lift LIGHTWEIGHT INNOVATIONS

Technology Project Abstract: Processing and Properties Database for Refill Friction Stir Spot Welding of Aerospace Materials

Lead Industry Partner: Boeing

Lead Research Partner: EWI

Technology Pillar: Joining and Assembly

Project Summary

The program will explore friction stir spot welding as a more common application in the aerospace industry. Friction stir spot welds (FSSW) have many of the same solid state benefits of traditional continuous friction stir welding (FSW) but has the greater freedom of being localized and more readily implemented into robotic assembly systems. Additional benefits of FSSW include the ability to more closely maintain the wrought properties of the parent alloy. With the increased cost of specialized fasteners and adhesives, FSSW also helps to bring down the cost to join different components.

Technology Gap / Need

Two technology gaps will be addressed by this project. The first is regarding the Refill Friction Stir Spot Welding (rFSSW) of titanium. While conventional FSW has been performed with titanium using refractory metals, there is currently no literature concerning refill friction stir spot welding. The second point is the availability of process information and its connection to mechanical properties. The development of the database of process parameters and mechanical properties will help drive the final design guidelines and allow this technology to advance beyond this project

Focus/Technology

The objective of this project is to validate and further develop rFSSW using aerospace alloys. Much work to date has been performed in standard aluminum alloys such as AA 2XXX, 5XXX and 6XXX. This project will expand the Manufacturing Readiness Level beyond these basic alloys to include hard metals such as Ti-64 as well as Aluminum-Lithium and 7xxx series aluminum.

Project Benefits

This project will deliver: an initial process and properties database; initial design guidelines based on this process data; demonstration articles of the proposed applications; and expanded capabilities of rFSSW using titanium. Each of these deliverables will bring the technology closer to production in aerospace than the current state of thetechnology

Education & Workforce Impact

Properties data will be included in company specific briefings to designers for integration into next generation components. Finally, the information will be available for dedicated training modules focused on tailoring the workforce for integration of these new technologies.

Project Duration

Start: April 2017
End: October 2018

Funding

Total Project Value: $2.08M

Participants

Industry Partners
Boeing Research and Development
GKN Aerospace
Lockheed Martin
Comau
Bond Technologies
Coldwater Machine

Research Partners
EWI
University of Tennessee-Knoxville
ORNL
University of Michigan