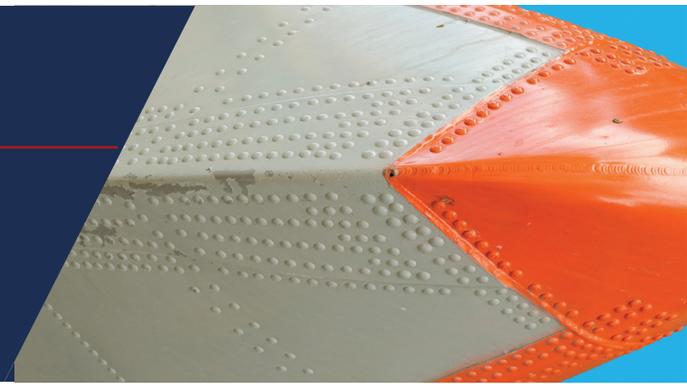# LIFT LIGHTWEIGHT INNOVATIONS

Technology Project Abstract:

Coatings-5: An Integrated Database and Computational Models for Corrosion-Resistant Microstructural Design

Lead Industry Partner: United Technologies Research Center

Lead Research Partner: The Ohio State University

Technology Pillar: Coatings

Project Summary

This project is taking steps to develop an integrated materials property database and computational model to assess localized corrosion susceptibility based on a specification of alloy composition, thermo-mechanical processing, heat treatment and service conditions. This project will develop the ICME framework and initial test cases to assess corrosion performance of high strength, aluminum alloy components and identify the tools needed for further development and assessment of alloy modifications. Efforts are focused on examples from the 2XXX (Al-Cu-Mg) series, including lithium-containing alloys, and the 7075 (Al-Zn-Mg-Cu) legacy alloy, where considerable background data exists, and where microstructural heterogeneity dominates the localized corrosion response.

Technology Gap / Need

The aerospace industry selects materials and manufacturing processes primarily on ensuring acceptable mechanical properties. Corrosion performance of microstructurally complex metallic materials may not be fully realized until the component is placed into service. Anticipating and managing corrosion susceptibility using computational models will save time and costs.

Focus/Proposed Technology

A combined approach will be used that includes microstructural and macroscopic modeling, characterizing how deformation during production affects corrosion, and rapid evaluation of corrosion samples. These techniques will identify ways to incorporate corrosion predictions into component designs. In addition, models for a mechanical property prediction will also be evaluated.

Project Benefits

When fully deployed, corrosion design and mechanical property design models can be used side-by-side to afford manufacturers the confidence to make alloy specifications during the design phase with a reduced risk of over-specification that might be made as a corrosion allowance, or of under-specification that might arise from unanticipated processing-induced susceptibility.

Workforce and Educational Impact

Two universities (OSU and UM) will be involved in this project to give STEM undergraduate and graduate students exposure to real world technology development. The industrial partners involved in the project are committed to mentoring these students and hiring a subset of them to work as summer interns and coops at their facilities.

Project Duration

Start: February 2016
End: January 2018

Funding

Total Project Value: $3.15M

Participants

Industry Partners
United Technologies Research Center

Lockheed Martin

DNV GL

Research Partners
The Ohio State University

University of Michigan