Experimental investigation of blast wave propagation in an urban environment

Charline Fouchier, D. Laboureur, L. Youinou and J.M. Buchlin
Von Karman Institute for fluid dynamics
Environmental and applied fluid dynamics department
Chaussée de Waterloo, 72B-1640 Rhode-Saint-Genèse-Belgium
charline.fouchier@vki.ac.be

Studies on the impact of complex environment on blast wave propagation are described in the literature. However, only a few studies at lab-scale were found while this scale option represents an economic and safe choice. Lab-scale experimental investigations on blast wave propagation in a complex environment are proposed in this paper.

Three kinds of explosive are used: 1.4 g black powder firecracker, RP80-EBW detonator and RP83-EBW detonator. Five experimental configurations, built on a 2.8m wood table using wood boxes, are tested in a 1:200 reduced scale. Several characteristics of the explosives used are studied: the geometry of the explosion, the repeatability and the TNT equivalent.

An overview of impacts of a complex environment on the blast wave characteristics is proposed. The typical urban configurations investigated are: the small straight street, the large straight street, the T junction, the cross junction and the channeling. Results are presented in graphs of overpressure peaks and scaled impulse plotted against scaled distance.

Investigations on confinement and reduce-scale effects on blast measurement and characteristics are detailed. Results obtained during the lab-scale experimental campaign are compared with free field experiments and larger scale observations.

Keywords: Blast wave, explosion, urban environment, lab-scale experiments, safety