

Effects of embedded LaRC Macro Fiber Composite actuators on Flexible Composite Structures with Static and Fatigue Loading

Cadet Adam J. Miller
Department of Physics
United States Military Academy
West Point, New York

ARL Adviser: LTC David C Meyer
Director of Plans and Programs
U.S. Army Vehicle Technology Directorate
Langley Research Center, Hampton VA

ABSTRACT:

The overall objective of my project was to categorize the effects of piezoelectric embedding on fiberglass in order to advance fatigue life methodology to predict strength and fatigue life of flexible, multi-functional composite structures

The main focus of the testing I was involved in was to test and analyze data collected from three sets of piezoelectrically-embedded fiberglass strips. The LaRC macro fiber composite was glued into the fiberglass composite three different ways, and through standardized interlaminar fracture toughness and fatigue fracture threshold calculations, the strength and flexibility of the material was determined.

With the information gathered in this testing, it is hoped that the effects of the embedding process can be negated from tests performed that use embedded piezoelectric strips to observe the test member. This will allow future testing to measure what happens inside the member while it is being fatigued or static loaded. This ability will add another dimension to stress testing, allowing scientists to see the internal working of stress. This will in turn allow the development of all manner of fiberglass and composite matrices that are lighter, stronger, safer, and last longer.

KEYWORDS: piezoelectric actuator, double-cantilevered beam test, static and fatigue loading.

CONTACT: LTC David C Meyer, Director of Plans and Programs, U.S. Army Vehicle Technology Directorate, Langley Research Center, Hampton VA, Tel: (757) 864-2035, Email: david.c.meyer@nasa.gov

Dr. Mark W. Nixon, Aerospace Engineer, U.S. Army Vehicle Technology Directorate, Langley Research Center, Hampton VA, Tel: (757) 864-1231, Email: m.w.nixon@larc.nasa.gov