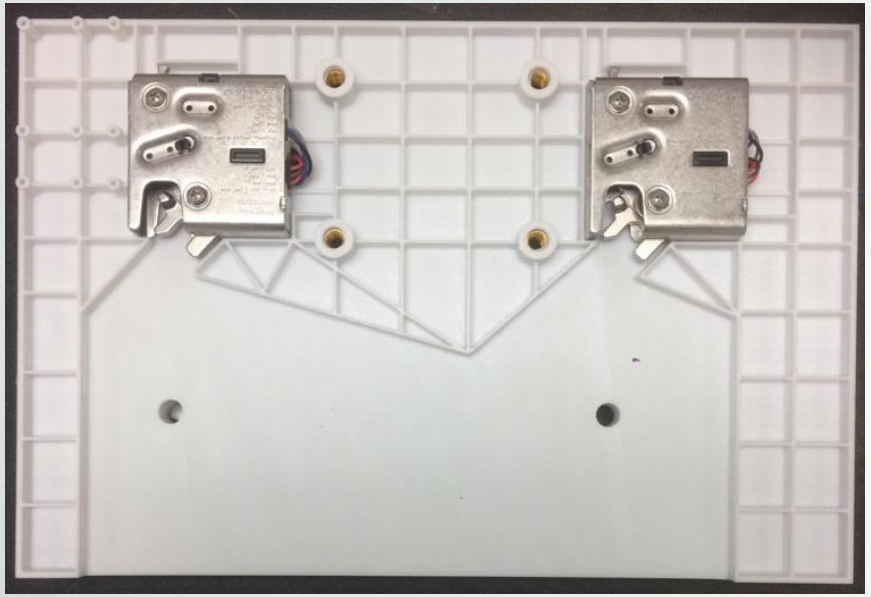
2x4 Adapter Analysis

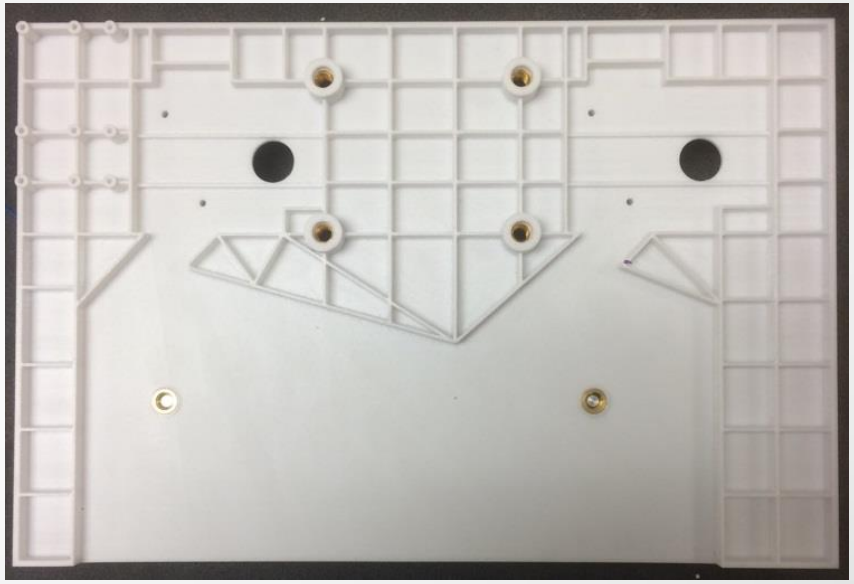


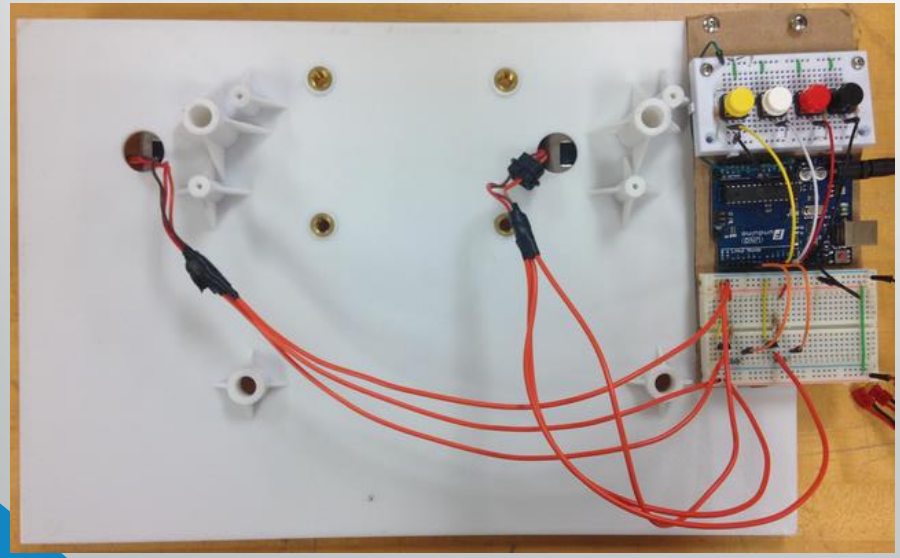
- Max Stress on Part: 19.4MPa
- Delrin 500 Properties
  - Yield Stress: 71MPa
  - Tensile Strength: 68MPa

