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MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Smart Materials and Adaptive Structures (5)

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FIBER-OPTIC STRAIN SENOR-BASED STRUCTURAL HEALTH MONITORING OF AN UNINHABITATED AIR VEHICLE

Abstract

Recent improvements in technology has enabled the use of very sophisticated sensors such as embedded fiber bragg gratings to obtain strain measurements from a variety of structural types. Conventional strain gauges tend to be heavy and bulky. Because of their accuracy, light weight, small size and flexibility these fiber optic sensors have big potential to be used in space exploration and the aerospace industry especially for flying aircraft that have strict weight and size limitations. These strain measurements can be used to predict the deformation shape of aircraft during real-time flights. The development of such methods for monitoring and control can potentially reduce the risk of in-flight breakups, such as that of the Helios Wing, and other similar catastrophic events.

The Structures, Propulsion, And Control Engineering (SPACE) NASA sponsored University Research Center (URC) of excellence has concentrated in the development of small, lightweight UAVs that have excelled in the area of endurance. Today, the UAV project is focused on the design of a multi-mission multipurpose air system that can operate autonomously. The configuration is a twin boom, pusher, and conventional wing design. In this paper, methods developed by the National Aeronautic and Space Administration (NASA)'s Dryden Flight Research Center for real-time deformation shape prediction of lightweight unmanned flying aerospace structures for the purposes of Structural Health Monitoring (SHM) and condition assessment are investigated. These methods are applied to the SPACE Center UAV for the purpose of assessing the effectiveness of the method and the potential for both SHM and control applications.