TNT BASELINE DATA:
APPLICABILITY TO SMALL - SCALE

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Several TNT dependencies of air blast parameters on scaled distance are available in the open literature. They are obtained as fittings to experimental data and can be used for comparing the effects of detonation of any explosive to that of trinitrotoluene. However, some issues may be hidden in these TNT baseline data sets:

- The mathematical forms of the dependencies – the fitting equations are not well defined from basic principles and various empirical equations are used.
- The nature of the measured parameters – some of the experiments deduce pressure from the time of arrival using empirical fitting equations, and the method seems to be highly sensitive to the type and quality of the fit.
- Data distribution – the data in the open literature concentrates at the lower part of the scaled distances for big trials and does not overlap too much with the small-scale trial data, concentrated at the upper range of scaled distances.
- Reliability of small-scale tests – TNT is sometimes presented as a material incapable of reproducible detonation in a small amount. This is partially true as shown in fig 1 by a sequence of frames taken from a small TNT charge failing to detonate.
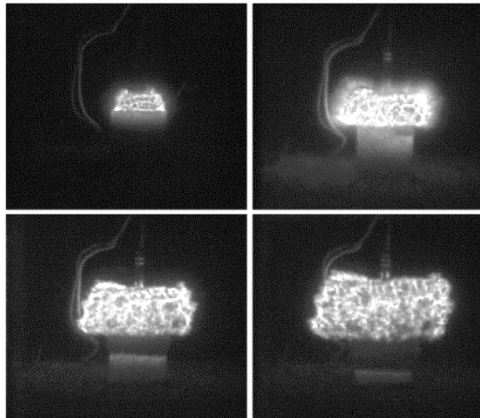

Figure 1. Sequence showing a cast TNT charge failing to detonate. A shock wave related light emission is clearly visible at the lower two frames.

Many of the TNT dependencies available in the literature are based on time of arrival data from huge TNT trials. In contrast, new explosives development requires small-scale tests (due to a limited material availability).

In this work, we present an experimentally based discussion on the issues affecting TNT baseline, focusing on the differences between our small-scale data (up to 1 kg) and classical big-scale literature data. Recommendations are made with respect to the use of small-scale data especially when evaluating the TNT equivalency.