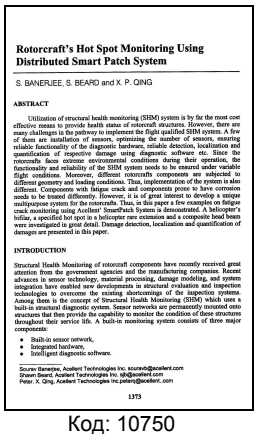

Rotorcraft's Hot Spot Monitoring Using Distributed Smart Patch System

S. BANERJEE, S. BEARD and X. P. QING

ABSTRACT

Utilization of structural health monitoring (SHM) system is by far the most cost effective means to provide health status of rotorcraft structures. However, there are many challenges in the pathway to implement the flight qualified SHM system. A few of them are installation of sensors, optimizing the number of sensors, ensuring reliable functionality of the diagnostic hardware, reliable detection, localization and quantification of respective damage using diagnostic software etc. Since the rotorcrafts faces extreme environmental conditions during their operation, the functionality and reliability of the SHM system needs to be ensured under variable flight conditions. Moreover, different rotorcrafts components are subjected to different geometry and loading conditions. Thus, implementation of the system is also different. Components with fatigue crack and components prone to have corrosion needs to be treated differently. However, it is of great interest to develop a unique multipurpose system for the rotorcrafts. Thus, in this paper a few examples on fatigue crack monitoring using Acellent' SmartPatch System is demonstrated. A helicopter's bifilar, a specified hot spot in a helicopter rare extension and a composite head beam were investigated in great detail. Damage detection, localization and quantification of damages are presented in this paper.

INTRODUCTION

Structural Health Monitoring of rotorcraft components have recently received great attention from the government agencies and the manufacturing companies. Recent advances in sensor technology, material processing, damage modeling, and system integration have enabled new developments in structural evaluation and inspection technologies to overcome the existing shortcomings of the inspection systems. Among them is the concept of Structural Health Monitoring (SHM) which uses a built-in structural diagnostic system. Sensor networks are permanently mounted onto structures that then provide the capability to monitor the condition of these structures throughout their service life. A built-in monitoring system consists of three major components:

- Built-in sensor network,
- Integrated hardware,
- Intelligent diagnostic software.

Sourav Banerjee, Acellent Technologies Inc. sourav@acellent.com
Shawn Beard, Acellent Technologies Inc. sjb@acellent.com
Peter. X. Qing, Acellent Technologies Inc.peterq@acellent. com

1373

Код: 10750

S. Banerjee, S. Beard, X.P. Qing

Rotorcraft's Hot Spot Monitoring Using Distributed Smart Patch System

Издательство DEStech Publications, Lancaster, 2010 год

8 стр; формат: 23,5 x 16 см; библиографический список: 6 единиц
ISBN: 978-1-60595-024-2

Utilization of structural health monitoring (SHM) system is by far the most cost effective means to provide health status of rotorcraft structures. However, there are many challenges in the pathway to implement the flight qualified SHM system. A few of them are installation of sensors, optimizing the number of sensors, ensuring reliable functionality of the diagnostic hardware, reliable detection, localization and quantification of respective damage using diagnostic software etc. Since the rotorcrafts faces extreme environmental conditions during their operation, the functionality and reliability of the SHM system needs to be ensured under variable flight conditions. Moreover, different rotorcrafts components are subjected to different geometry and loading conditions. Thus, implementation of the system is also different. Components with fatigue crack and components prone to have corrosion needs to be treated differently. However, it is of great interest to develop a unique multipurpose system for the rotorcrafts. Thus, in this paper a few examples on fatigue crack monitoring using Acellent' SmartPatch System is demonstrated. A helicopter's bifilar, a specified hot spot in a helicopter rare extension and a composite head beam were investigated in great detail. Damage detection, localization and quantification of damages are presented in this paper.

Ключевые слова:

Содержание.

Rotorcraft's Hot Spot Monitoring Using Distributed Smart Patch System