U.S. Army Awards $4.9 Million to Southern Miss for Helmet Liner Research

The United States Army has awarded a $4.9 million research contract to The University of Southern Mississippi for development and evaluation on a helmet liner designed to provide enhanced head protection for warfighters.

The Southern Miss Pneumatic Cushioning helmet liner was developed in the laboratories of Dr. Jeff Wiggins, director of the School of Polymers and High Performance Materials, in collaboration with Dr. Trent Gould, associate dean in the College of Health and professor in the School of Kinesiology, and Dr. Scott Piland, assistant director and associate professor in the School of Kinesiology. The primary objective of this two-year program is to develop next generation pneumatic cushioning systems which exceed the blunt impact performance standard of current Army helmets in cold, ambient, and hot testing conditions.

Wiggins stressed that the Southern Miss Pneumatic Cushion liner system is radically different from traditional foam pads that have been the basis of energy absorption in helmets for decades.

"It’s important to note that commercialization of our helmet cushioning has proven the technology is manufacturing-ready and reproducible in high volumes, the economics are in the same range as foams, and cushioning levels can be 'tuned' where foams generally cannot," said Wiggins. “This two-year program has the potential to yield substantial improvements in energy absorbing capabilities leading to new standards for military and civilian protection.”

Piland emphasized that developing a better understanding of brain injuries can improve the liner system’s utility.

"Brain injuries, encompassing concussion, are at the forefront of common concern," said Piland. "Over the past decade, our research efforts in the School of Kinesiology have been to better understand this injury, its mechanism, diagnosis, treatment and prevention. These efforts, combined with the ongoing pneumatic cushion development with our colleagues in Polymer Science, provides a multidisciplinary approach to the problem that is highly unique."

U.S. Senator Thad Cochran, (R-Miss.), chairman of the Senate Defense Appropriations Subcommittee, praised the award of the contract to Southern Miss researchers.

“Southern Miss researchers have an opportunity to accelerate technology that can better protect our men and women in the military from head injuries and brain trauma. Advances in this area have the potential to be life changing for American servicemembers, who are too often exposed to the debilitating aftereffects of severe brain injuries,” Cochran said. “I have great hope for this research.”

Southern Miss Pneumatic Cushion liner technology provides inflation of helmet cushioning bladders to specified pressures which remain inflated and stable over the lifetime of the helmet. The University partnered with Rawlings Sporting Goods to evaluate, test, develop, produce and sell Southern Miss Pneumatic Cushion liners in football helmets starting in 2011.

Within one year the helmet which incorporated Southern Miss technology was one of only three helmets in the country independently rated in the May 2012 Virginia Tech Helmet Ratings as 5-Star highest performing helmet. Within one year the PC liner technology developed by USM, outperformed every helmet in the country through the most recognized rating system.

In 2012, University researchers began collaboration with the U.S. Army Helmet Thrust group at Natick Soldier Research, Engineering and Development Center to evaluate USM pneumatic cushioning liners in comparison to existing standard issue foam systems.

Preliminary un-optimized prototypes demonstrated improvements over the existing U.S. Army foam padding system of more than 30 percent at ambient temperatures (70°F) and more than 60 percent at hot temperatures (130°F). These advancements are critical with the potential for providing enhanced cushioning performance over such a broad temperature range, a performance attribute crucial to warfighter protection, and a limiting factor for traditional foam padding systems.

The cushioning design currently employed in football helmets represent the baseline system to be evaluated, but the Army program provides resources to advance the technology to even higher levels of performance.

Gould points out that the primary goal of the cushioning research is to fully understand and characterize the human material interface related to protective helmets.

"This project with the Army provides us the support to accomplish this task," he said. "I fully anticipate our efforts will substantially add to the daily
expanding knowledge base of concussion and will facilitate positive prevention application for both athletes and warfighters."

Wiggins echoed that assessment: “It is fully expected that materials formulations and designs resulting from this project will demonstrate broad applicability to other areas of the human body which require energy mitigating characteristics for injury protection,” he said. “Beyond the military, a broad array of applications among sport is available. Those opportunities are not limited to just liner systems for sport headgear, but also to body and on-field padding.”

For more information about the School of Polymers and High Performance Materials at The University of Southern Mississippi, call 601.266.4868 or visit: http://www.usm.edu/polymer. To learn more about the School of Kinesiology at Southern Miss, call 601.266.632 or visit: www.usm.edu/kinesiology

About the Author

Van Arnold
Reporter, Office of University Communications
Phone: 601.266.5568
E-mail: van.arnold@usm.edu

RELATED TERMS: Academics News Makers Science and Technology Faculty and Staff Research