

MSDII Testing – Muscle Leak Testing

Team: P15001: Active Ankle Foot Orthotic

Engineer: Tyler Leichtenberger – Mechanical Engineer

Related System: AAA- Secure Foot; ABBB- Articulate Foot

This test would help determine if the connections between the air tank and McKibbon muscle would leak over time. If the air leaks over time, it would not only affect the life of our air tank, but it could also affect the performance of the McKibbon muscle, because the muscle must hold the desired air capacity during some points in our use scenario. This is potentially a high risk item for our team because of the connections and tubing being used.

Engineering Requirements

ER2- Design Failure Factor of Safety

ER4- Torque to lift foot by McKibbon air muscle

ER5- Dorsiflexion mobility with McKibbon air muscle

ER6- Number of muscles flexes untethered

Testing Plan

This test, which could evolve over time depending on the severity of the leaks, would involve the red air compressor, the tubing and connections, and our final McKibbon muscle design. For repeatability, this test would be completed 3 times, potentially at 3 different time frames. First, the air compressor would be turned on and pressurized to a known operating pressure similar to that which our system will run on, 70 psi. Once it hits this value, the compressor will be turned off. After 5 minutes, the difference in pressure will be taken. Because we will know the difference in pressure and the volume of the tank, we can find the air lost due to leaks.

After the first part of the test is completed, the tank will be refilled to our desired pressure. Once the tank hits 70 psi, the muscle connected to the tank will be filled to that pressure. After the same time frame, we can read the pressure that the tank reads with the muscle connected. The difference in pressure drops from when the muscle was unconnected to when it was connected can be calculated, and the leak rate can be determined from these values, along with volume of air being used.

Start Date: February 2015 (Phase 2)

End Date: March 2015

Budget

Equipment	Price	Quantity
Prototype McKibbin Air Muscle, including attachments	-	1
Red air compressor	-	1
Air tubing	-	1
Quick connections	-	1
Total:	-	