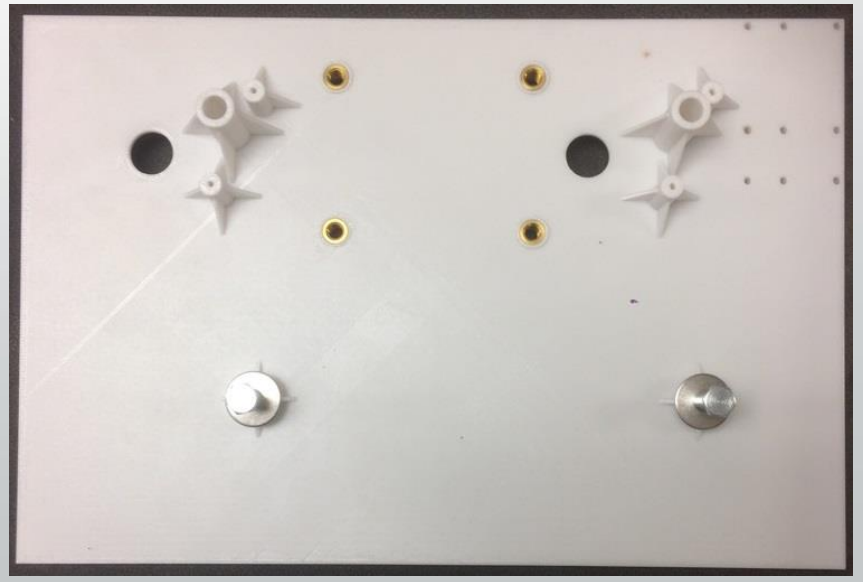
Daniel Kozell

Interface Plate Design









