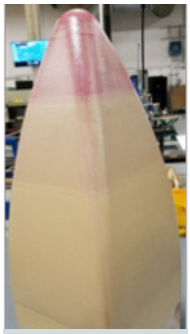
PROJECT SUMMARY 3008

Maturation of Advanced Manufacturing for Low Cost Sustainment – Fairings Family of Parts

ULTEM Substructure and Support Tooling

Lamination Process



Fiberglass Reinforced ULTEM Fairing (not trimmed)

Complete Hybrid Fairing

The hybrid nose cone fairing is designed to utilize a flyaway additively manufactured substructure to support the fiberglass skins during the fabrication process and stiffen the flyaway part. These images show various stages of the fabrication process.

PROBLEM

For flight test and/or singular repairs, additive manufacturing (AM) has proven invaluable for fast and relatively inexpensive substitutions versus traditional manufacturing. This project addresses the reduction of lead times and cost savings offered by AM in a broader application space by reducing the nonrecurring expenses of point design and developing a capability for part families.

OBJECTIVE

This project plans to transition point design production of AM aircraft fairings into a family of parts solution. The focus is on the hybrid AM approach of composite sandwich panels that could lead to production of aircraft semi-structural fairings without the need for tooling. In this approach, the underlying fused deposition modeling (FDM) structure and printed Ultem 9085 core act as the tool for layup of the composite skins, reducing the tooling costs, minimizing the touch labor from layup and cure, and ultimately reducing the manufacturing span time and the overall cost of semi-structural fairings. This approach is a game changer for the aerospace industry and has the potential to significantly reduce costs for Air Force flight platforms.

AMERICA MAKES TECHNOLOGY DEVELOPMENT ROADMAP

This project aligns to:

VALUE CHAIN

ASTM PROCESS CATEGORY: Material Extrusion

EQUIPMENT: Fortus 900mc

MATERIAL: Ultem 9085

TECHNICAL APPROACH

The focus of this project is on B-52 pylon fairings as demonstration articles. The design and development of the hybrid approach includes choosing fairings and related parts where sustainment issues exist; identifying flight requirements for these parts; modeling to demonstrate adequate design details for the hybrid composite panels to withstand the flight requirements; fabricating test coupons; performing mechanical and environmental testing to verify part property and performance requirements; and applying AM capabilities to produce and test flight worthy composite fairings. The lessons learned from the B-52 pylon fairing family of parts are then to be transitioned to a larger part family set of composite sandwich panel aircraft fairings.

PROJECT START DATE

June 2017

EXPECTED END DATE

June 2019

EXPECTED DELIVERABLES

- An overall demonstration plan to include the design-build-test matrix and the metrology plan.
- A hybrid AM standard work procedure that ensures consistent repeatable part production.
- List of expected and unexpected barriers and challenges associated with the B-52 ALCM pylon fairing family of parts.
- Technical data: in situ monitoring data, materials characterization data, modeling & simulation results, etc.
- Recommendations and Implementation plans.
- Final report including demonstration results.

FUNDING

$1.6M total project budget
($1.4M public funding/$250K private funding)

PROJECT PARTICIPANTS

Project Principal:
The Boeing Company

Project Participants:
Youngstown Business Incubator

Public Participant:
U.S. Department of Defense

3008 Maturation of Advanced Manufacturing for Low Cost Sustainment – Fairings Family of Parts (MAMLS Ph2)

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