

Problem Statement:

Sgt. Craig Brady is a transtibial amputee who walks on sand frequently. His current prosthesis is not made for sand and causes him extreme inconvenience and discomfort.



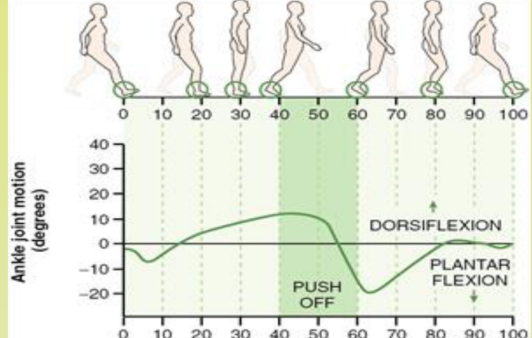
Objective:

Design and manufacture a prosthetic foot for Sgt. Brady to use on sand without inconvenience or discomfort. Prototypes were made from initial customer requirements.



Background:

The human gait cycle was studied to determine the best way to approach our design process.



Interdisciplinary Senior Project 2019- 2020

Advisor:
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Members:
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Sponsor:
Vanessa Salas (QL+)



Final Design:



Final Design Components:

- Polyurethane (PMC-790) Foot, mimics flexibility of biological foot on sand
- TruLife Aluminum Pylon, molded directly into polyurethane.
- TruLife Adjustable Adapter Clamp, interfaces with Sgt. Brady's current socket.

Manufacturing:

The polyurethane foot was resin casted in a 6-piece mold. The mold was 3D printed in PLA and assembled with standard hardware.



Engineering Specifications:

Quality to be Measured	Requirement	Test Result
Total Weight (lbs.)	< 4 lbs.	2.89 lbs.
Toe Deflection (in.)	2 ± 0.5 in.	2.1 in
Highest Stress (psi)	< $S_{UT}/2 = 598$ psi	551 psi
Functionality after Water/Sand Submersion	maintains full functionality	Yes
Material Reduction (in/year)	<0.004 in/year	0.001 in/year
Matching of Standard Parts	parts must mate	Yes
Sinking depth into sand (in)	≤ sink depth of natural foot	Yes
Weight of Sand Piled on Foot after Step	3.0 oz	1.335 oz

Testing:

The foot was virtually tested with FEA simulation and physically tested by a team member using a fixture to simulate wearing the foot.