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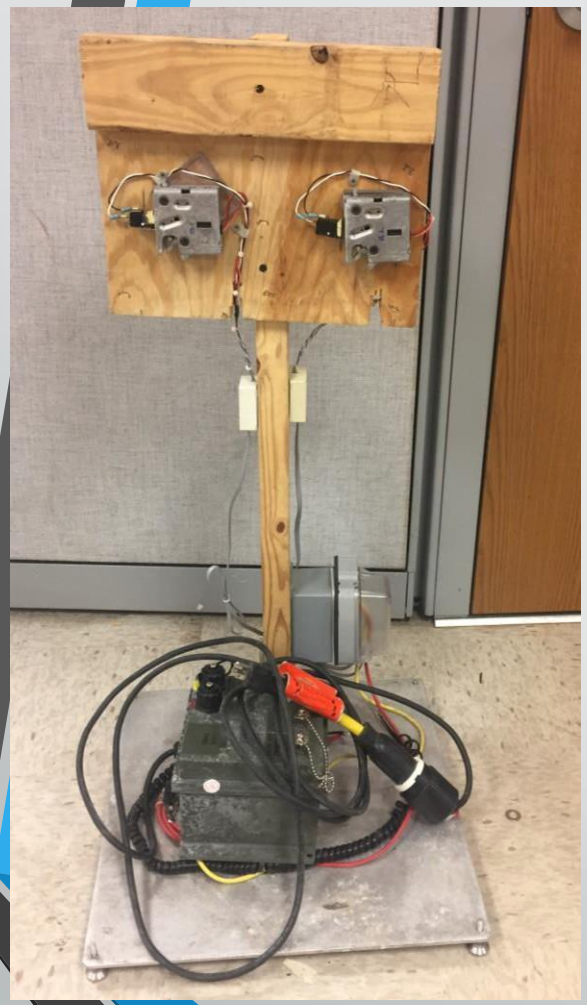
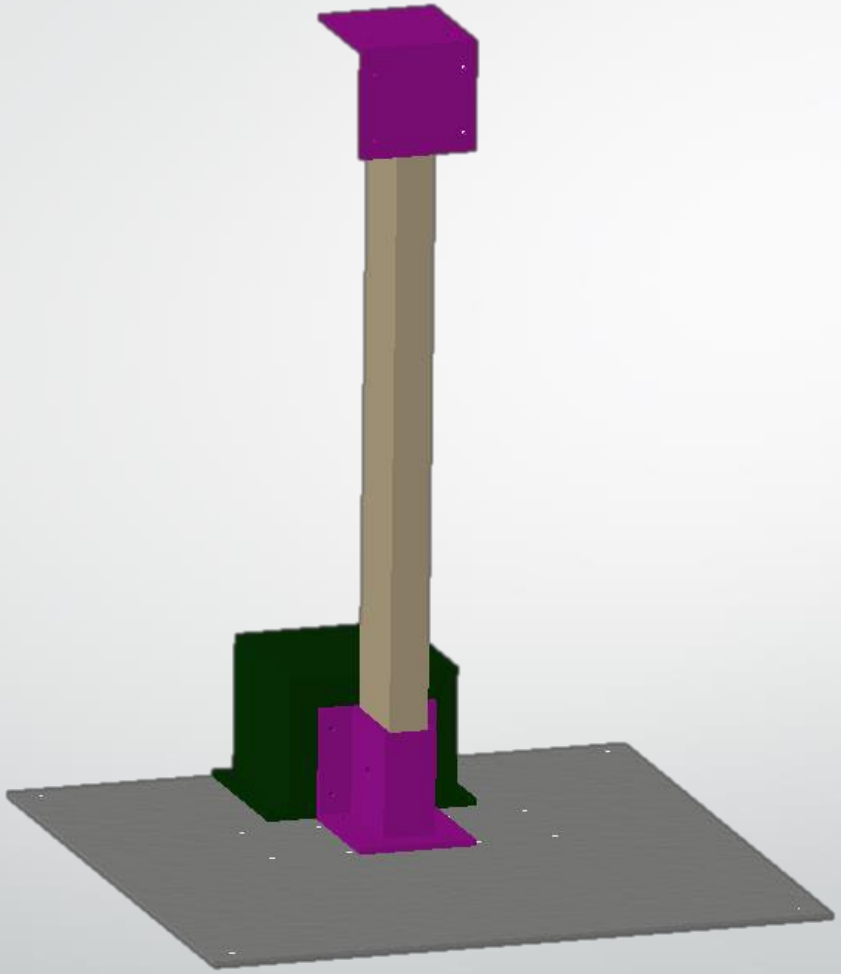
