

1145-62-1864

Kevin J Lin* (kevin.lin@afit.edu), 1253 Windsor Dr, Beavercreek, OH 45434. *SHM Factor Validation on Airframes.*

Validation of SHM systems for aircraft is complicated by the extent and number of factors for which the SHM system must demonstrate robust performance. Therefore, a time and cost-efficient method for examining all the sensitive factors must be conducted. In this paper, we demonstrate the utility of using the simulation modeling environment to determine the SHM sensitive factors for future experimentation. We demonstrate this concept by examining the effect of SHM system configuration and flaw characteristics on the response of a signal from a known piezoelectric wafer active sensor in an aluminum plate using simulation models of a particular hot spot. We derive the signal responses mathematically and through statistical design of experiments, determine the significant factors that affect the damage indices computed from the signal using only half the number of runs normally required. We determine that the transmitter angle is the largest source of variation for the damage indices considered, followed by signal frequency and transmitter distance to the hot spot. These results demonstrate that the use of efficient statistical design and simulation may enable a cost and time-efficient sequential approach to quantifying sensitive SHM factors and system validation. (Received September 24, 2018)