IAF MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Smart Materials and Adaptive Structures (9)

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USE OF FIBER-OPTIC SENSORS FOR LONG-TERM HEALTH MONITORING OF AEROSPACE STRUCTURES

Abstract

Smart structures have been widely investigated in recent years for structural parameter measurements and health monitoring throughout the life cycle of spacecraft and launch vehicle systems. Among various emerging technologies, fiber-optic sensors are one of the leading candidates and have received considerable attention. In this paper, a sensing system was constructed consisting of multiplex fiber-optic sensors and a parallel processing interrogator. Fiber-optic sensors were designed with distinct package structures for respectively sensing strain or temperature. Tests were performed on a pressure vessel sample which was pressurized. Multiple strain and temperature fiber-optic sensors were fixed on the bottom and cylinder regions of the vessel, and parameters were monitored simultaneously and continuously. It was discovered that strains and temperatures kept changing associated with the pressure level. The pressurization tests successfully demonstrated the use of fiber-optic sensors for long-term health monitoring of aerospace structures. Moreover, the additional advantages such as damp proofing, high sampling rates and real-time inspection make the novel sensing technology especially appropriate for load monitoring and damage detection in future flight programs.