

Technology Project Abstract:

Agile 1 - Agile Fabrication of Sheet Metal Components with Assured Properties

Lead Industry Partner: Boeing

Technology Pillar: Agile Processing

Lead Research Partner: University of Michigan
Northwestern University
The Ohio State University

Project Summary

This project will develop tools that can determine optimal forming routes for the fabrication of sheet metal parts without using matching dies, and meet both property design allowable and dimensional specifications. The project will develop validated chains of existing processes and an associated design methodology that can produce components within estimated costs with precisely controlled geometries and assured properties.

Technology Gap / Need

A business need exists to be able to quickly create dimensionally precise components, in aerospace for repair and low-volume production and for automotive repair, specialty and legacy vehicles. Technologies are emerging, but the major barriers to implementation are that commercial processes do not yet exist - including proven design methods, simulation, and assured design allowables for use in failure-critical or Federal Motor Vehicle Safety Standards (FMVSS) critical applications.

Proposed Technology

Many component technologies in agile sheet metal forming exist in high manufacturing readiness levels, for example, hydroforming is regularly practiced commercially and part of many military production specifications. Single point incremental forming (SPIF) has seen limited commercial application in demonstrations due to lack of geometric accuracy. Double point incremental forming (DPIF) has yet to see wide applications due to the need for special machinery, but there has been extensive work on programming tool paths and demonstrating the ability to form specific components with high accuracy. New aspects to be added here are to design processes for given parts and demonstrate these techniques to assess their readiness for commercial use with particular attention to simulation, assured properties with certification and cost modeling.

Project Benefits

Often times multi-million dollar aerospace assets are grounded in need of just a few parts, but only legacy techniques for making new parts can be used. The project will develop paths to certification for civilian and military use of agile sheet forming for aircraft and vehicle applications, allowing innovation in low-volume and custom production of sheet products.

Education & Workforce Impact

Outreach education, manufacturing competition and training events, a combination of lectures on theory and practice, hands-on manufacturing and experimentation, will be available to graduates and undergraduates, and relevant components will be available for K-12 education through the ASM Materials Camp network and associated projects.

Project Duration

Start: August 2016
End: August 2018

Funding

Total Project Value: \$2.93M

Participants

Industry Partners

Boeing
Lockheed Martin
Comau

Research Partners

University of Michigan
Northwestern University
The Ohio State University
Massachusetts Institute of Technology

