ACOUSTICS2008/1676
Acoustic frequency wave propagation and fluid-loading in composite sandwich panels

Jennifer Crossley and Johann Sienz
Swansea University Engineering Department, Singleton Park, SA2 0DS Swansea, UK

Composite sandwich panels comprising glass fibre reinforced epoxy skins with nomex honeycomb cores have found application as aircraft interior fixtures and partitions. This is due to their low density combined with static strength and stiffness. In this complex acoustic and vibration environment however, the same properties can lead to unwanted sound transmission through the structure. We analyse, in this paper, fluid-loading of such a panel by an acoustic fluid using an elementary theory which has been developed in the study of structural dynamics and vibration, based on a generalisation of Timoshenko theory for homogeneous beams. The dispersion relations derived from this theory, with and without fluid-loading terms, are used to quantify the effect of fluid-loading by air on shear and flexural waves at acoustic frequencies in such stiff, lightweight structures. The most appropriate method of fluid-structure coupling to be applied in modelling an internal acoustic field enclosed by such a structure is discussed.