Accepted Manuscript

Sound transmission loss of composite and sandwich panels in thermal environment

Xiangyang Li, Kaiping Yu, Rui Zhao, Jingyong Han, Haiyang Song

PII: S1359-8368(16)31308-7

DOI: 10.1016/j.compositesb.2017.09.023

Reference: JCOMB 5269

To appear in: *Composites Part B*

Received Date: 14 July 2016

Revised Date: 29 March 2017

Accepted Date: 9 September 2017

Please cite this article as: Li X, Yu K, Zhao R, Han J, Song H, Sound transmission loss of composite and sandwich panels in thermal environment, *Composites Part B* (2017), doi: 10.1016/j.compositesb.2017.09.023.

Sound transmission loss of composite and sandwich panels in thermal environment

Xiangyang Li, Kaiping Yu*, Rui Zhao, Jingyong Han, Haiyang Song

Department of Astronautic Science and Mechanics, Harbin Institute of Technology, No. 92 West Dazhi Street, Harbin 150001, People's Republic of China

lixiangyang@hit.edu.cn (X. Li);

yukp@hit.edu.cn (K. Yu);

ruizhao@hit.edu.cn (R. Zhao)

Abstract

Composite sandwich structures are extensively applied in automotive, marine, aircraft because of superior stiffness-to-weight ratios. These structures are invariably exposed to the thermal and noise environment in their service life especially as a component of the hypersonic aircraft. The paper is originally focused on the sound transmission loss (STL) of the sandwich panels constituted of orthotropic materials in thermal environment. Firstly, the governing equations are obtained by applying Hamilton's principle. Both the natural frequencies and corresponding mode functions are derived with thermal stresses taking into account. The formulation of STL is obtained by using the mode superposition method. Then the published experimental result and numerical simulation are demonstrated to validate the accuracy of the analytical solution. Finally, the influences of temperature, elevation angle and azimuth angle of incident sound on the STL of finite sandwich panels are investigated systematically. It is observed that natural frequencies of the panel decrease and peaks of the STL tend to drop and flow to the lower frequencies with the increment of the temperature. The STL decreases with the increment of the elevation angle.

Keywords: Sandwich panel; composite; sound transmission loss; thermal environment

Nomenclature

a	Length of the panel	T_0	The initial temperature
b	Width of the panel	T_{end}	The end steady temperature