

Validation of ExploSim

Blast

ExploSim indicates blast effects over distance based on a selected weight and type of explosive. The basis for the calculations is the cube root scaling for a hemispherical (ground based, open field) explosion; where the blast scaling factor $k = R / W^{0.33}$. Where R = range, W = explosive charge weight.

The Kingerly and Bulmarsh¹ calculations are used in the CONWEP² model. The calculations were cross referenced against other Level One blast software such as the ExpSAFE Blast Calculator³.

The Kingerly Bulmarsh calculations are well validated in field trials and are used as the basis for recognised hemispherical free field air-blast.

An internet search for “Kingerly Bulmarsh” “Validate Kingerly Bulmarsh” and “Validate CONWEP” will result in many papers and authoritative references which validate the accuracy of the Kingerly Bulmarsh calculations in field trials.

ExploSim uses two data points of 207 kPa (~30 psi) for blast lethality and 34 kPa (~5 psi) for blast injury⁴. ExploSim has been field tested to confirm that the distance at which these peak incident pressures are indicated are comparable to those predicted by Kingerly Bulmarsh.

Annex 3 of the ExploSim Instruction Manual provides additional detail on the basis for blast, fragmentation, injury levels and structural damage calculations <https://layer3services.net.au/explosim/>.

RF

ExploSim uses RF (WIFI) to show the distances at which the explosive effects will occur. The system has been designed to minimise variations in the signal. Field testing has shown a worst-case variation of 12.5% over distance.

¹ Kingery, C.N. and Bulmarsh, G. (1984), Airblast Parameters From TNT Spherical Air Burst and Hemispherical Surface Burst, Technical Report ARBRL-TR-02555, US Army Armament Research and Development Centre, Ballistic Research Laboratory, Aberdeen Proving Ground, United States

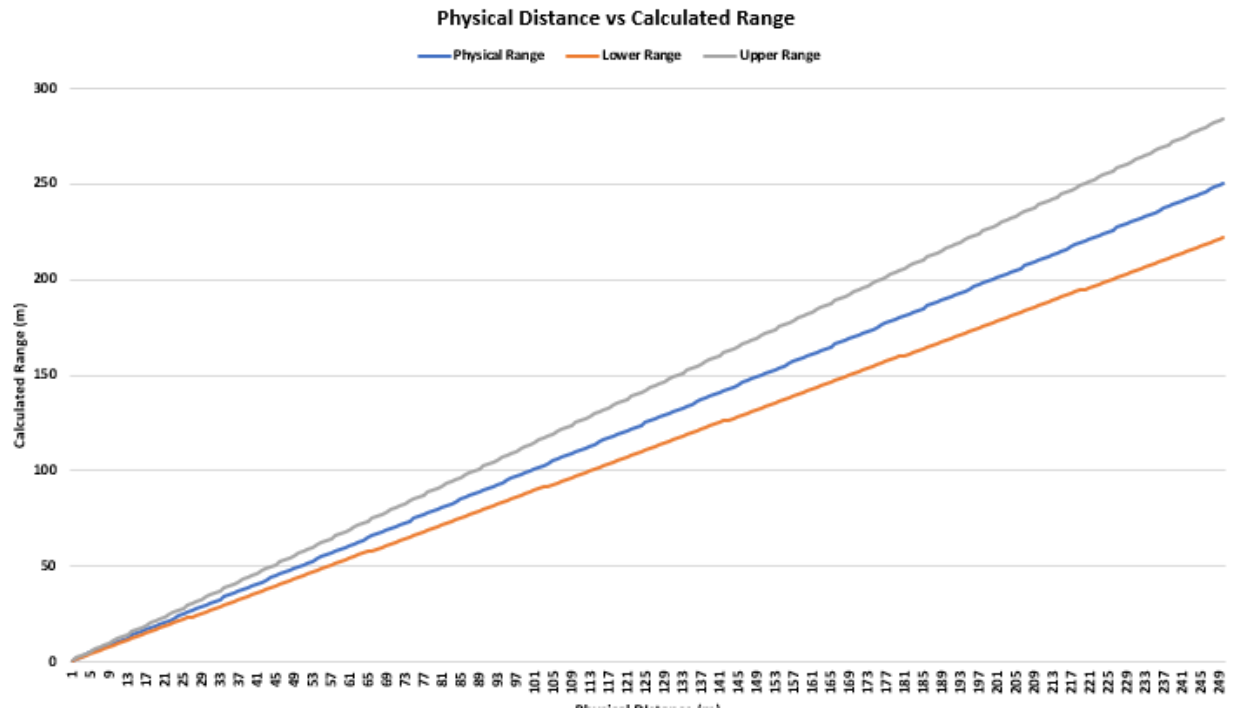
² US Army TM5-855, (1992) Conventional Weapon Effects (CONWEP), US Army Waterways Experiment Station, US Department of the Army.

³ Gibbs Software, see ExpSAFE applications for IOS.

⁴ The pressures selected for ExploSim are taken from US Federal Emergency Management Agency FEMA 426 “Reference Manual to Mitigate Potential Terrorist Attacks Against Buildings” Table 3.1 quoting US Department of Defence 3-340-02, “Structures to Resist the Effects of Accidental Explosions” (2008b).

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The following graph shows the worst-case variation over distance compared to the calculated pressures.



Conclusion

Given the real-world variations of blast effects particularly over distance due to composition, orientation, detonation, confinement and placement of the explosive in conjunction with environmental effects such as altitude, humidity and wind, the RF variation is well within tolerance.