BLAST TESTING OF COMPOSITE AND TEXTILE ELEMENTS AND FLY-BAG CONCEPT VALIDATION

Dr Andrew Tyas*

Blastech Ltd., The Sheffield Bioincubator,40 Leavygreave Road
Sheffield, S3 7RD, United Kingdom
a.tyas@sheffield.ac.uk
http://www.blastechltd.co.uk

Dr James A. Warren

Blastech Ltd., The Sheffield Bioincubator,40 Leavygreave Road
Sheffield, S3 7RD, United Kingdom
j.warren@sheffield.ac.uk
http://www.blastechltd.co.uk

Mr Stephen D. Fay

Blastech Ltd., The Sheffield Bioincubator,40 Leavygreave Road
Sheffield, S3 7RD, United Kingdom
sfay@blastechltd.co.uk
http://www.blastechltd.co.uk

Abstract

A key aim of the Fly-Bag concept is that it must be capable of containing the effect of the detonation of a small explosive charge, thus preventing damage to an aircraft structure. There are two aspects to this containment of the explosion. The structure must be capable of withstanding a) localised, intense shock loading from the detonation and b) a global increase in internal pressure due to the detonation products (so called "Quasi-static pressure" or QSP). The design approach used for Fly-Bag is to use high-strength, impermeable textile to contain the QSP, and composite sandwich strengthening panels to resist the localised shock loading.

In the shock loading test program, square samples of composite panel material have been subjected to damped blast loading, by placing an explosive charge on packs of towelling material of different thickness, to simulate the "softening" of shock loading by the fact that the blast wave would have to travel through luggage contents. The purpose of these tests is to identify the resistance of the panels to shock-holing as the thickness of the towelling pack (and therefore the proximity of the explosive charge) is reduced.

QSP testing has concentrated on the ability of the textiles to resist a suddenly applied increase in pressure without rupturing. In these tests, a small explosive charge is detonated in the base of a 1m3 five-sided strong steel box, with the open face of the box covered by a sheet of fabric material, clamped around the edges. Records of the internal pressure-time history are taken, and the response of the fabric face monitored by high speed video.

Test results will be presented and the type of materials deemed most suitable for resisting the blast loading will be discussed.

Keywords blast resistant; textile; unit load device; luggage container; explosion; quasi-static pressure.

* Corresponding author. Tel: +44 (0)114 222 57 35