



## ADVANCED JOINING & PROCESSING LABORATORY



*The Advanced Joining and Processing Laboratory at Wichita State University's National Institute for Aviation Research specializes in friction stir welding research, including friction stir processing and friction stir spot welding. The lab's experienced staff and state-of-the-art equipment provide aviation and non-aviation related manufacturing companies with accurate and reliable results in FSW research.*



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## OVERVIEW

The Advanced Joining and Processing Laboratory provides research driven by friction stir welding (FSW) and friction stir processing, both patented in 1991 by The Welding Institute. This revolutionary solid-state joining technology is increasingly replacing rivets and fusion welding on many aerospace structures, providing an energy-efficient and environmental alternative that eliminates the need for filler metals and shield gases and provides better material utilization.

Over the last decade, FSW has grown exponentially in research, development and application, which means NIAR's FSW research efforts are crucial to staying in the forefront of research and implementation.



## FACILITIES & EQUIPMENT

- 3,930 square feet of lab space
- MTS ISTIR PDS 5-axis motion, 7-axis force monitoring friction stir welding machine, 120-inch x 25-inch x 40 inch work envelope



## CAPABILITIES

- Ability to perform multiple joint configurations such as butt joints in aluminum alloys up to 1" in thickness and lap joints in multiple sheet metal gages
- Prototype development and pilot production of complex curvature structures using FSW
- Material and structural testing and analysis of structures utilizing FSW
- Ability to provide multi-axis FSW research and development tools for technology transfer into the industrial sector
- Ability to join and process high temperature materials such as nickel aluminum bronze, steel and titanium
- Ability to perform self-reacting FSW
- Corrosion testing
- Automatic microhardness testing/mapping
- Metallography testing and analysis
- Friction stir spot welding
- Development of standards and specifications



## BENEFITS OF FSW

- Improved joint strength
- Reduced manufacturing time
- Reduced complexity of manufacturing process
- Reduced parts count and weight
- Expansion of weldable materials
- Environmentally friendly processes

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