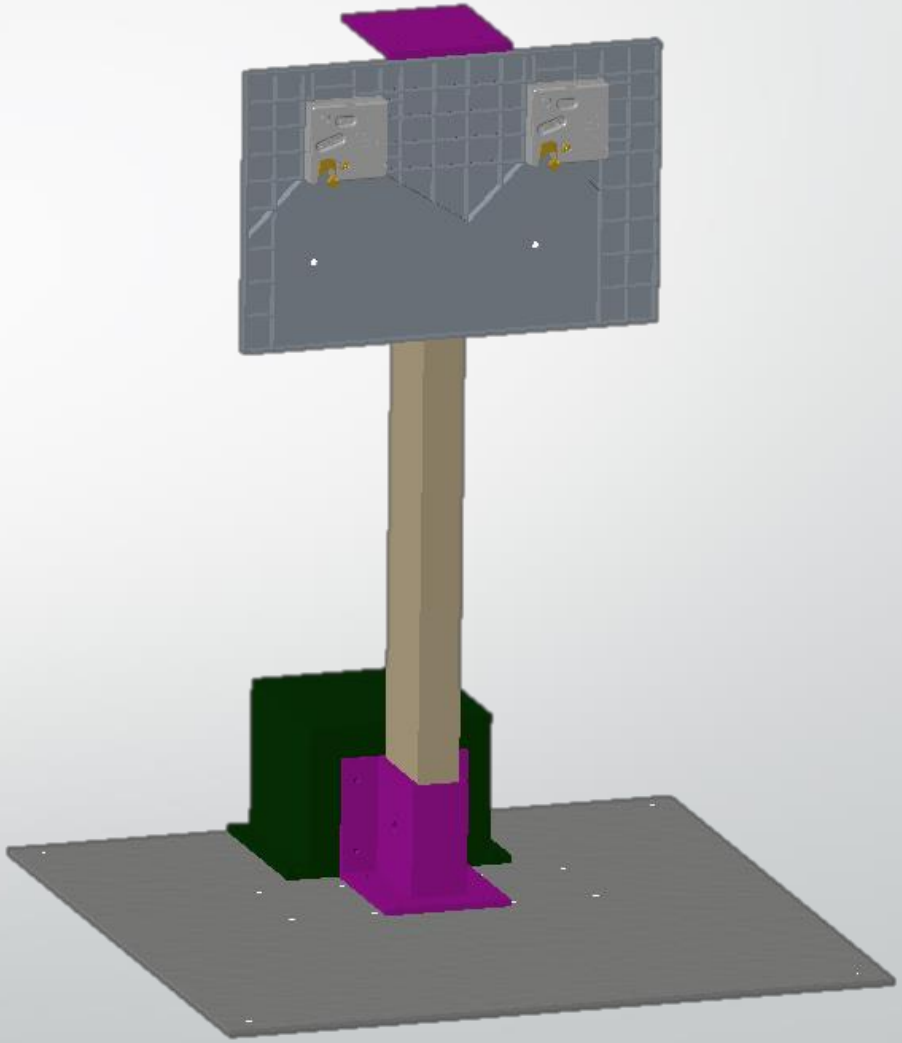
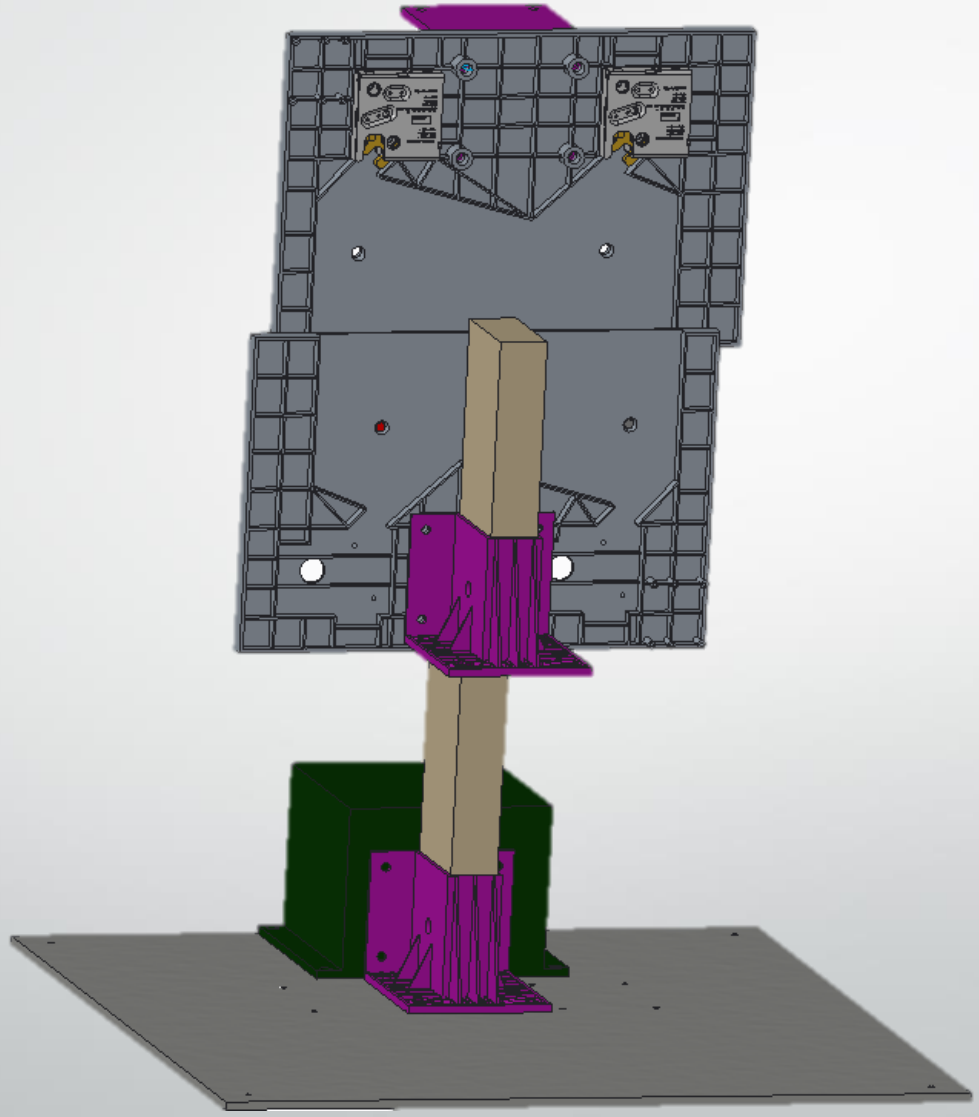
Stand Design



