NEW MODEL FOR SURVIVABILITY PREDICTIONS FOR SIMULATED FREE FIELD BLAST

I. El Maach, J.P. Dionne, A. Makris

Med-Eng Systems Inc.
2400 St. Laurent Blvd., Ottawa, Ontario K1G 6C4 Canada

The performance of blast Protective Personal Equipment (PPE) is traditionally evaluated by relating experimental data acquired from non-human surrogates to injury predictions using various models. For blast lung injuries, the Richmond-Bowen curves, which link positive phase blast duration and peak overpressure, are typically used to directly assess survivability for free field scenarios. When it comes to Traumatic Brain Injuries (TBI), current injury predictive tools do not provide such a direct prediction of survivability. For instance, the Head Injury Criterion (HIC) provides instead probabilities of suffering various levels of closed head injury ranked on the Abbreviated Injury Scale ranging from AIS 1 (minor) to AIS 6 (virtually unsurvivable). In this article, a model that translates probabilities of TBI-related AIS levels into a theoretical probability of survivability is first proposed. This model takes into account the survival probabilities associated with each AIS level specified in the 2005 revision of the Abbreviated Injury Scale. In a second step, the probabilities of survival obtained from that model are combined with those of the Richmond-Bowen curves to estimate the overall survival probability of a blast victim suffering both Traumatic Brain Injuries and blast lung. This combined head/chest injury model is developed based on the International Classification of Diseases Injury Severity Score (ICISS). The method presented in this work allows for a more conservative injury prediction assessment in the context of blast, as compared to the current individual use of head and chest injury models.