Equipment Testing

Blast Induced Injuries to the Dismounted Soldier

Recent conflicts have highlighted the threat posed to dismounted Soldiers by buried explosives that result in severe soft tissue damage to the extremities and urogenital areas. Many areas of the body injured during buried blast events are not protected by body armor and are only covered by the combat uniform. Researchers at the Army Research Laboratory (ARL; Aberdeen Proving Ground, MD) have performed experiments and simulations to reduce vulnerability of the dismounted Soldier.

Buried explosive arena experiments were performed to characterize the secondary debris component of buried blast events so that the loading can be replicated through more controlled, nonexplosive, and less expensive methods (*Spink, 2018*). Specially designed shields, placed at the perimeter of the arena (1m from the exploding source), allowed some debris to pass through where it could be recorded by high speed video. Roadbed and cross-country compaction specifications were evaluated and used to establish the speed and angle of the debris. Fabric targets backed by half-cylinders made of silicon rubber were placed at the same 1m distance to evaluate the resulting damage to the fabric from the buried blast.

The goal of this simulation was to identify aspects of fabric design that contribute to performance in order to optimize the fabric for protection from buried blast events. The simulations illustrated how impact direction, fiber material, and yarn construction influenced the amount of tearing and skin exposure. The results showed that deflection patterns and fabric texture resulted in higher stress and failure during oblique impact compared to a normal impact to the extremities and urogenital areas. The use of continuous filament yarns or 100 percent aramid ripstop yarns reduced fabric tearing and exposure compared to the staple yarns currently used in the uniform fabric. These findings demonstrate the impact of uniform fabric on injury resulting from explosion and provide a viable option to reduce extremity and urogenital injuries in the field.

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REFERENCES:

Spink, R. (2018). Characterization of Secondary Debris during Buried Blast Events. U.S. Army Research Laboratory: Aberdeen Proving Ground, MD.