Ares I and Ares V Launch Vehicles

Robotic Weld Tool (RWT)
- It 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 gage and thinning structures on the railable.

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

Vertical Trim Tool (VTT)
- Trims welded tab bar end sections to length.

Mortise Table Tool (MTT)
- Creates friction-pull plug welds to close out SR-FSW keyholes, as well as fixture welds, for the Ares I upper stage common bulkheads.

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)

VPPA/GTAW
- Variable Polality Plasma Arc/Stir Weld System

Advanced Welding Applications

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)