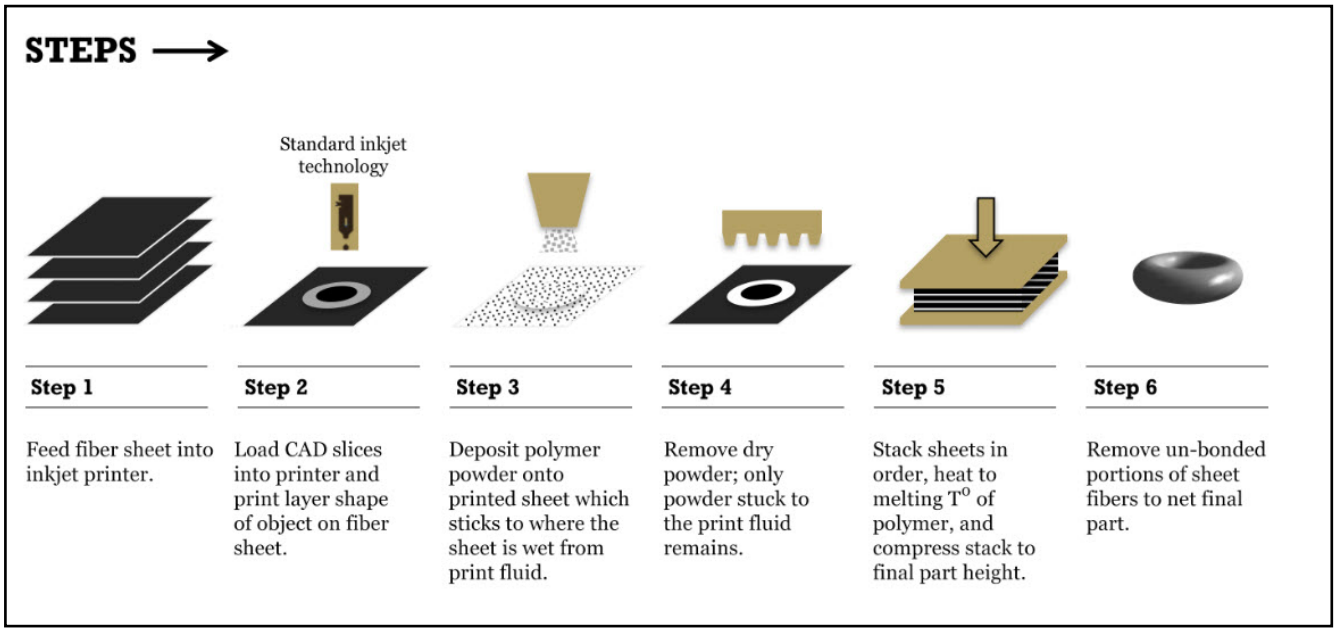
PROJECT SUMMARY 3015

MAMLS Demonstration of 3D Composite-Based Additive Manufacturing (CBAM) Build Process for Low Criticality Part Families



Steps within the 3D CBAM build process.

PROBLEM

As legacy systems age it becomes more difficult to source replacement components for maintenance. Part availability issues stem from a number of root causes including obsolescence, diminishing manufacturing sources, material shortages, and unexpected failures on parts not originally planned to need to be replaced. These are all significant and expensive drivers for maintenance down time in legacy systems.

OBJECTIVE

Composite-based additive manufacturing (CBAM) technology provides an avenue for overcoming the difficulties associated with maintaining legacy systems by providing on demand composite parts fabrication to reduce costs and lead times. The objective of this project is to demonstrate the use of CBAM technology in the manufacture of low criticality parts for USAF systems. An additional intent is to identify a transition path for the part to enter the USAF supply chain.

AMERICA MAKES TECHNOLOGY DEVELOPMENT ROADMAP

This project aligns to:

PROCESS

ASTM PROCESS CATEGORY: Sheet Lamination, Binder Jetting

EQUIPMENT: Custom Pilot One Machine

MATERIAL: Carbon Fiber plus Nylon 12, Carbon Fiber plus PEEK

TECHNICAL APPROACH

Utah Advanced Materials & Manufacturing Initiative (UAMMI) plans to lease an Impossible Object's composites-based 3D printer and locate it close to Hill AFB. Quality checks are to be performed following installation and throughout the project via coupon tests. Selection by UAMMI and USAF personnel is to include a minimum of six parts to demonstrate the CBAM technology. The parts fall into three categories: electrical components, subsystem components, and nonstructural secondary components. Two selected parts from each category are to be sourced from noncritical, nonstructural components used in Air Force weapon systems that fit within the current CBAM build volume of 11 x 7 x 4 inches.

Parts created using CBAM must demonstrate that they meet the dimensional and mechanical requirements for the given application. Tensile and short beam shear test coupons are to be included with each part build. The Utah Composites Laboratory, University of Utah intends to perform mechanical testing of the coupons and dimensional testing of parts is to be performed at Hill AFB, First Article Laboratory.

UAMMI and USAF cognizant engineers and appropriate DoD/potential vendors plan to work together to transition the technology. A trade study and materials and parts substitution guidelines are to be generated to compare costs of using CBAM technology against other fabrication methods.

PROJECT START DATE

June 2018

EXPECTED END DATE

June 2020

EXPECTED DELIVERABLES

- Operational CBAM unit
- CBAM built subsystems components
- CBAM electrical components
- CBAM built nonstructural and secondary components
- Assessment of CBAM parts
- Trade study analysis report
- Material and part substitution guidelines report
- Technical data package

FUNDING

$928K total project budget
($600K public funding/$328K private funding)

PROJECT PARTICIPANTS

Project Principal:
Utah Advanced Materials and Manufacturing Initiative

Other Project Participants:
Impossible Objects
Lockheed Martin
Altair
TE Connectivity

Public Participants:
U.S. Department of Defense
National Science Foundation
U.S. Department of Energy

NCDMM Headquarters
486 Cornell Road
Blairsville, PA 15717
Phone: (724) 539-8811

Letterkenny Offices
4755 Innovation Way
Chambersburg, PA 17201
Phone: (717) 553-0068

America Makes Offices
236 West Boardman Street
Youngstown, OH 44503
Phone: (330) 622-4299

ncdmm.org

AmericaMakes.us