



US DEPARTMENT OF DEFENSE

BLAST INJURY RESEARCH PROGRAM COORDINATING OFFICE

Injury Models

Matched-Pair Tests Identify Preliminary Injury Assessment Reference Curve for Foot and Ankle Fractures in Under-Body Blast Events

USARL is currently working with experts in injury biomechanics to simulate UBB in a laboratory setting to study LE musculoskeletal injuries resulting from high-rate blast loading. This collaboration is conducted via the ARL's WIAMan PMO and is sponsored by Director Operational Test and Evaluation (DOT&E), ASD(R&E), USAMRMC, and RDECOM. The current Live Fire foot-ankle criteria use post-mortem human surrogate fracture data, but lack the Hybrid III ATD matched-pair testing needed to appropriately assess risk of injury. Using the validated experimental pendulum and custom UBB vertical accelerator device at the Medical College of Wisconsin, USARL developed preliminary foot-ankle injury criteria for calcaneus and/or distal tibia fractures, which, concurrent with FE models, will inform the design of equipment to best prevent musculoskeletal injuries resulting from UBB events. Based on recent research on blast loading rates and Warfighter-specific anthropometry, the new foot-ankle criteria will allow ARL analysts and Service Evaluators to more precisely predict injury using the Hybrid III ATD and the WIAMan Blast ATD. It is anticipated that these capabilities (i.e., new blast-specific ATD and new injury assessment criteria associated with UBB loading rates) will allow vehicle developers to predict blast injuries and incorporate improved survivability features to protect Warfighters in military vehicles.