MANUFACTURING TECHNOLOGY

High-Performance, Durable Actuators for Demanding Applications

NASA offers companies the opportunity to license or jointly develop this in-plane, high-strain piezoelectric technology for smart structure and mechanical control.

Developed at NASA Langley Research Center, the Macro-Fiber Composite™ (MFC) actuator is a high-performance, cost-competitive, easily manufactured piezoelectric strain actuator that produces controlled motion when stimulated by voltage and generates a potential when dynamically strained. The MFC actuator may be embedded in or attached to the surface of a flexible structure for distributed deflection, vibration control, and strain sensing. Its innovative design keeps manufacturing costs low while providing numerous performance benefits.

Benefits

- Made of cost-competitive materials
- Flexible and durable
- Low-cost, repeatable manufacturing processes
- Increased strain actuator efficiency
- Directional actuation/sensing
- Damage tolerant
- Conforms to surfaces
- Readily embeddable
- Environmentally sealed package
- Demonstrated performance

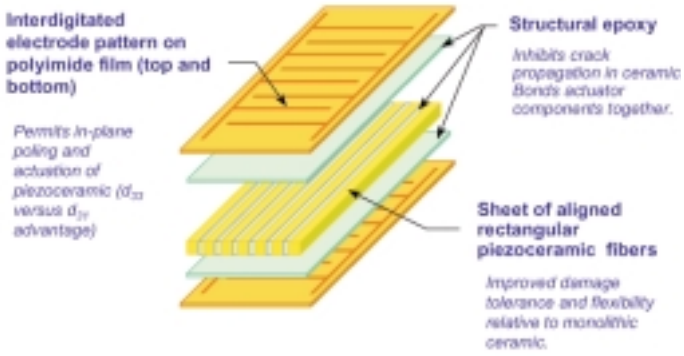
Applications

- *Helicopters*—Vibration suppression, individual rotor blade control
- *Aircraft*—Buffet alleviation on rudders
- *Spacecraft*—Jitter suppression or elimination
- *Actuators*—Shape changing, auto-focusing, structural stiffening, micropositioning
- *Sensors*—Dynamic structural health monitoring, direct mechanical-to-electrical conversion, accelerometers

National Aeronautics and Space Administration

The Technology

Researchers at NASA Langley Research Center have developed an innovative actuator that offers high performance and flexibility in a cost-competitive device. As shown in the figure below, the Macro-Fiber Composite actuator consists of rectangular piezofibers sandwiched between layers of adhesive and electroded polyimide film. This film contains interdigitated electrodes that transfer the applied voltage directly to and from the piezofibers. This assembly enables in-plane poling, actuation, and sensing in a sealed, durable, ready-to-use package. When embedded in a surface or attached to flexible structures, the MFC actuator provides distributed solid-state deflection and vibration control. This new technology offers superior and reliable performance (see table below). NASA is currently using the MFC actuator for alleviating tail buffeting in aircraft, increased stability in helicopter rotors, vibration control of inflatable spacecraft structures, and structural control of composites.



MFC Performance at 25 °C with Various Configurations

Electrode width/pitch	PZT 7-mil ceramic	In-plane μ strain/volt
7 mils/42 mils	5A-type	0.5
7 mils/42 mils	5H-type	0.9
5 mils/21 mils	5A-type	0.8
5 mils/21 mils	5H-type	1.2

Partnering Opportunity

This technology is part of NASA's technology transfer program. The program seeks to stimulate commercial use of NASA-developed technologies. NASA Langley has filed for patent protection on the MFC actuator and seeks companies interested in licensing and commercializing this technology. Interested companies are invited to attend a technology showcase scheduled for **July 18, 2000,** at Langley Research Center in Hampton,Virginia.

For More Information

If you would like more information, please register for the July 18th technology showcase at NASA Langley Research Center in Hampton, Virginia. Registration deadline: July 13. You can register online (http://www.rti.org/technology/tbrief), or feel free to contact:

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