Defense Health Agency

Advanced Military Footwear System with Composite Orthotic

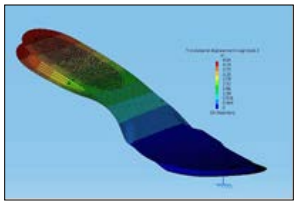
...for the reduction of lower extremity overuse injuries

A multidisciplinary team of experts have collaborated on the design of an advanced prototype combat boot.

The overarching objective of the new combat boot design is to reduce lower extremity overuse injuries in soldiers during training and operational deployment. The prototype boot includes a new footbed assembly featuring a high-performance energy storage and return orthosis (>10% in the forefoot during impact testing) developed and optimized via finite element modeling and constructed from advanced lightweight composite materials. Comprehensive biomechanical and physiological testing will be conducted on a selected prototype design to demonstrate improved function through lower energy cost compared with the current standard issue Army Combat Boot.

Design Concept

Finite Element Model



Performance Testing

Prototype Development

Supporting the Continuum of Care

Point of Injury	Role 1	Role 2	Role 3	Role 4
First Responder Care	First Aid Posts	Brigade Level Care (i.e., Bastion)	Division Level Facility (i.e., Multinational Medical Unit Kandahar Airfield)	Definitive Medical/Surgical Rehabilitative Care (i.e., Landstuhl, VA poly-trauma)

Project directly supports specific Continuum of Care Stage

Project does not directly support specific Continuum of Care Stage

Key Achievements

- Design team has expertise in composite materials, footwear biomechanics, military medicine, and manufacture of military footwear
- Development of a parameterized finite element model for the design of a composite material energy storage/return orthosis (ESRO).
- Design of an advanced footbed system including: cupsole container, Kevlar forefoot/rearfoot protective elements, advanced composite ESRO, cushioning midsole
- Construction of combat boot prototypes with modified design features based upon feedback from soldier performance testing
- Greater than 10% boot weight reduction compared with the standard issue Army Combat Boot
- Preliminary design of a customized in-shoe foot orthosis (ISFO) to reduce loading rates
- Comprehensive biomechanical and physiological testing of advanced combat boot design at the Military Performance Laboratory, Center of the Intrepid

PACIFIC JOINT INFORMATION TECHNOLOGY CENTER

This project is managed by the **Pacific Joint Information Technology Center**, which focuses on rapidly researching, testing, and developing warfighter medical solutions and products, through pilots or prototypes in support of the DOD.