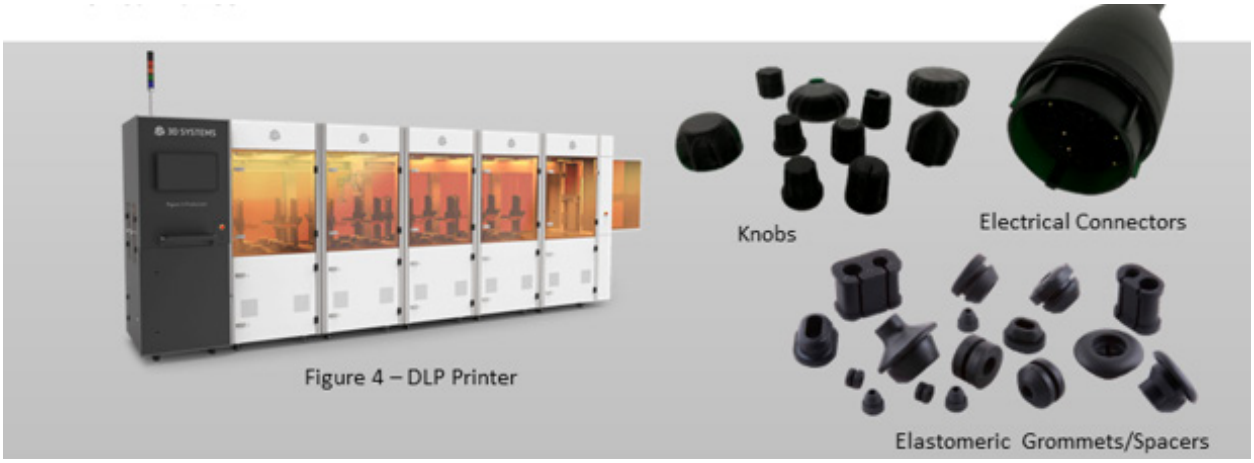
PROJECT SUMMARY 3017

MAMLS Rapid Part Replacement via Digital Light Processing



DLP using 3D Systems' Figure 4™ platform for rapid part replacement of low criticality part families such as knobs, electrical connectors, wire grommets, and spacers.

PROBLEM

One of the biggest challenges for the sustainment community is the need for parts that are not readily available due to unforeseen replacement demand, lack of suppliers, cost, and lead times of required tooling. The return on investment (ROI) to replace simple low-criticality plastic parts like knobs, connectors, and spacers typically does not warrant the investment in traditional manufacturing methods. Efforts to relieve some of this pressure via fused deposition modeling (FDM) technology have been initiated on a Phase I Maturation of Advanced Manufacturing for Low-Cost Sustainment (MAMLS) program and at the Air Logistic Centers (ALCs), but the lack of speed, resolution, density, and process controls have limited the parts that are able to be addressed by FDM alone, resulting in lower productivity at the ALCs.

OBJECTIVE

The objective of this project is to evaluate and advance the ability of emerging DLP technology to supply low criticality components that fulfill sustainment part functions for rapid, custom, and robust parts to reduce stock level requirements and product lead times. The technology is expected to supplement existing AM technologies at the ALCs where higher resolution, smoother surfaces, elastomers, or increased volumes are needed. The goal is to quickly scan and print these parts in real-time (hours not days) for just-in-time inventory control of small polymer parts critical to ALC efficiency.

AMERICA MAKES TECHNOLOGY DEVELOPMENT ROADMAP

This project aligns to: PROCESS

ASTM PROCESS CATEGORY: VAT Photopolymerization

EQUIPMENT: Figure 4 (3D Systems)

MATERIAL: Photopolymer

TECHNICAL APPROACH

3D Systems recently introduced their Figure 4™ platform, a modular, scalable, fully-integrated direct 3D production platform which incorporates high speed digital molding. To address the need for low criticality part replacement, the project team plans to demonstrate the utility and benefits of Figure 4™ (DLP) technology; identify and overcome technological and material science challenges associated with DLP through part family-specific testing, characterization, and post processing; demonstrate rapid part replacement for low-criticality parts of immediate need to ALCs; and establish a clear technology development, vetting, and transition pathway for emerging AM technologies like the Figure 4™ model.

PROJECT START / END DATE

May 2018 - May 2020

EXPECTED DELIVERABLES

- DLP landscape review article
- ROI and readiness impact summary for up to 3 part families
- 6X representative prototype parts (form only) from each part family for the Air Force
- Summary sheets highlighting all known dimensions, materials, and part requirements for all ALC driven candidate electrical connectors
- Specific parts of interest within the defined part families identified and locked-in
- 3X base resins that address primary part requirement with corresponding data and safety sheets
- Print parameters for each deliverable resin
- Printed test specimens in accordance with test plan
- Final parts for each family printed at 2 locations
- Print guide for each part family and resin combination
- Test matrix
- Data and summary reports from all performed tests
- Part specific performance testing data
- Downselection of appropriate post processing treatment for each resin
- Data and summary reports from all performed resin tests
- Technology transition requirements for innovation centers and ALCs
- Transition pathway consensus review
- Final report

PROJECT PARTICIPANTS

Project Principal:
University of Dayton
Research Institute

Public Participants:

U.S. Department of Defense
National Science Foundation
U.S. Department of Energy

Other Project Participants:
3D Systems Corporation
Northrop Grumman
APTIV
Lockheed Martin

FUNDING

$920K total project budget
($600K public funding/$320K private funding)

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