

Ares I and Ares V Launch Vehicles



Robotic Weld Tool (RWT) is a 7-axis robot that can perform conventional friction stir welding (FSW) or self-reacting FSW (SR-FSW) on complex curvature structures. Weld fixtures are used to position and secure fitting, gore, and Y-ring structures on the turntable.



Process Development System (PDS) is used to develop weld parameters at the panel level.



Vertical Trim Tool (VTT) trims welded tank barrel sections to length.



Vertical Weld Tool (VWT) can perform conventional FSW or SR-FSW on tank barrel sections.



Morton Table Tool (MTT) creates friction pull plug welds to close out SR-FSW keyholes, as well as fusion seal welds for the Ares I upper stage common bulkhead.



Thermal Stir Weld (TSW) system is used to fabricate nozzle extensions to improve performance of the J2-X rocket engine.

Space Shuttle Launch Vehicle

External Tank (ET)



PDS



VPPA/GTAW

Variable Polarity Plasma Arc/
Gas Tungsten Arc Weld System



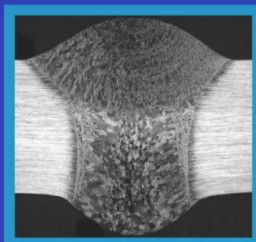
FSW



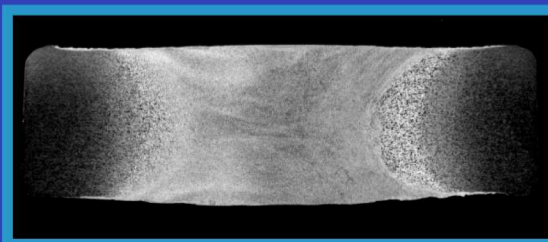
VWT



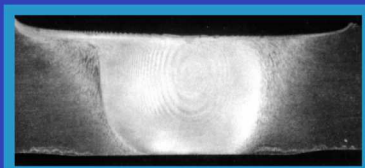
Microstructural Results From Four Weld Processes



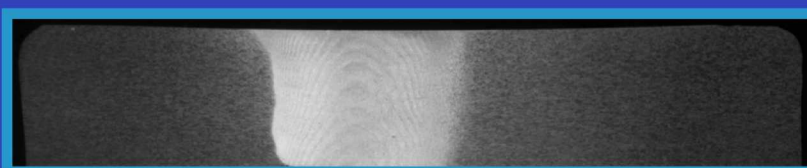
VPPA Weld (Fusion)
on Aluminum (0.320-inch thick)



SR-FSW (Friction—Pinch Force)
on Aluminum (0.320-inch thick)



Conventional FSW (Friction—Push Force)
on Aluminum (0.320-inch thick)



TSW (Friction—Electromagnetic Induction) on Aluminum (0.320-inch thick)

advanced welding applications