Team National: Advanced Tactical Air Cooling System

Objectives

- General Need: Decrease heat casualties among soldiers.
- Description/Estimation of Market Size: Nearly 200,000 soldiers deployed in hot and arid regions.
- Customer requirements:
  - Cooling ability, Rugged, Lightweight, Quiet, Comfortable, Not bulky
- Engineering Characteristics:
  - Weight, Volume, Hours of continuous use, Change in body temperature, Loudness, Number of controls, Life Cycle, Ambient temperature produced
- Constraints:
  - Minimize weight. Target < 10 lbs, integrate into MOLLE system

Design

- Warm ambient air pulled into the system via intake fans
- Peltier transfers heat from “cold sink” to exhaust heat sink
- Air is cooled via convection as it travels thru the cold sink fins and is directed out a nozzle to user
- Exhaust heat is removed from the heat sink by exhaust fan

Prototype:

- Final design constructed with HDPE to ensure durability
- Large heat sinks for maximum cooling
- Lightweight high capacity battery packs minimize weight while providing hours of cooling

Prototype and Testing

- Testing up to 150°F intake temperature ensures robust performance
- Space heater used to create artificial conditions
- Infrared thermometer to measure intake and exhaust temperature

Test Results and Future Work

- Testing up to 150°F intake temperature ensures robust performance
- Space heater used to create artificial conditions
- Infrared thermometer to measure intake and exhaust temperature

Concept Generation

- Air-Cooled Helmet
  - Pro: Lightweight
  - Pro: Maximum Cooling
  - Con: Weight
  - Con: Noise

- Water-Cooled Vest
  - Pro: Integrated with CamelBak
  - Con: Power Requirements

- Air-Cooled Helmet
  - Pro: Lightweight
  - Pro: Large Operating Range
  - Con: Noise

- Air-Cooled Vest
  - Pro: Noise

Product Operation:

- Heat transfer was optimized, the whole design was created with optimal heat transfer in mind

Possible Improvements:

- Focus on distribution system

Overview:

- Team National created a personal air cooling system that is able to remove large amounts of heat from the environment, but still weighs under 10 lbs. The test results for our first round of prototype testing shows that our product is feasible.