March 1971

Brief 71-10045

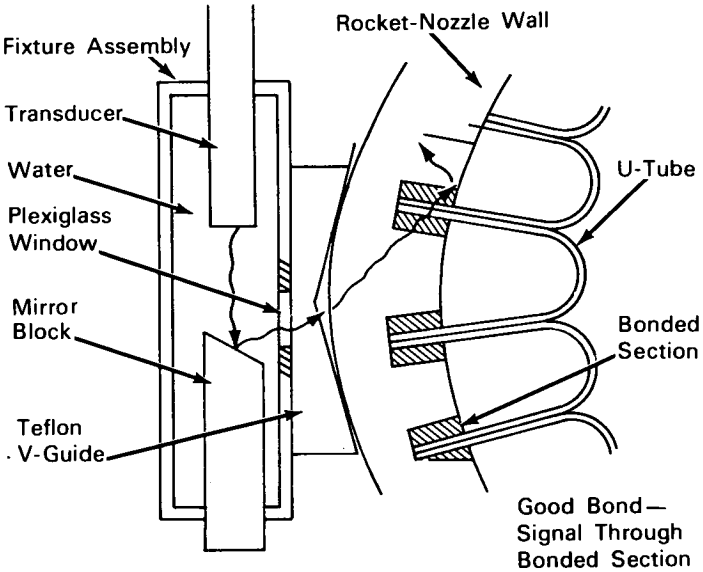
# AEC-NASA TECH BRIEF

*Space Nuclear Systems Office*



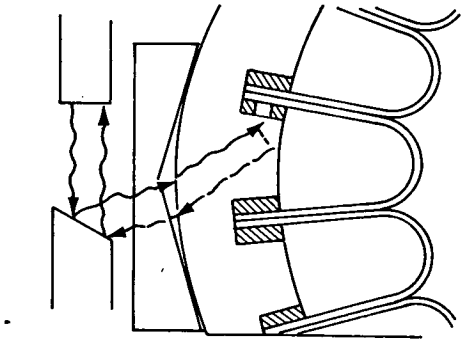
## Ultrasonics Used for High-Precision Nondestructive Inspection of Brazed Joints

Brazed joints can now be inspected nondestructively with a high degree of precision using a new method involving ultrasonics. Earlier ultrasonic equipment was too cumbersome to allow accurate, easy aiming of the sound beam. With the new technique, however, voids of ≥ 0.1016 cm (≥ 0.04 in.) in depth have been detected in braze depths of 0.254 cm (0.10 in.), and detecting voids of smaller dimensions is possible.




An ultrasonic mirror "fixture" is used to aim the beam without having to move the entire beam structure. The fixture consists of an ultrasonic transducer and a polished aluminum mirror block-mounted in a sealed chamber. The mirror can be rotated and moved longitudinally, and the beam can be easily aimed within $0.875 \times 10^{-2}$ rad (0.5 deg) after the fixture is in approximate position.

If the beam is considerably defocused when the mirror position is changed, it can be refocused by adjusting the position of the transducer, a lithium sulfate long-focus transducer operating at 2.25 MHz.




Coupling water is pumped through the fixture. Careful internal design ensures control of the beam's water path length to within 0.635 cm (0.25 in.). This length is critical to the accuracy of the system.

### Notes:

1. For a Hastelloy X rocket nozzle 1.5 m (5 ft) in diameter, 1.8 m (6 ft) long and 1.016 cm (0.40 in.) thick, the method described plotted 250,000 data points in the inspection of 685.8 m (2250 ft) of braze joint. Every unsatisfactory bond was detected.

(continued overleaf)

2. Requests for further information may be directed to:
Technology Utilization Officer
AEC-NASA Space Nuclear Systems Office
U.S. Atomic Energy Commission
Washington, D.C. 20545
Reference: B71-10045

**Patent status:**

No patent action is contemplated by the AEC or NASA.

Source: R. M. Peterson of
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under contract to
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