Structural Health Management – Boeing Overview

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Structural Health Management (SHM) and its related technologies offer the combined benefits of reducing maintenance costs while preserving or improving structural design performance. Advanced SHM technology implementation for in-service aerospace platforms requires a disciplined approach to quantify how each application can provide benefit in the context of design practices and design and maintenance criteria. The presentation will give an overview of Boeing company and SHM from a design and integration perspective followed by some examples that demonstrate SHM implementation in the context of a broader design and maintenance perspective. Aircraft structural components may have known "hot spots" where any initial damage is anticipated to occur or has consistently been observed in the field. Automated inspection of these areas, or hot spot monitoring, may offer significant time and cost savings for aircraft maintainers, particularly when the hot spots exist in areas that are difficult to access or where traditional NDE inspection methods will not work. Important criteria to qualify an on-board Structural Health Monitoring (SHM) system for aircraft flight demonstrations and fleet-wide usage include both an ability to detect damage of a specific size via the creation of a 'Probability of Detection' (POD) curve as well as an estimate of the associated false alarm rate. The POD curve provides the best estimate of crack size with 90% POD and 95% confidence (a90/95) and a basis for setting inspection intervals as part of maintaining aircraft structure integrity. MIL-HDBK-1823A [1] contains technical information related to generating a POD curve and is the guide used to quantify the detection capability of NDI systems used as part of the US Air Force's Aircraft Structural Integrity Program (ASIP). While the intended outputs of SHM and NDI systems are very often the same, there are differences in parameters that affect their performance and implementation hat may require special attention. This paper will discuss using MIL-HDBK-1823A [1] techniques in the context of SHM and will provide valuable insight about how the characteristics of collected and processed SHM data affect the formulation of that system's POD curve. The presentation will conclude with vision for future and a list of challenges for the SHM community.