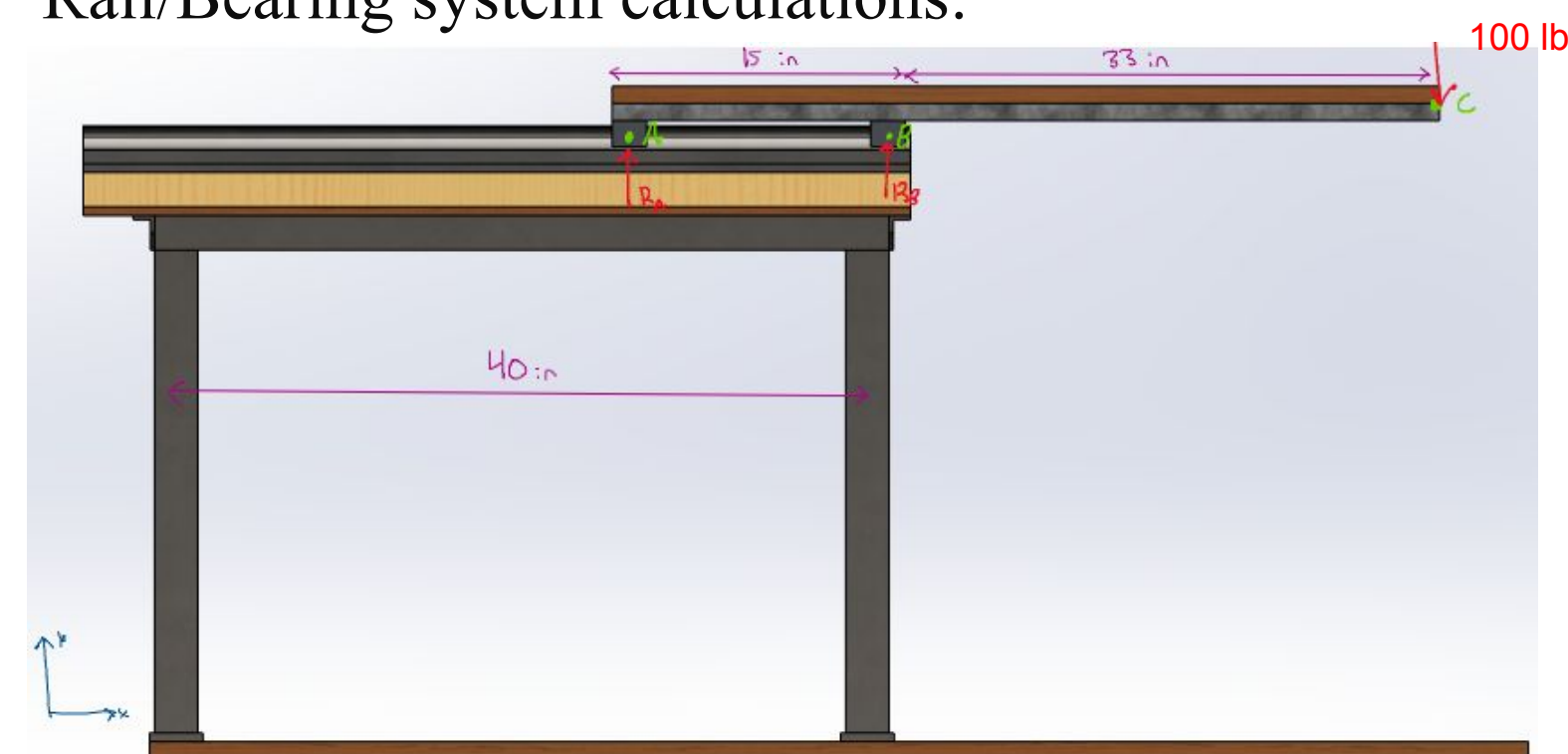


Problem Definition

- **Client:** Ms. J - Retired Healthcare Educator
- **Objective:** Provide a sufficient bedside workspace to compensate for Ms. J's generalized weakness & low vision.
- **Design Focus:**
 - Ergonomics for ease of use
 - Enhanced comfort & independence
 - Adjustability
 - Tech Integration → Monitor, iPad
 - Safety and Accessibility
 - Body & Vision Centered in Bed
 - Storage

