LOW COST MANUFACTURING OF MATERIALS FOR IMPROVED WARFIGHTER PROTECTION

PROBLEM / OBJECTIVE

The Army Research Laboratory, in collaboration with Natick Soldier Research, Development, and Engineering Center, identified two primary technology barriers that to date had prevented the consideration of materials with significantly higher ballistic mass efficiency for use in ballistic helmet shells. These barriers included preforming and thermoforming technologies that were needed to optimally process thermoplastic composite materials (in contrast to the current domestic manufacturing base which is optimized for thermoset materials).

ACCOMPLISHMENTS / PAYOFF

Process Improvement:

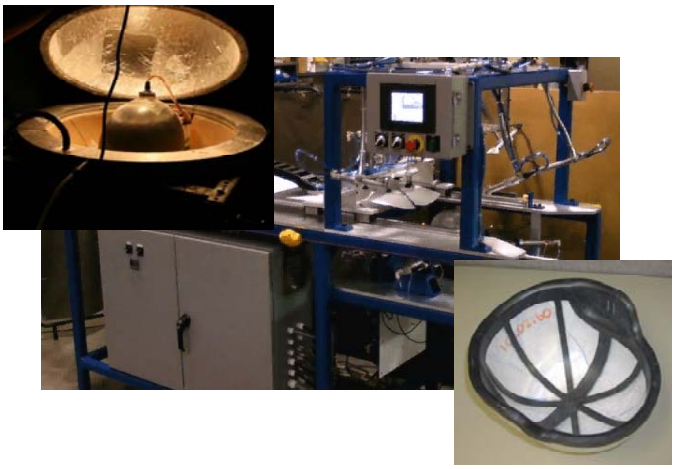
This Army Technology Objective for Manufacturing (ATO-M) demonstrated several technologies including:

- Low thermal mass tooling constructed from metal alloys with both the female and male components plumbed for active cooling
- A 100% automated preform assembly system which used both forced convection and localized thermal binding to accurately index and build up successive material layers into a uniform preform
- An integrated work cell that optimally applied both thermal and pressure cycles
- A novel rim stiffening system that provided additional structural integrity to the helmet while reducing part count and secondary machining and assembly operations significantly

The program has obtained its goal of a Manufacturing Readiness Level (MRL) of 8, and has been instrumental in supplying helmet shells for ballistic evaluation by PEO Soldier and production planning by the Marines.

Implementation and Technology Transfer:

Production capable processes and technologies were transitioned directly to the participants of the ManTech program. The transition strategy allowed participants to integrate ManTech-developed technologies with technologies that were unique or proprietary to the participants, thus preserving competitive advantages while providing a catalyst for innovation. PEO Soldier production planning resulted in significant technology transfer of ManTech technologies.



ManTech Process and Helmet Technologies

Expected Benefits and Warfighter Payoff:

This ManTech program was cited as one of two enabling technologies that have allowed both the Marines and the Army with the capability to produce the Enhanced Combat Helmet (ECH). The ECH is expected to have > 35% frag protection over the current ACH helmet and it will represent an historical shift to thermoplastic-based ballistic composites. The ROI was 16.6 with cost avoidance of $88.3M.

FUNDING

Army ManTech: $5.7M

TIME LINE / MILESTONE

Start Date: July 2006
End Date: September 2009

PARTICIPANTS

RDECOM Army Research Laboratory
RDECOM Natick Soldier Research, Development and Engineering Center (NSRDEC)
PEO Soldier, BAE Systems, GENTEX, MSA, Diaphorm