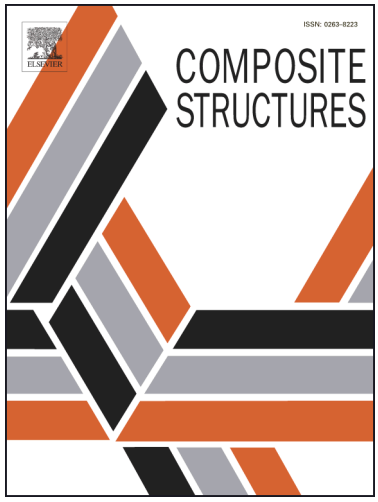

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PII: S0263-8223(17)30406-3
DOI: https://doi.org/10.1016/j.compstruct.2018.03.106
Reference: COST 9553

To appear in: *Composite Structures*

Received Date: 5 February 2017
Revised Date: 1 March 2018
Accepted Date: 28 March 2018

Please cite this article as: Wang, Z., Zhou, C., Khaliulin, V., Shabalov, A., An Experimental Study on the Radar Absorbing Characteristics of Folded Core Structures, *Composite Structures* (2018), doi: https://doi.org/10.1016/j.compstruct.2018.03.106

An Experimental Study on the Radar Absorbing Characteristics of Folded Core Structures

Zhijin Wang [1,*], **Chen Zhou** [1], **Valentin Khaliulin** [2], **Alexey Shabalov** [2]

[1] Minister Key Discipline Laboratory of Advanced Design Technology of Aircraft, Nanjing University of Aeronautics and Astronautics, Nanjing 210016, China

[2] Kazan National Research Technical University Named After A. N. Tupolev, Kazan 420111, Russia

Abstract

Folded core sandwich structures are promising multifunctional structures for both load bearing and radar absorbing capability. This paper presents an experimental study on the radar absorbing characteristics of folded core structures. The influences of various factors on the folded core radar cross section (RCS) are investigated. The experiments were carried out in an anechoic chamber. Comparisons are made between folded core samples and an aluminium flat panel. The results show that the folded core height has significant effects on the radar absorbing performance of V-pattern folded core, while core material only lead to a slight difference. The RCS of V-pattern folded core is lower than that of the flat panel, while the RCS of M-pattern folded core is of the same order of magnitude as that of the flat panel with a much wider range.

Keywords: folded core, radar absorbing structure, radar cross section, sandwich structure

1. Introduction

Stealth technology is vital for the survivability of aircrafts or warships. Radar was and still is the primary mean used in detection systems [1]. Therefore, much attention has been given to the reduction of the radar cross section (RCS), which is used to describe the intensity of the reflected electromagnetic energy. Since the radar detection range is proportional to the fourth root of RCS, a significant reduction in RCS is required to obtain real benefits [2]. Specifically, in order to decrease the detection range of an aircraft by half, the corresponding RCS needs to be reduced by 100 times.

Several methods are studied to reduce the echo intensity [3]. Configuration shaping is widely used to reduce specular reflection, edge diffraction, etc. Flat surfaces which are perpendicular to the incoming radar beam should be excluded since they are usually high RCS contributors. In general, the radar detection range is one order of magnitude greater than the difference in height between the radar station (RS) and the aircraft, which makes them most likely to be exposed to radar. Edges are usually set parallel to each other to align spikes in the same direction. Therefore, the radar reflecting surfaces should be minimal in size and inclined with respect to the reflecting radiation for the disposal of the reflected radar waves. The aircraft fuselage or warship hull should be designed in such a way that the number of surfaces perpendicular to the radar beam is minimized. One method adopted is to represent the outer surface of the object with faceted shape. However, this kind of design also leads to some disadvantages. The fuselage is designed faceted, i.e. consisting of many planar faces bounded by edges. As a result, the aerodynamic characteristics of the aircraft will significantly deteriorate and consequently its speed and maneuverability will be affected.

* Corresponding author: zhijin@nuaa.edu.cn (Zhijin Wang).