Blast Exposure Analysis

Physics and Physiology Based Human Body Model of Blast Injury and Protection

Blasts from improvised explosive devices (IEDs) are one the most common causes of combat injuries in recent military operations; however, there is a limited understanding of blast injury pathways including biomechanical injuries caused by the direct effects of pressures penetrating the body, flying debris, body translocation in air, and impact on hard objects. Therefore, anatomically consistent human body model and computational tools for modeling blast physics coupled to human physiology and biomechanics may help to better understand blast injuries, interpret experimental data, and develop improved protective armor, diagnostics and medical treatment procedures. As part of the FY14 Department of Defense (DoD) Small Business Innovation Research (SBIR) program, CFD Research Corporation (CFDRC) received funding for the Phase I SBIR project titled “Physics and Physiology Based Human Body Model of Blast Injury and Protection.” The overall goal of this project is to develop, validate, and demonstrate a fast anatomy and physiology based computational tool, and a human body model for assessment of explosion blast injury loads, body responses, injury mechanisms to vital organs, casualty estimation, and evaluation of protective equipment. As part of the follow-on Phase II project, researchers at CFDRC are currently investigating ways to improve the individual model components, validate the models using experimental data, and integrate these models into a user friendly software tool. The technology developed has immense potential application in military medicine including the development and evaluation of protective armor and equipment, characterization of blast events, development of blast dosimeters and diagnostics, and improvements in treatment of blast injury casualties.