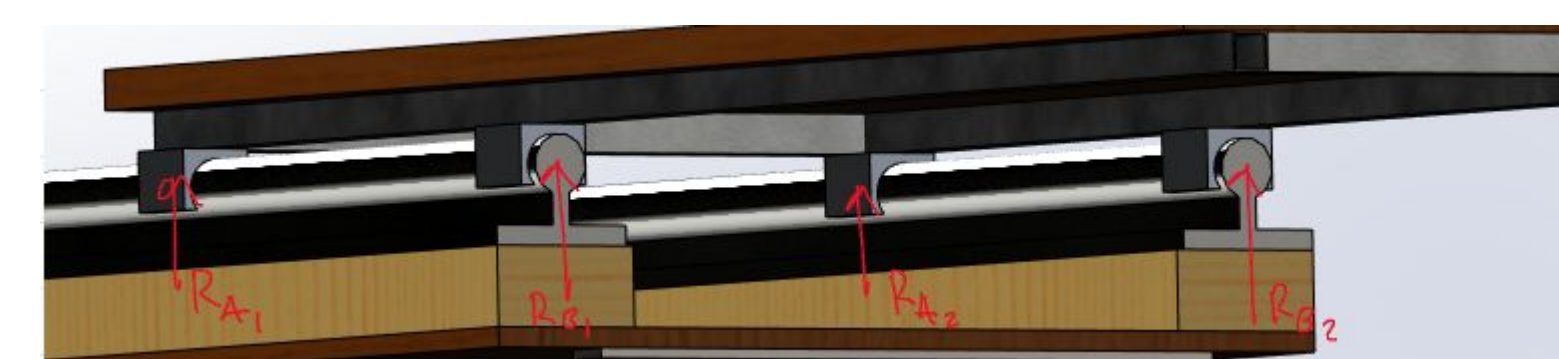
Design Calculations & Analysis

Rail/Bearing system calculations:



$$\sum M_a = 0 = (R_b)(15 \text{ in}) - (100 \text{ lb})(48 \text{ in}) \Rightarrow R_b = 320 \text{ lb}$$

$$\sum F_y = 0 = R_a + R_b - 100 \Rightarrow R_a + 320 - 100 = 0 \Rightarrow R_a = -220 \text{ lb}$$