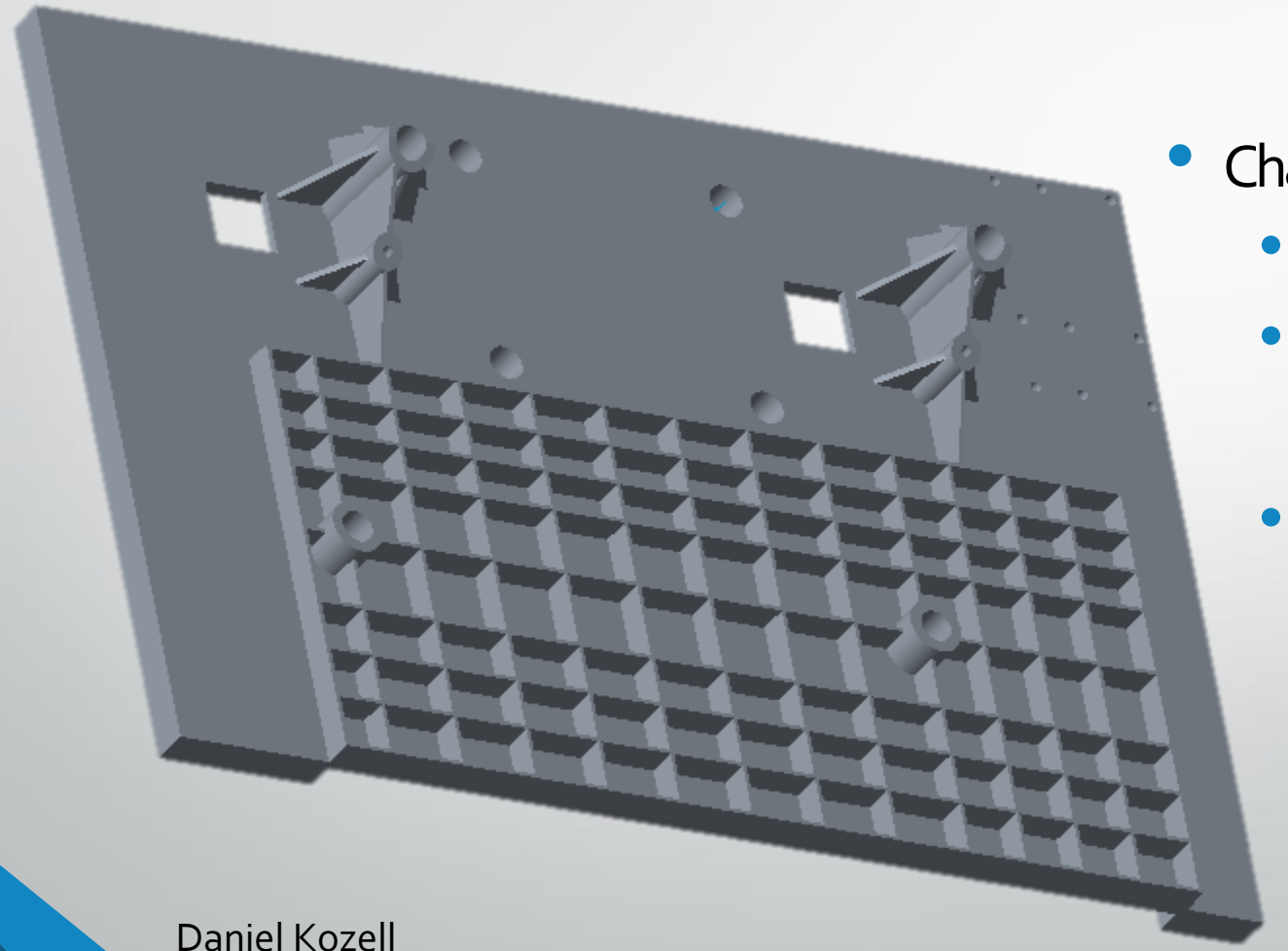




Full Assembly



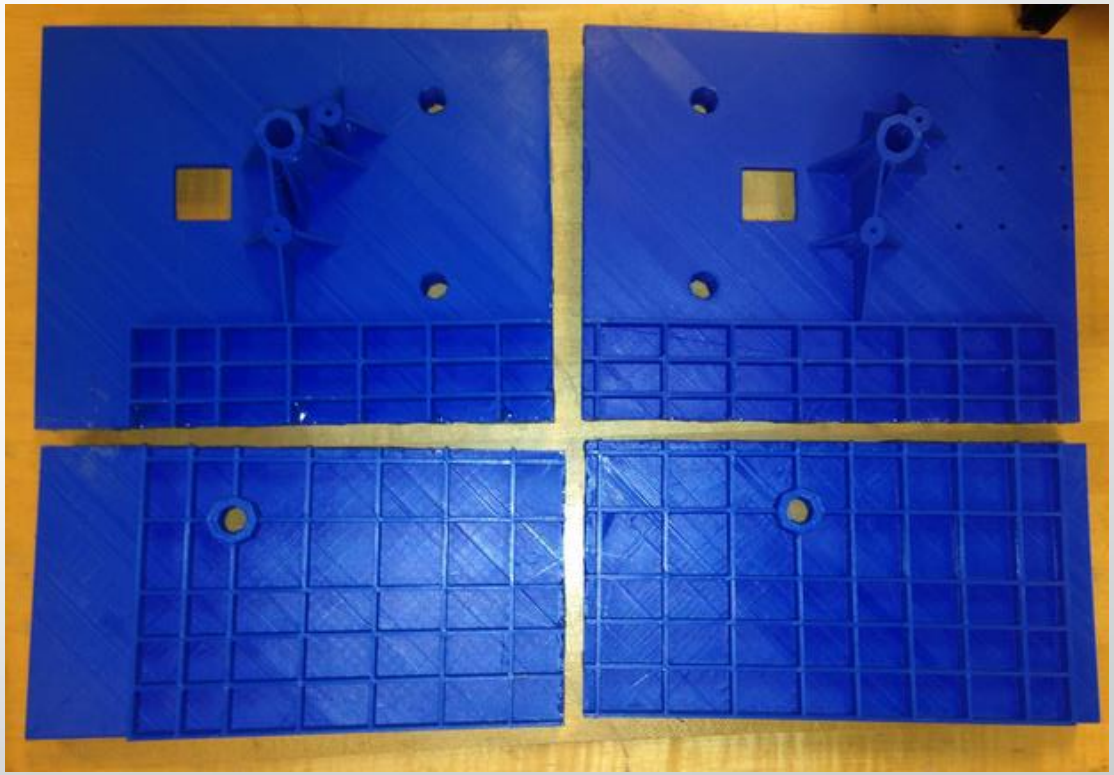
Desired Design Modifications



- Changes Made
  - Ribbing added to back
  - Material added to eliminate problems resetting
  - Wire holes reshaped to square

Problems Encountered

- Interface Plate too large to 3D print
  - Too costly to print in one complete part
  - Printed in sections
- Received parts incompatible with project
  - Warped APLA material
  - Failed binding of sections



Cost Analysis for Molded Parts

- Factors to Consider
  - Cost of Material and Size of Part
  - Number of inserts needed
  - Number of manual operations
- Target Price
  - 2x4 Adaptor = $25.00
  - Interface Plate = $50.00
  - Stand = $70.00
- Calculated Cost
  - 2x4 Adaptor = $15.00
  - Interface Plate = $25.00
  - Stand = $66.00
- Equation used to Estimate Cost For Injection Molded Parts
  - Cost($) = (4*(Cost of material($ / lb)*Weight of Part(lb)))
    +($2*Number of inserts)
    +($1* Number of manual operations)

Final Steps

- Continue dropping and analysis
  - Identify areas of failure
  - Report findings to Lockheed Martin
- Send prototypes to Lockheed Martin
  - Include code
  - Include CAD
  - Include important findings

Summary

- Current prototype
  - Designed for manufacturability
  - Reduces binding on latches
  - Easier to reset
  - Movable by one person
- Refine and continue to production