Composites Manufacturing Technology Center

Developing Improved Manufacturing Processes for Composites

Composites Technologies on Naval Platforms

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Development, Technology Transfer and Transition

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Virtual Center Approach Keeps Costs Low

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Resolving Manufacturing and Repair Issues

UPCOMING EVENTS:

The Composites Consortium (TCC) Fall 2016 Technical Meeting
The Museum of Flight
9404 East Marginal Way South
Seattle WA 98108
September 20-21, 2016

CAMX 2016
Anaheim Convention Center
800 W Katella Avenue
Anaheim CA 92802
September 26-29, 2016
CMTC Booth: N56

DMC 2016
Hyatt Regency Denver
Denver Convention Center
650 15th Street
Denver, CO 29403
November 28 - December 1, 2016
CMTC Booth 135

PHOTO CREDITS:

Cover

Figure 1 - Handheld FMT Prototype
Photo courtesy of Creare

Other graphics on Cover:

Office of Naval Research logo
Courtesy ONR

Navy ManTech Logo
Courtesy of Navy ManTech

ATI logo
Courtesy Advanced Technology International

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Figure 2 - Rear Admiral Mathias W. Winter and Marty Ryan, ATI Vice President, discuss CMTC's Enabling Technology efforts..."Transitioning Advanced Manufacturing Technology for an Affordable Fleet"

Photo courtesy of Composites Manufacturing Technology Center (CMTC)

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Figure 3 - Enabling Technologies Submarine Composites
Photos courtesy of Material Sciences Corporation

TechNotes

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Composites Manufacturing Technology Center

F-35 High Fidelity Fastener Feature Measurment

Problem/Objective:
High fasteners are a critical issue on the F-35, especially if not caught until the latter stages of the manufacturing process. F-35 fastener feature measurements must be taken for countersink depth, installed fastener flushness, and final fastener flushness after fill material has been applied. Current methods for inspecting fastener features at various states of manufacture are dependent on handheld gauges which have proven unreliable and non-repeatable. Single line laser scanners have also been evaluated by our partners at Lockheed but rejected because these systems cannot detect fastener tilt that is perpendicular to the measurement direction nor can they characterize the curvature of aircraft panels. The F-35 team at Lockheed Martin and Northrop Grumman desires a portable inspection device which can measure these features precisely, quickly, and affordably.

The goal of this program, and a complementary SBIR-funded effort, is development and validation of a non-contact laser scanner for measurement of the flushness of unfilled fastener heads on the production floor. The results of the program should provide aerospace prime contractors with sufficient information to determine if they would like to purchase systems for use during produc-tion. The system will be designed to measure the position of unfilled fastener heads with respect to the profile of the outer skin of the aircraft. The target accuracy for the system is ±0.001" (one standard deviation).

The Creare Fastener Measurement Tool (FMT) is intended to provide three important advantages over existing inspection methods: (1) greatly improved accuracy, (2) significantly reduced dependence on operator skill (measurement accuracy will no longer depend on the position and orientation of the measurement device), and (3) reductions in both inspection time and cost (an initial evaluation by Lockheed Martin shows that the technology can reduce lifecycle program costs by more than $13M for unfilled fasteners alone).

Accomplishments/Payoff:
The FMT has been shown to be a precise and accurate handheld device, while also being fast and easy to use. Multiple rounds of testing have consistency produced results showing an expected FMT precision-to-tolerance on the order of 12% (when calculated according to current F-35 unfilled-fastener-depth manufacturing tolerances). This is a very strong level of performance both with respect to our specific device requirements and general metrology standards in manufacturing. Furthermore, both FMT accuracy and measurement time have been shown to be improvements on current fastener measurement methods, suggesting a significant cost saving when the FMT is incorporated into F-35 production.

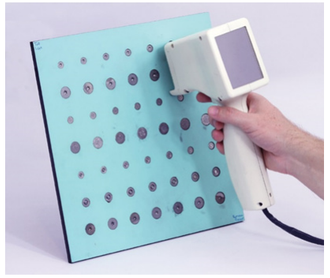

Figure 1: Handheld FMT Prototype

Lockheed Martin has performed an affordability analysis to determine if the purchase of production units of the FMT is justified. Per Lockheed Martin's assessment, the application of this technology on unfilled fasteners alone would save over $10,000 per aircraft. Further savings could be realized with this device as the capabilities are augmented for filled fastener flushness measurement.

Implementation
The necessary steps have been taken to ensure that a low-cost method of surface feature measurement has been demonstrated that meets the requirements of the program and is safe for operator use. A fully functional measurement hand tool has been built and proven on production-equivalent aircraft parts. No qualification testing is anticipated to be required at this time. In addition, the cost benefits of adopting the technology on the production floor will be quantified via (1) a refined estimate of inspection time and cost savings per aircraft, (2) pricing analysis for the FMT, and (3) evaluation of additional benefits provided by the technology. Implementation is expected late FY16.