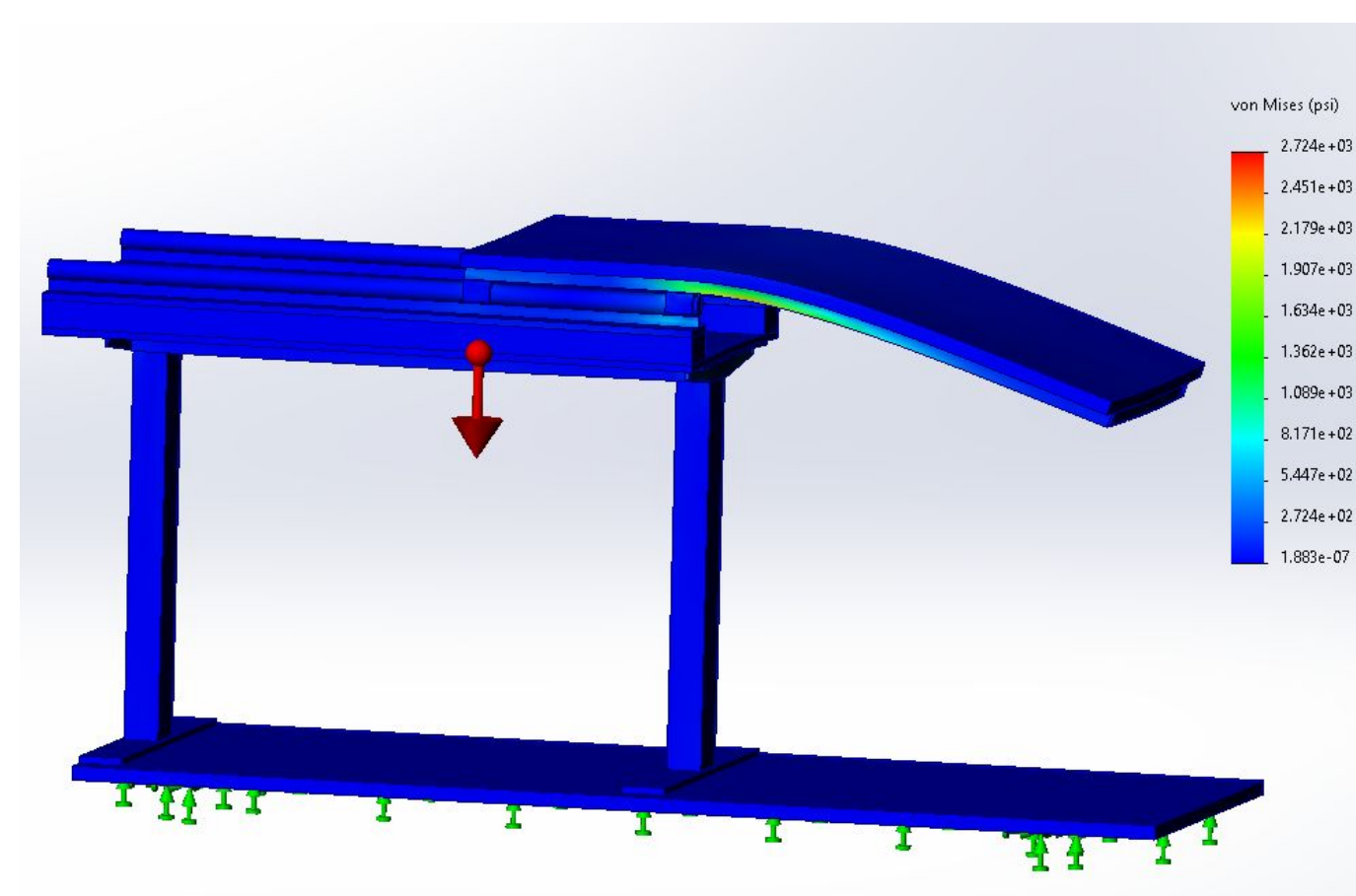
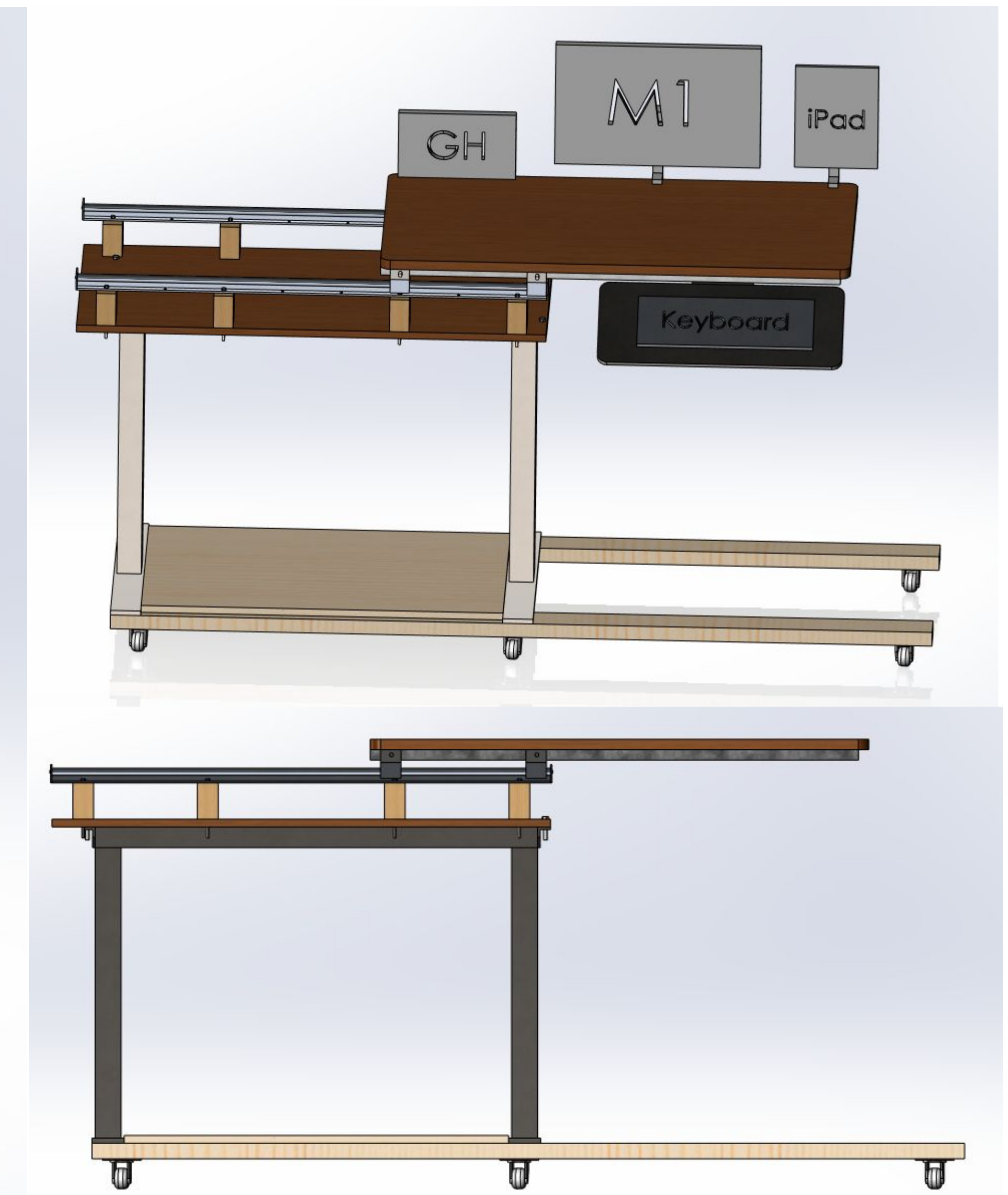
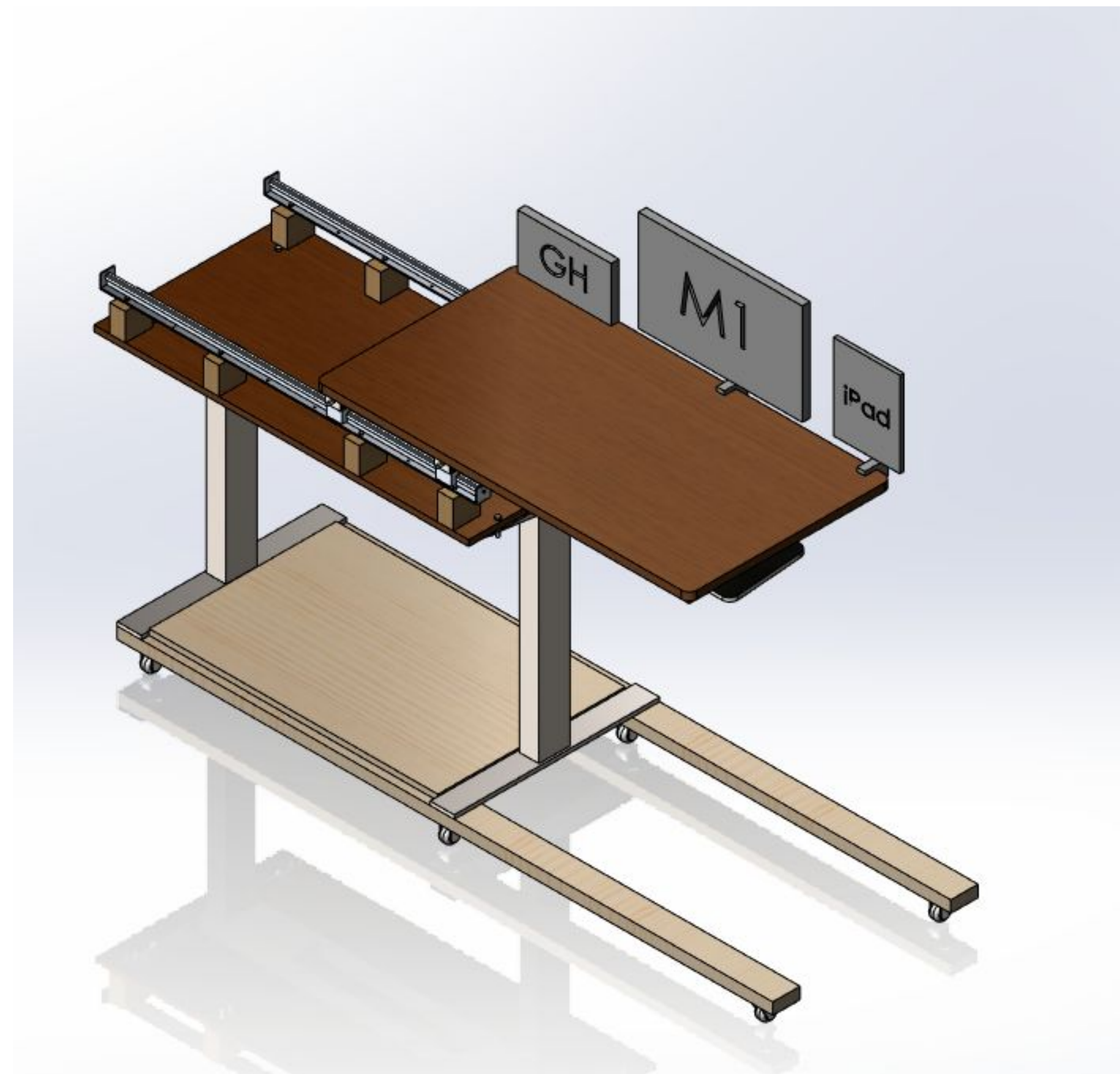


$$R_{a1}, R_{a2} = -110 \text{ lb}$$

$$R_{b1}, R_{b2} = 160 \text{ lb}$$

Thus, the bearing blocks will have a Dynamic Load capacity of 192 lbf and a Static Load capacity of 307 lbf. From this it is safe to assume that our prospective rail/bearing system can support the loaded weight of the desk

Final Design



Cantilever Bending Calculation:
Applied an evenly distributed 100 lb load across the top of the desk face to determine a safety factor of the design. From this experiment we determined the desk will be able to withstand a 100 lb load.

Prototype & Test Results

• **Weight Capacity** - The desk surface will be loaded on the furthest edge of the cantilever while extended in order to ensure the design safety factor. The frame has already been weight tested in its stowed position to sustain and be vertically adjustable with a load up to 180 lbs. More than 180 lbs has not been tested, but this number is reasonable for the engineering criteria of our design.

• **Rail Sliding Force Test** - A force meter will be fastened to the desk surface on the side closest to the bed and pulled to evaluate the necessary horizontal force to position the desk surface over the bed. This test is reliant on the product being assembled and the parts coming in on time. The target is that the required force to slide the desk surface along the rails will be no more than 15 lbs of force. Additional force may require mechanical assistance to move the desk into position.