cal design. Also, the sensor resolution is nearly uniform across its operational range, which is in contrast to eddy current and capacitive sensors whose sensitivity is dependent upon position.

This work was done by Robert Youngquist and Alyssa Garcia of Kennedy Space Center and Stephen Simmons of ASRC Aerospace Corporation. For additional information, contact the Kennedy Innovative Partnerships Program Office at 321-867-5033. KSC-13265

High-Temperature Surface-Acoustic-Wave Transducer

This thin, high-temperature-resistant sensor is designed for crack inspections.

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Aircraft-engine rotating equipment usually operates at high temperature and stress. Non-invasive inspection of microcracks in those components poses a challenge for the non-destructive evaluation community. A low-profile ultrasonic guided wave sensor can detect cracks *in situ*. The key feature of the sensor is that it should withstand high temperatures and excite strong surface wave energy to inspect surface/subsurface cracks. As far as the innovators know at the time of this reporting, there is no existing sensor that is mounted to the rotor disks for crack inspection; the most often used technology includes fluorescent penetrant inspection or eddy-current probes for disassembled part inspection.

An efficient, high-temperature, low-profile surface acoustic wave transducer design has been identified and tested for nondestructive evaluation of structures or materials. The development is a Sol-Gel bismuth titanate-based surface-acoustic-wave (SAW) sensor that can generate efficient surface acoustic waves for crack inspection. The produced sensor is very thin (submillimeter), and can generate surface waves up to 540 °C. Finite element analysis of the SAW transducer design was performed to predict the sensor behavior, and experimental studies confirmed the results.

One major uniqueness of the Sol-Gel bismuth titanate SAW sensor is that it is easy to implement to structures of various shapes. With a spray coating process, the sensor can be applied to surfaces of large curvatures. Second, the sensor is very thin (as a coating) and has very minimal effect on airflow or rotating equipment imbalance. Third, it can withstand temperatures up to 530 °C, which is very useful for engine applications where high temperature is an issue.

This work was done by Xiaoliang Zhao of Intelligent Automation, Inc. and Bernhard R. Tittmann of Pennsylvania State University for Glenn Research Center. Further information is contained in a TSP (see page 1).

Inquiries concerning rights for the commercial use of this invention should be addressed to NASA Glenn Research Center, Innovative Partnerships Office, Attn: Steven Fedor, Mail Stop 4–8, 21000 Brookpark Road, Cleveland, Ohio 44135. Refer to LEW-18547-1.