Dynamic monitoring of service members to quantify blast exposure levels during combat training using BlackBox Biometrics Blast Gauges: explosive breaching, shoulder-fired weapons, artillery, mortars, and .50 caliber guns.

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Abstract:
CONQUER is a pilot blast monitoring program that monitors, quantifies, and reports to military units the training-related blast overpressure exposure of their service members. Overpressure exposure data are collected using the BlackBox Biometrics (B3) Blast Gauge System (BGS, generation 7) sensors mounted on the body during training. To date, the CONQUER program has recorded 450,000 gauge triggers on monitored service members. The subset of data presented here have been collected from 202 service members undergoing training with explosive breaching charges, shoulder-fired weapons, artillery, mortars, and .50 caliber guns. Over 12,000 waveforms were recorded by the sensors worn by these subjects. A maximum peak overpressure of 90.3 kPa (13.1 psi) was recorded during shoulder-fired weapon training. The largest overpressure impulse (a measure of blast energy) was 82.0 kPa-ms (11.9 psi-ms) and it was recorded during explosive breaching with a large wall charge. Operators of .50 caliber machine guns have the lowest peak overpressure impulse (as low as 0.62 kPa-ms or 0.09 psi-ms) of the blast sources considered. The data provides information on accumulation of blast overpressure on service members over an extended period of time. The cumulative peak overpressure, peak overpressure impulse, or timing between exposures is all available in the exposure data.

This paper presents blast overpressure exposure data on service members during training. The data provides the relative magnitude and number of exposures during training and can help commanders plan training to reduce frequency of blast exposures. Approaches to mitigate blast exposure are presented with the goal of having minimal impact on service member training.

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Explosive Breaching	Shoulder-Fired Weapons	Artillery	Mortar	.50 Caliber Gun
Wall Charge	M3 MAAWS (Carl Gustaf)	M777 155 mm	M224 60 mm	MK 15
Door Charge	M136 AT4 M136 AT4-CS		M252 81 mm	M107
Window Charge	M72 LAW		M120 120 mm	M2A1
	Mk 153 SMAW			GAU-21

Figure 1: Blast overpressure sources on military service members during training.

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