BLAST RESPONSE OF HEMI-CYLINDRICAL TENTS

D. V. Ritzel[1], J. Crocker[2]

[1] *Dyn-FX Consulting Ltd,*
19 Laird Ave North, Amherstburg, Ontario, N9V 2T5 Canada
[2] *Martec Ltd,*
Suite 400, 1888 Brunswick St., Halifax, Nova Scotia, B3J 3J8 Canada

During routine conditions at expeditionary military camps as well as many permanent bases, personnel and valuable materiel resources will be located within lightweight relocatable shelters which can serve for accommodation, messes, stores, vehicle-bays, offices, and housings for special equipment. In the event of an explosive accident or terrorist-bombing attack which does not allow for protective action or withdrawal to hardened shelters, assets within such structures will usually be at much higher risk than had they been exposed to blast in the open. This heightened risk is a consequence of the structures presenting large surface areas compared to their supporting lightweight, low-rigidity framework which is thereby imparted high accelerations and displacements even under weak blast conditions.

Metal-framed hemi-cylindrical tents with polyester weathershell skins are a common type of lightweight relocatable shelter used by the Canadian Forces in many roles at expeditionary camps. A comprehensive program of full- and model-scale blast experiments, as well as computational modelling has been conducted to quantify the blast vulnerability of such tents and develop blast hardening upgrades. The dynamics of blast interaction with tents is complex, and the project has required new developments in experimental diagnostics for highly responsive, large-scale structures. Summary vulnerability charts, fast-running response-solvers, and a high-resolution LSDYNA model for this class of tent have been produced from the current work. Practical expedient blast-protection upgrades have been developed and longer-term refit concepts proposed. Important blast vulnerability issues for lightweight relocatable shelters and possible generalized mitigation measures are discussed.

Typical hemi-cylindrical tent and internal snapshot of blast-response dynamics.