NASA Langley's
Eddy Current Probe for Detection of Cracks in Difficult-to-Reach Places

From within the interior of installed hardware, probe can identify outer surface damage

NASA Langley has developed a new eddy current inspection device that probes for cracks in parts of metal structures that are often inaccessible without extensive disassembly. The probe is specially designed for insertion into the cavity of a part to inspect the surrounding structure in an outward direction. For example, the probe may be held inside a large, thick tube and pointed outward to inspect the outer diameter of the tube. NASA used the probe to test for stress corrosion cracking in the relief radius of Space Shuttle thrusters without having to dismantle the hardware, reducing inspection time while ensuring the health of the structure. NASA Langley is seeking organizations that would like to license the probe to test for cracks in rocket thrusters and other metallic structures with hard-to-reach inspection areas.

Benefits

- Robust and reliable: testing has demonstrated repeated performance
- Operator independent when paired with a stepper motor scanner
- Enables access in small cavity-like spaces

partnership opportunity

Langley Research Center

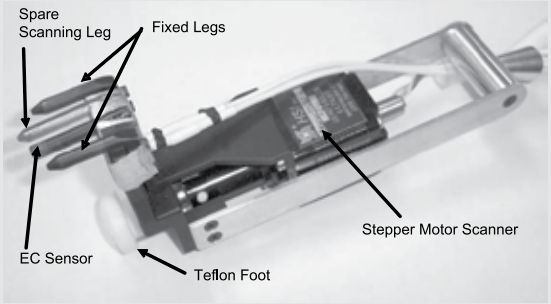

Figure 2: Stepper motor-controlled eddy current Primary Reaction Controlled System (PRCS) thruster scanner

Applications

The technology may be used for inspection of deep relief radius cracks in the following industries:

- Commercial aerospace: inspection of Shuttle-like thruster motors for launching satellites or crew vehicles
- Nuclear power plants: inspection to ensure the integrity of thick tubing structures in power plants

The Technology

Test results have shown that the system is a robust, operator-independent, and reliable inspection method for granular crack detection in the relief radius of thruster components. It is designed to inspect for outer surface damage by accessing the structure from the interior of the thruster cavity and probing in an outward direction. The technique incorporates a dual frequency, orthogonally wound eddy current probe mounted on a stepper motor-controlled scanning system.

Figure 1 displays a photograph of the prototype eddy current sensor and schematic diagram of the technique. Matched eddy current coils are arranged orthogonally to each other and scanned into the acoustic cavity of the thruster. In the conceptual diagram, the inspection coil on the left is arranged with its axis along the circumferential direction. This orientation enables a relatively deep field penetration with the small diameter coil required to fit into the acoustic cavity, and induces current in a direction that will have a strong interaction with cracks originating in the relief radius and growing toward the acoustic cavity. A second coil with its axis parallel with the acoustic cavity provides a local reference for the inspection. The probe has been prototyped and tested and used at NASA. Figure 2 shows a photograph of the eddy current sensor attached to the stepper motor scanner.

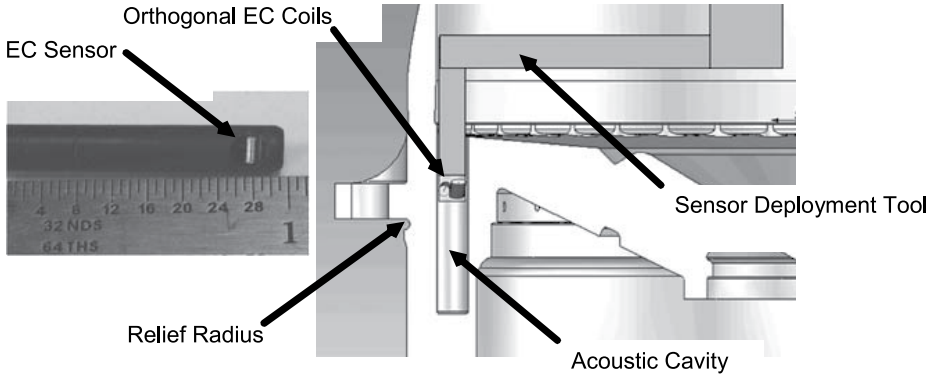

Figure 1: Photograph of prototype eddy current sensor and schematic diagram of eddy current thruster inspection tool

For More Information

If your company is interested in licensing or joint development opportunities associated with this technology, or if you would like additional information on partnering with NASA, please contact:

The Technology Gateway

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