H. Soejima, K. Takahashi, Y. Okabe, N. Takeda, M. Yoshida

Investigation of the Probability of Detection of Our SHM System

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We have been developing a structural health monitoring (SHM) system for evaluating structure integrity in aircraft composite structures De-bonding in the bondline, which is a kind of the most critical damages in composite structures, can be diagnosed by evaluating changes in Lamb waves generated and detected by our hybrid sensing system. In our sensing system, a macro fiber composite (MFC), which is one of the piezoelectric devices, is used as an actuator to generate Lamb waves, and a fiber Bragg grating (FBG) optical fiber sensor is used as a sensor to detect the propagating Lamb waves.

In order to achieve the implementation of our SHM system to commercial aircraft, we have been investigating a lot of issues, such as probability of detection (PoD), environmental influences, installability of the SHM system, system compatibility to aircraftystem and structures, and so on. PoD assessment is one of the indispensable subjects in order to apply a SHM technique as one of the non-destructive inspections (NDI) for actual commercial aircraft. And both of the durability of the hybrid sensor systems and the influences of environmental conditions on detected Lamb waves, which affect the precise diagnosis of structural integrity, should be investigated. Moreover, consideration of the installability and compatibility of the SHM systemto aircraft, in which the academic investigations are not included so much unfortunately, are absolutely required to achieve commercial applications.

In this paper, we propose an appropriate assessment procedure of PoD of SHM technologies that can diagnose damage initiation and its growths, being different from the conventional NDI, such as ultrasonic inspection.

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Ключевые слова:

Содержание.
Abstract
Introduction
Description of our SHM technique
Proposed evaluation procedure
Test specimens for proposed procedure
Evaluation procedure
Results and discussions
Conclusions
Acknowledgement