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New partnership between VTTI and Center for Injury Biomechanics receives first award

BLACKSBURG, Va., April 20, 2009 – A team of three Virginia Tech faculty members, Stefan Duma, Warren Hardy and H. Clay Gabler was recently awarded \$2.6M from U.S. Army Research Acquisition Activity to study the biomechanics of head, neck and chest injury prevention for soldiers. Joel Stitzel at Wake Forest University will also be heavily involved in the project.

This award represents the first major grant of a new partnership between the Virginia Tech Transportation Institute (VTTI) and the Center for Injury Biomechanics (CIB) that combines VTTI auto safety expertise with CIB injury biomechanics for military applications. This project will be conducted in a new facility, opening this summer, in the Corporate Research Center to investigate full military vehicle crashes thereby designing better restraint systems for military vehicles.

VTTI Director Tom Dingus said, “We are pleased to form this partnership with CIB. With VTTI’s existing expertise in crash avoidance research, CIB’s expertise in crash survivability is a natural fit. This partnership will give us great synergy to help reduce automotive injuries and fatalities.”

The United States military is faced with a number of significant biomechanical questions for the nearly 3 million active duty and reserve personnel who fight in this nation’s conflicts. Head (brain, eye and facial fracture), neck and chest injuries are an ever present risk of military duty. Injuries to the head, neck and chest can be seriously debilitating or fatal and dramatically reduce the combat effectiveness of the American soldier.

Given improvements in helmet design and body armor and the resultant reductions in penetrating injuries including penetrating head trauma, blast-related closed head injuries have become the signature injury of most military operations. For the past five years, Virginia Tech has utilized the Head Impact Telemetry (HIT) System (Simbex, Lebanon, NH), a wireless system that provides real time data from impacts (to football players) to a signal receiver and laptop computer system located on the sidelines.

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Conditions of impact as well as the design criteria to quantify the effect of head supported mass (HSM) on neck injury risk through computational modeling will be evaluated.

Design changes to the High Mobility Multipurpose Wheeled Vehicle (HMMWV), such as additional ballistic armor, have lead to a severe increase in rollover accidents. Specifically, rollover accidents account for 42% of HMMWV accidents and over 70% of all fatalities suffered in HMMWV vehicles in Iraq. Troops suffer from inadequate restraint systems, often failing to use restraint at all due to the incompatibility of these restraint systems and the ability of the troop to perform their mission. In addition, fatalities and injuries from helicopter crashes result in the loss of highly trained pilots that could be saved with advanced restraints. The U.S. military inventory includes over 30,000 armored military ground transport vehicles and over 15,000 aircraft. Effective restraint systems must be developed to allow the troops to maintain their operational effectiveness while protecting the troop in the event of an impact.

Over the course of the next two years, Phase I of this project will analyze head injury biomechanics to aid in head protection design. Phase II will focus on improving neck protection through analysis of current models and human head supported mass testing to develop head supported mass criteria. Chest protection is the goal of Phase III which will utilize thorax injury models to evaluate advanced restraints.

Duma, director of CIB and professor in the mechanical engineering department at Virginia Tech, received his Ph.D. in mechanical engineering from the University of Virginia in 2000; his M.S. in industrial engineering from the University of Cincinnati in 1996; and his B.S. in mechanical engineering from the University of Tennessee in 1995. He has been the director of CIB since 2000.

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