25 International Symposium on Military Aspects of
Blast and Shock
MABS25, The Netherlands, 2018

UTILITY OF PRESSURE RATIO ANALYSIS FOR INTERNAL DETONATION AIRBLAST STUDIES

A. Ohrt[1]

[1]*Air Force Research Laboratory, Munitions Directorate, 101 W. Eglin Blvd, Ste. 309, Eglin AFB, FL, 32542, USA*

Key words : Internal Airblast – Detonation Products- Quasi-Static Gas Pressure – Blast Winds

Airblast environments resulting from explosions within buildings or other confined spaces are exceedingly complex, consisting of a) direct, reflected, and diffracted shocks, and b) the rapid expansion of detonation products throughout the confining aspects of the target geometry. Pressure from the confined detonation products, sometimes referred to as quasi-static gas pressure, is often estimated using algorithms of room-to-room mass flow of detonation gasses. These algorithms might utilize ideal or non-ideal gas laws coupled with simple methods of compressible flow through nozzles to arrive at a fast-running estimate of quasi-static gas pressure and mass flow through the building geometry.

Individual pressure measurements from internal detonation experiments may indeed quantify quasi-static gas pressures and the time frames through which venting of these gasses occur. Direct measurement of detonation product flow (i.e., velocity and direction) at points of interest has proven difficult. The Air Force Research Laboratory has been exploring various means of measuring or estimating detonation product flows and their associated pressures. Since the mass flow of detonation products through an opening is a strong function of the pressure environment across that opening, AFRL has investigated the utility of deliberately measuring airblast pressures on each side of room openings through experiments in small-scale building models. Measured waveforms across the opening are arithmetically divided from one another to compute a pressure ratio, and this pressure ratio is then analyzed to determine if it correlates in a useful manner to detonation product flow parameters. This paper provides an assessment of the pressure ratio technique, providing comment on its utility for measuring, understanding, and quantifying detonation product flows from internal detonations.

Distribution A: Approved for public release; distribution unlimited