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-retracting FSW (SR-FSW) on complex composite structures. Weld fixtures are used to position and secure filling gage and backing structures on the turnaround.

Process Development System (PDS)
It can be used to develop weld parameters or test welds on the turntable.

Vertical Trim Tool (VTT)
It trims weld bead from sections to length.

Vertical Weld Tool (VWT)
It can perform conventional friction stir welding (FSW) or SR-FSW on large sections.

Mortise Table Tool (MTT)
It creates friction stir plug welds to close out SR-FSW keyholes, as well as fusion welds in areas to the Area I upper stage common bulkhead.

Thermal Stir Weld (TSW)
It is used to fabricate rocket exhaust structures to improve performance of the J2-K rocket engine.

Space Shuttle Launch Vehicle

External Tank (ET)

PDS

VPPA/GTAW
Variable Polarity Plasma Arc/Sel-Tungsten Arc Weld System

WWT

Microstructural Results From Four Weld Processes

VPPA Weld (Fusion) on Aluminum (0.326-inch thick)
SR-FSW (Friction—Pinch Force) on Aluminum (0.326-inch thick)

Conventional FSW (Friction—Push Force) on Aluminum (0.326-inch thick)
TSW (Friction—Electromagnetic Induction) on Aluminum (0.320-inch thick)