Ares I and Ares V Launch Vehicles

Robotic Weld Tool (RWT) is a 7-axis robot that can perform conventional fusion or friction stir welding (FSW) or self-reaction (SR) FSW on complex composite structures. Weld fixtures are used to position and secure filling guns and clamping structures on the workpiece.

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

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

Mortise Table Tool (MTT) creates friction-pull plug welds to close out SR-FSW keyways as well as friction welds for the Ares I upper stage common bulkhead.

Thermal Stir Weld (TSW) system is used to fabricate nitride inserts 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

WWT

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)