

MAMLS Phase 3 – Phase 1 Rapid Transition

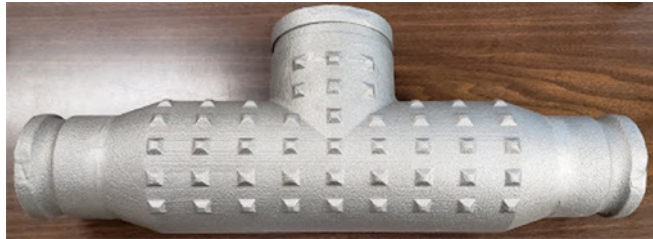
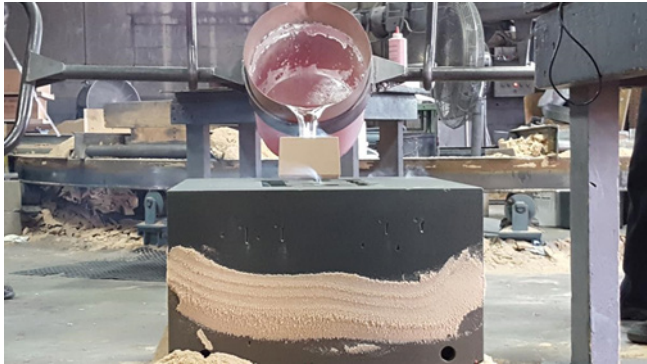


Image of T-step pipe cast in aluminum using 3D sand printed mold and core.

PROBLEM

The Air Force is tasked with sustaining legacy aircraft with an average life of 27 years to operate on their designed missions. In this time period, many of the component suppliers for these aircraft have gone out of business, parts are out of production, or they cannot produce low quantities at an affordable cost with reasonable lead times. MAMLS Phase 3 - Phase 1 Rapid Transition is successfully developing advanced manufacturing solutions to sustainment needs by focusing on metal cast and noncritical interior parts for USAF and DoD customers, identifying and working with supply chain partners, and transitioning these solutions so that the reserve units and Air Logistic Complexes can continue to maintain their legacy aircraft.

OBJECTIVE

The objective of this program is to enhance and improve Air Force sustainment operations through the development, demonstration, and transition of additive manufacturing and related advanced manufacturing technologies. The program is aimed at improving efficiency of the factory and/or Air Logistics Complex for rapid part replacement for legacy and other aircraft, focusing on metal castings and noncritical interior aircraft parts.



**AMERICA MAKES
TECHNOLOGY
DEVELOPMENT
ROADMAP**

This project aligns to:



VALUE CHAIN

**ASTM
PROCESS CATEGORY:**
VAT Photopolymerization,
Material Jetting, Binder
Jetting, Material Extrusion

EQUIPMENT:
ExOne S-Max Sand Printer,
Fortus 900-mc, ProJet
2500, Voxeljet,
Formlabs Form2

MATERIAL:
Sand, Wax, Polymethyl
methacrylate (acrylic,
PMMA), Polylactic acid
(PLA)

TECHNICAL APPROACH

Youngstown State University is focusing on two main tasks based on the Phase 1 program to continue to transition sustainment solutions to ALC and operational unit levels:

- Additive manufactured metal casting tooling
- Enabling AM for nonstructural interior parts and operational level maintenance

Further improvements in 3D printing sand casting molds and cores are being investigated in the castings project to strengthen the tools, reduce the surface roughness in the poured part, develop improved shell fabrication options for investment casting, compare the parts created using investment casting and sand casting processes, and increase the efficiency of this process.

The nonstructural interior parts project proposed work for Phase 3 builds upon the findings of Phase 1 that included a variety of barriers to successful AM adoption that lie within the related personnel skills, organizational structures, and established cultures. The Phase 3 tasks focus on identifying nonstructural interior parts and addressing all requirements for airworthiness including transition of this process to achieve operational utility at a variety of regional bases. YSU is also creating workshops and training to transition these techniques to the Air Force Air Logistics Complexes and operational units.

Best practices are being captured and a recommended transition plan is being disseminated to the Air Force, America Makes members, and at DoD-relevant manufacturing conferences and workshops across the country.

PROJECT START DATE

June 2017

EXPECTED END DATE

June 2019

EXPECTED DELIVERABLES

- Transition plan supporting the OC-ALC microfoundry
- Transition plan supporting 910th Airlift Wing
- Data management plan
- Operational level workshop
- Best practices for 3D sand printing
- Best practices for Additive Manufacturing Investment Casting Expendable Patterns (AMICEP)
- Best practices for operational-level employment of 3D printing
- Final report

FUNDING

\$1.5M total project budget

(\$1.2M public funding/\$300K private funding)

PROJECT PARTICIPANTS

Project Principal:

Youngstown State University

Project Participants:

University of Northern Iowa
Youngstown Business Incubator
Humtown Products
BasTech
Lockheed Martin
Boeing

Public Participants:

U.S. Department of Defense

3010 MAMLS Phase 3 – Phase 1 Rapid Transition

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