Traumatic Brain Injury
Reducing Army Combat Helmet

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Outline

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Background

- Former U.S. Army soldier, now a UConn nursing student, suggested improvements to combat helmets after serving in Iraq.
- Current helmets provide ballistic protection, but limited head trauma protection.
- The *New England Journal of Medicine* reported a study where over 15% of soldiers in Iraq suffered from Traumatic Brian Injuries (TBIs).
- TBIs are defined as sudden trauma to the brain that causes a varying extent of damages.
- TBIs are mainly caused by Improvised Explosive Devices (IEDs), vehicle accidents, and falls.
  - Limited TBIs resulted from bullets, shrapnel, and fragments.
Room for improvement is greatly needed to make helmet capable of protecting against these injuries:
- Padding system
- More supportive/better fit
- Facial protection

Current Advanced Combat Helmet used by US Army
Project Description

- Design a new helmet and padding system that provides facial and neck protection and reduces the risks of TBIs.
Subunits

- Outer Shell
- Expanded Polystyrene Layer
- Comfort Padding
- Suspension System
- Chin Guard
- Neck Guard
Outer Shell

- Shape will be similar to ACH
  - Slightly larger
  - More protection

- Made of Kevlar using a composite kit
  - Mold for shell will be made based on the shape of the ACH
Padding/Impact Protection System

- Expanded Polystyrene Layer
  - For impact protection
  - Currently used in bicycle and motorcycle helmets
  - Contacting manufacturers for custom molded EPS

- Comfort Padding
  - Removable for comfort and fit
  - Team Wendy ZAP pad kit
Chin Guard

- Wear to protect face
- Lift up and lock when not needed
- Made of Kevlar
Neck Guard

- Made of Kevlar
- Attached with pin
  - Automatically adjusts as user moves head
Testing

- Drop test from various heights
- Same test used by DOT and for ACH testing
- Aimed to minimize G-force
  - Acceleration less than 125G is desired
Gentex Corporation creators of most modern U.S. military helmets

- ACH
- MICH: precursor

Previous helmets
- PASGT (1980s)
  - First Kevlar helmet
- M1 (World War II, Vietnam)
  - Metal helmets

MICH: used briefly by Special Forces
Patents: Motocross

- Largest manufacturers include Shoei, Troy Lee Designs, HJC
- Key areas of patent interest include padding and suspension system

Shoei Hornet DS Helmet
Budget

- ACH: donated
- Motocross Helmet: donated
- Shell mold & components: $640
- Padding layers: $350
- Suspension System: $50
- Test apparatus: $150
- Total: ~$1200
- Cost of product: $420
Conclusion

This helmet will:

- Reduce TBI risk
- Provide a stable, comfortable, and secure fit
- Provide facial and neck protection
- Be suitable for fast action situations
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Questions?