Numerical study of the effect of a core-adjacent layer of polyurea on the blast energy absorption of a sandwich T-joint

L.A. Louca¹, A. Soleiman Fallah¹, M. Saunders² and A. Groves²

¹Imperial College London, Dept. of Civil and Environmental Eng., South Kensington, London, SW7 2AZ.
²Dstl (MoD), Physical Sciences Dept, Materials and Protection Science, Dstl Porton Down SP4 0JQ.

Keywords: T-joint, Sandwich panel, Polyurea, Blast energy, Cushioning

Abstract

The present study investigates the effect of the energy absorption characteristics of a T-joint between 2 sandwich panels using a layer of polyurea between the core and the skin of the base sandwich panel. Finite element simulations using ABAQUS 6.6 have been conducted on a conventional T-joint and a modified configuration. The conventional T-joint comprises a leg and a base sandwich panel with balsa cores and GFRP skins, a Crestomer fillet and two overlaminates. The modified T-joint is similar to the conventional set-up except that a layer of polyurea has been introduced under the top skin of its base panel while preserving the original dimensions. Due to the presence of a rigid body mode (plunge), kinetic energy is not a reliable parameter as the basis of comparison between the two models. Study of partial strain energies and support transmitted forces shows the improvement in the behaviour of the T-joint due to the insertion of the polyurea layer. The support reaction has been abated by 43% at the cost of 7% increase in the weight of the T-joint. The possible mechanisms responsible for mitigation of partial strain energies and the amplitude of the force transmitted to supports are discussed.