

Department of the Navy SBIR/STTR Transition Program

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Topic # N16A-T015

Reduced Cost, Repeatable, Improved Property Washout Tooling for Composite Fabrication

Nevada Composites, Inc.

WHO

SYSCOM: ONR

Sponsoring Program: Commander Fleet Readiness Centers (COMFRC)

Transition Target: Potential Application to V-22

TPOC:

Mr. Bill Nickerson Jr
william.nickerson@navy.mil

Other transition opportunities: Aircraft and Naval platforms (ships, submarines) which could benefit from reduced part count and complex composite components.

Notes: The MV-22 Osprey assigned to Marine Medium Tilt-rotor Squadron 161 (VMM-161) is pictured at the Fleet Readiness Center Southwest paint complex Nov. 19, 2016, during the aircraft's painting process. The aircraft requires hand/scuff sanding of its entire surface, which results in a "leopard" pattern appearance. U.S. Navy Photo



Depot Level Repair - <http://www.navair.navy.mil/index.cfm?fuseaction=home.NAVAIRNewsStory&id=6440>

WHAT

Operational Need and Improvement: Develop a manufacturing process capable of producing a washout tool that can be used in the OEM manufacturing of composite structures as well as at COMFRC facilities for repair and replacement of composite parts such as ducts, hatches, stringers and stiffeners, etc. Washout tooling is required when the composite part manufacture results in the tool being trapped when the process is complete. Solutions to this problem include metal puzzle tooling which has limited life, is expensive and time consuming to manufacture or washout tooling which is a single use tool that may or may not be capable of processing the composite cure temperatures required. Nevada Composites has developed a washout tooling technology that uses 3D digital manufacturing to rapidly produce a mold for the washout tool. Our material is capable of processing temperatures in excess of 550F and pressures of 100 psi assuring its compatibility with today's high-performance composites and with the very high temperature composite resins envisioned for the future.

Specifications Required: The washout tooling must be capable of:

Meeting tight tolerances (+/- 0.005 ");

Low costs;

Minimal processing times, and

Remain functional after processing at temperatures in excess of 350F and 100 psi.

Technology Developed: Nevada Composites has developed a technology for rapidly creating washout mandrels that can be used for the manufacture of composite parts at temperatures up to and exceeding 550F and pressures of 100 psi and greater. Because of the very small coefficient of thermal expansion (CTE) that nearly matches that of carbon fiber tolerances of +/-0.005 can be met. By the introduction of novel approaches to heating and hardening our washout tooling material we have been able to reduce the thermal hardening step from 6-8 hours to 8-10 minutes while retaining other features of the technology.

Warfighter Value: This technology is going to empower the artisans in the Fleet Readiness Center to return their fixed wing or rotary wing platform to combat ready status in a greatly reduced time. Because the tooling material is serviceable over such a large temperature range it can be used to manufacture or repair almost all composite materials presently in use or contemplated in the near future. It is environmentally green with no added burden to storage or disposal.

WHEN

Contract Number: N68335-18-C-0085 **Ending on:** November 15, 2019

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Mold design rules established for a) molds created by CNC machining (subtractive manufacturing and b) molds created by 3D printing (additive manufacturing).	Low	Following established design rules, molds are rapidly created that meet requirements for tolerance, cost and serviceability.	7	4th QTR FY18
Improved microwave hardening of washout material	Med	Ability to specify power level and hardening time for washout tooling as a function of size and shape 3D printing of structural cohesive water soluble material	6	2nd QTR FY19
Direct 3D printing of washout ceramic tooling material	High	Green washout material can be deposited precisely in a size meeting tolerance requirements. In addition materials can be hardened and adhere in layer to layer application.	5	1st QTR FY20

HOW

Projected Business Model: Nevada Composites intends to license our technology for use by repair facilities and OEM manufacturers. We will supply our customers with specifically designed equipment for the manufacture of washout tooling and with the proprietary materials required.

Company Objectives: To qualify our technology as the tool-of-record in multiple government and commercial repair installations as well as for composite manufacturing.

Potential Commercial Applications: Potential commercial applications include providing tooling for low rate manufacturing of composite parts for general and commercial aviation including parts for legacy aircraft systems. This also applies to custom manufacturing of parts for other transportation platforms such as trucks, automobiles and motorcycles.

Contact: Linda L. Clements, Ph.D., Chief Executive Officer
lclements@nevadacomposites.com (775) 246-0505