BLAST INJURY CHARTS FOR EOD SCENARIOS BASED ON SCALED EXPLOSIVE PARAMETERS

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Blast injuries can be classified in four main categories: primary injuries, related to the direct interaction of the blast wave with the internal organs, secondary injuries, related to fragments accelerated at high speed by the explosive device, tertiary injuries which can be related to the impact with obstacles of the individual accelerated by the blast winds, and finally quaternary injuries, which include burns, exposure to toxic gases, etc.

Explosive Ordnance Disposal (EOD) technicians, when attempting to render safe explosive devices, expose themselves to the entire range of blast injuries described above, and as such, their personal protective equipment (PPE) has to be designed to address all these possible threats. While secondary, tertiary and a range of quaternary injuries can be mitigated by the selection of appropriate protective materials and validated with a number of test methodologies, it is much more challenging to assess the protection provided by EOD PPE against the threat of primary blast injuries. The purpose of the present paper is thus to investigate how primary blast injuries can be mitigated by EOD PPE. In particular, emphasis will be put on chest overpressure injuries, and blast-induced traumatic brain injuries (TBI), and some related biomechanical models.

In previous studies, user-friendly injury charts had been developed for that purpose. In these charts, the probability of survival based on the combination of chest overpressure injuries and blast-induced TBI was quantified in terms of the amount of high explosives and the standoff distance. Since these charts were generated, more data on Hybrid III mannequins exposed to blast while wearing EOD PPE has been gathered, and a new approach to present the data has been developed. In particular, the concepts of “scaled standoff distance”, “scaled acceleration” and “scaled impulse”, inspired from other work on the scaling of explosive device behaviour, have been applied for the generation of updated injury charts.

The purpose of the present work is to introduce those revised injury charts for EOD PPE (which include predictions for the unprotected individual), based on the concepts of scaled engineering variables, for a better accuracy throughout a wider range of explosive conditions (mass and standoff distance).