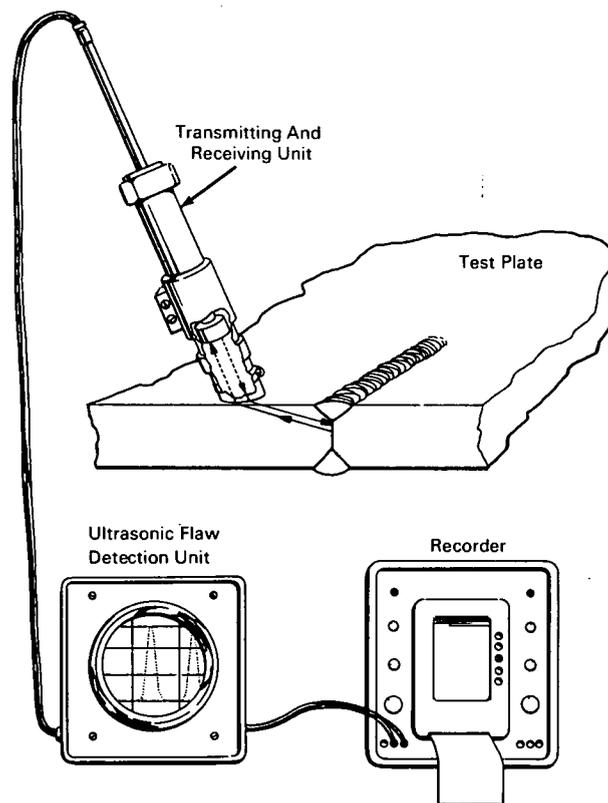


# NASA TECH BRIEF



NASA Tech Briefs are issued to summarize specific innovations derived from the U.S. space program, to encourage their commercial application. Copies are available to the public at 15 cents each from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151.

## Development of Mechanized Ultrasonic Scanning System



A mechanized ultrasonic scanning system has been designed and developed for inspecting the flaw content in the welds of space vehicle booster stages and propellant tanks. The most significant achievement of the project was the development of a water column probe which eliminates the necessity of submerging the weld being tested in water or providing a water flush over the inspection surface. The mechanized ultrasonic scanning system proved itself to be capable of scanning welds at speeds greater than 1 inch per second.

Although radiographic (X-ray) techniques for testing butt welds have been in use for some time, the range of material thicknesses used in the space vehicle components limited the capability of radiography in the detection of lack-of-fusion and lack-of-penetration due to insufficient density changes. Thus a method was desired that would provide a higher degree of reliability in the detection of flaws and would enable improved analysis of butt welds.

(continued overleaf)

The mechanized ultrasonic scanning system consists of four basic functional units.

- (1) The ultrasonic flaw detection instrument
- (2) A recording system
- (3) A transmitting and receiving unit (water column probe)
- (4) The special tooling required to move the transmitting and receiving unit along the part being inspected.

The transmitting and receiving unit consists of an ultrasonic transducer enclosed within a water filled cylinder. The transducer is connected to a coaxial rod that is routed through the upper end of the sealed cylinder and connected to a coaxial cable that is connected to the detection unit. The lower end of the cylinder is covered with a rubber diaphragm that serves as a water seal and contact surface and permits transmission of the ultrasonic beam to the weldment being inspected with a minimum loss of energy.

**Note:**

Complete details of this development are contained in *Development of Mechanized Ultrasonic Scanning System*, by Raymond Evans and J. A. MacDonald, NASA TM X-53598, Marshall Space Flight Center, June 22, 1967. Copies of this report are available from:

Technology Utilization Officer  
Marshall Space Flight Center  
Huntsville, Alabama 35812  
Reference: B68-10004

**Patent status:**

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

Source: Raymond Evans and J. A. MacDonald  
(MFS-13638)