

# **VALIDATED NUMERICAL SIMULATIONS OF BLAST LOADS ON STRUCTURES**

16th International Symposium on Military Aspects of Blast and Shock, Oxford, England, September 2000

GE Fairlie, KC Moran  
Century Dynamics Ltd., England

NF Johnson  
Police Scientific Development Branch, Horne Office, UK

Designers need accurate blast loads from explosions that may be planned, accidental or malicious in nature. Well defined blast loads allow designers to assess the consequences on structures of interest and potentially make design modifications to resist the threats.

High explosive (HE) blast loads in simple geometries can be predicted using empirical or experimentally based methods. These can be used to calculate blast wave parameters for spherical or hemi-spherical explosions in air, and to predict loads on isolated structures. In more complex geometries typical of a modern urban environment one alternative is to use a numerical tool such as AUTODYN to predict the blast wave behaviour from first principles. Such tools solve the governing fluid conservation equations and can be used to solve 3D blast wave propagation including multiple reflections, rarefaction and diffraction in complex geometries. The disadvantages of using numerical methods to solve blast wave problems are the computer resources required, especially compared to analytical methods, although such simulations can now be run on desktop PCs.

The capabilities and limitations of the explosion and blast prediction methods described above will be discussed. Example HE blast calculations including comparison with full-size and small-scale experimental results will be described using three examples.