

Feasibility Testing Report – Strength Test

Team: P15001: Active Ankle Foot Orthotic

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Test Date: 04/14/2015

Related System: ABBBB: Raise Foot

The test is designed to test the strength of the air muscle and related components to determine the durability of the prototype.

A secondary muscle was made with similar materials and arrangements as that of the first muscle. The muscle was subjected to a force of approximately 3 times the design force using suspended weights.

Engineering Requirements: ER2: Design Failure Factor of Safety

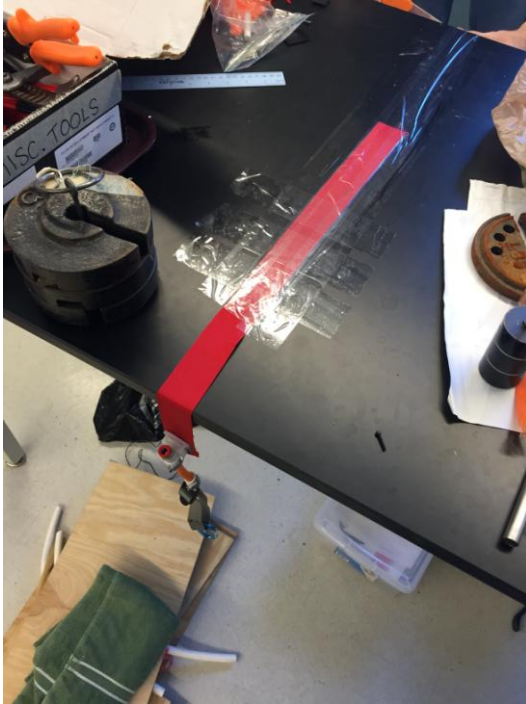
Ideal value: 1.3-1.8

Marginal value: 1.3-4

Supplies:

- 1.) Prototype McKibbin muscle
 - a. Plastic air port
 - b. Plastic plug
 - c. Silicon tubing
 - d. Sheathing
 - e. Air fill attachment
 - f. Silicon sealing material
 - g. Worm clamps
 - h. Thread
 - i. Red inelastic ribbon
 - j. ¾" strap and strap lock
 - k. 30 lbs of weights
 - l. Packing tape
 - m. Plywood and additional silicon tubing for damping support

Setup:



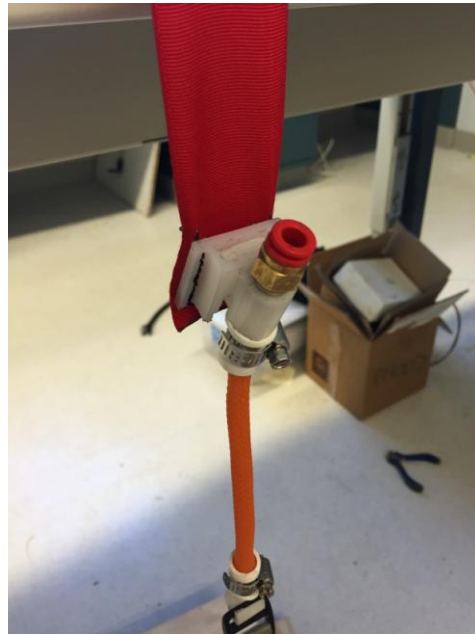
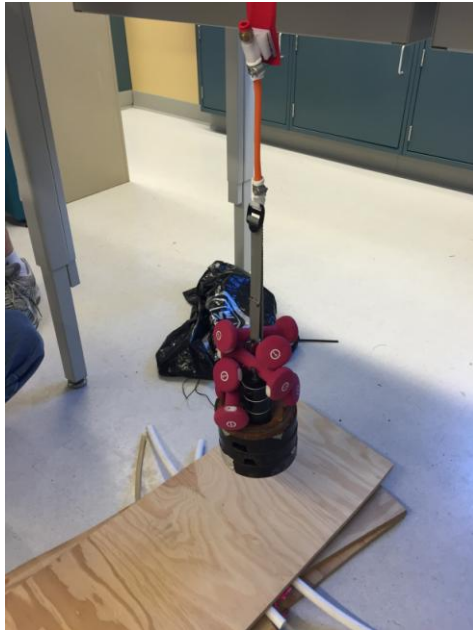
Basic Test Set-Up

Procedure(s):

Test:

1. Construct a nearly identical McKibben muscle to be subjected to rigorous testing
 - a) Use identical materials used in our McKibben muscle; i.e., silicon, sheathing, plastic plugs, etc.
2. Sew muscle base to red inelastic support to mimic actual brace set-up
3. Suspend muscle from table and attach red inelastic ribbon securely to the table via packing tape
4. Add weights to the muscle rig, note any deflection, failure, or other things worth note.
5. Add up to 30lb and then attempt to drop the maximum weight to simulate impact forces.

Pictures of Testing:



Results:

The muscle successfully supported 30 lbs of vertical force with no apparent signs of deflection or failure.

When impact testing was ready to be performed, the red inelastic ribbon actually slipped off the table and pulled away from the packing tape. A group member elected to simply hold the weights by the ribbon with their own hand but in the process the red ribbon was pulled with at an unusual angle and as a result, tore away from the muscle base.



Muscle base and red inelastic ribbon after failure

Conclusion:

- a.) Muscle and components supported the weight of 30lbs without failure or noticeable deflection. This corresponds to a factor of safety of about 3 for a max design lift of approximately 10lbs.
- b.) Failure occurred between the inelastic ribbon and the muscle base after a considerable amount of force was applied at an unusual angle near the upper muscle base.