P05 Blast with Ground Reflection, A Real Scale Experimental and Numerical Study

***Loïc Ehrhardt*[1], *Johanna Boutillier*[2], *Pascal Magnan*[1], *Caroline Deck*[2], *Sébastien De Mezzo*[1], *Rémy Willinger*[2]**

[1]Institut franco-allemand de recherches de Saint-Louis (ISL),
[2]Strasbourg University, Icube, UMR 7357, Multiscale Materials and Biomechanics

Abstract:

A good understanding of the blast effect in air with presence of ground is necessary to predict or mitigate the injuries on the exposed soldier. The loadings imposed are described by the pressure time history, which can be estimated by experimentally tabulated values with the scaling laws or explicit computation of the fluid dynamics. This latter approach has a non negligible numerical cost but is generally preferred as it leads to more reliable data and takes the complex ground reflection into account. This work is done in the context of the BLASTHOR project, which is aimed to predict the interactions between the blast and the human thorax. Experimental and numerical study of the air blast with ground reflection is performed in order to assess with confidence the physical characteristics of the blast before reaching a target. The complexity will later be increased by the addition of physical targets with increasing geometrical complexities. This step-by-step procedure will permit to understand all the complex physical phenomena associated to blast interaction with realistic biological structures. In this contribution, focused on the free-field configuration, a literature review is first proposed on the experimental and numerical knowledge, showing the lack of public data despite numerous studies conducted. Next, experiments were performed by detonating different weights of C4 at different heights of burst in a free-field environment instrumented with pressure gauges. With the experimental findings, numerical simulations using an in-house developed code and a commercial code (Ls-Dyna) are processed. The experimental and numerical results are compared and discussed in regard to the trajectory of the triple point, where simple shock reflection turns into Mach reflection. This study proposes new experimental data in order to understand and validate numerical simulations induced by an air blast.

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