

CHARACTERISATION OF HOME-MADE EXPLOSIVES SUCH AS ANFO AND NM AGAINST A MILITARY GRADE EXPLOSIVE, PE4, IN OPEN AIR ENVIRONMENT

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Abstract:

The detonation of an explosive charge generates the propagation of a shock-wave, principally affecting gas-containing organs, such as lungs, middle ear and gastrointestinal tract [1]. In a free-field environment, the pressure-time history resulting from a detonation has a well-known shape, called the Friedlander profile [2]. The use of improvised explosive devices (IEDs) results in more complex waves, with multiple reflections that can interact simultaneously with the soldier, resulting in more severe injuries.

The influence of different explosives such plastic explosives (PE4), home-made explosives, such as nitromethane (NM), ammonium nitrate (fertilizer), and fuel oil (ANFO) which been used in IEDs should be investigated to begin to assess the effectiveness of the performance of materials and personal protective equipment used in this environment.

In order to develop equipment to protect soldiers during IED attacks, an important step is to understand the complex blast waves and to quantify the pressure level. In this study, the blast wave characteristic of two home-made explosives in a form of NM and ANFO are investigated and compared with the military grade PE4 explosive charge using the BTM.

The work presented a series of experiments conducted where normally reflected blast parameters (peak overpressure, positive and negative phase impulse and primary shock and second shock arrival time) were measured for the three explosives. Two Blast Test Device (BTM) were placed 2m away from the location of detonation, 220mm off the ground, and was instrumented with pressure transducers at different locations.

Results were summarized and it was noted that PE4 demonstrate higher peak reflected pressure and impulse compared to the NM and ANFO explosives at the same NEC. This suggests that PE4 is the more energetic explosive and ANFO is the least energetic of the three explosives tested. For the two home-made explosives NM is found to have a higher output than ANFO at the same standoff. PE4 and ANFO have the shortest peak rise time compared to the NM. PE4 has the longest positive phase duration, followed by NM and then ANFO

References

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