Timeline/Milstone:
Start Date: September 2013
End Date: March 2016

Funding:
Navy ManTech Investment: $500K

Participants:
ONR Navy ManTech, SCRA/Composites Manufacturing Technology Center, and Creare

Join Us At:

CAMX 2016 in Anaheim, CA on September 26th through 29th in Booth N56. We look forward to seeing you there!

SPONSORED BY:

DEPARTMENT OF THE NAVY ONR Science & Technology

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Shiptech 2016

Figure 2: Read Admiral Mathias W. Winter and Marty Ryan, ATI Vice President, discuss CMTC's Enabling Technology efforts..."Transitioning Advanced Manufacturing Technology for an Affordable Fleet"

The Composites Manufacturing Technology Center (CMTC) participated in Shiptech 2016 in Charleston, SC on March 1-2, 2016. Shiptech is a two-day event that provides a forum environment for the domestic shipbuilding industry, its supplier base, the U.S. Navy Program Offices, and the U.S. Navy-sponsored shipbuilding research programs. The conference highlighted technical sessions that provided information in relation to eight key areas: Ship Design, Welding, Shipbuilding Processes & Technologies, Systems Technologies/Training, Materials Technologies/ Additive Manufacturing, Innovative Manufacturing Technologies, Electrical/ Electronics Technologies, and Maintenance and Sustainment.

This CMTC highlighted technology from the current project Enabling Technologies for Integrated Manufacturing of Submarine Components is a featured technology on Page 3.

CMTC Project Portfolio

Active Projects	Project Number
Low Cost Hybrid Fairings	S2601
Composite Hybrid Rotating Coupling Covers	S2532
Light Weight Low Cost SeaRam 11-Round Guide Phase 1 & 2	S2455
Enabling Technologies for Integrated Manufacturing of Submarine Components	Q2596
Composite Manufacturing Technology for Fire Safe Resins	Q2533
Automated Material Mixing for F-35	A2587-A
Smart Processing Manufacturing Technology	A2583
F-35 Automated and Rapid Boot Installation	A2513
Automated Manufacturing of Hull Tiles Phase 1	S2655-1
Back-fit Composite Flood Grates	M2676

Near Term Proposed New Start Projects	Project Number
AFP/ATL Hybrid Structures	Q2688
Carbon Fiber Substitute for Composite Rocket Motor Cases	Z2685
LBulkhead T-Flange Crease Elimination (Mega Rapid Response)	M2684
3-D Composites for Out of Plane Strength	Q2680
Fire Safe Resins Phase 2	S2679
F-35 Automated Optical Distortion Measurement and Correction	A2678
Plug and Play Composites	S2677
Gear Box High Temperature Fairing	A2670
Main Rotor Hub Fairing	A2669
Plasma Surface Preparation for Composite Nutplate Installation	A2657
CH-53K Canopy Frames	A2654
Automated Conformable Tooling For Mold-In-Place Coatings	A2574
JSF Infomatics	A2568

Questions of the Quarter

Our new section, ***"Questions of the Quarter"*** is dedicated to what YOU want to learn more about the CMTC, advanced materials, new technologies, etc. It is also a space for CMTC to learn about what YOU would like to see featured within our ***CMTC TechNotes Newsletter***.

We will use your questions and suggestions in order to ensure we are providing you with the most current, relevant information within the industry. Each quarter CMTC will highlight questions that are asked and provide insight to all ***TechNotes*** readers.

Q: Who do I contact if I have a question about CMTC or a request for future ***TechNotes***?

A: Please send your questions, suggestions, and requests to:

Leslie Hill
Sr. Program Administrator, CMTC
Office: 864-646-4505
Mobile: 864-704-2479
Email: Leslie.Hill@ati.org

Q: How are featured ***"Questions of the Quarter"*** selected?

A: CMTC will select several questions for each ***TechNotes*** publication to feature based on how frequently the question is asked, the benefit to ***TechNotes*** readers, and its relevance to the Composites Manufacturing Technology Center.

Q: I sent in a question, but it is not a featured ***"Question of the Quarter,"*** how can I learn the answer?

A: Regardless of whether your question is featured, CMTC will respond to all requests via phone call or e-mail.

Q: I have a question, but do not want it featured in ***TechNotes***?

A: We will not feature your question. Please let us know that you would prefer to keep your question, request, or suggestion private and you will not see it in any TechNotes publication.

The only exception to this is if it is a frequently asked question that many other readers have sent in and are also curious about.

2016 Sea-Air-Space: The Navy League's Global Maritime Exposition

CMTC participated in the Sea-Air-Space Exposition 2016 in National Harbor, MD on May 16-18, 2016. This annual exposition brings together key stakeholders from each branch of the military, industry, and community in order to collaborate, network, educate, and learn about United State maritime efforts. The event displayed over 200 exhibits that showcased current information and technology relevant to maritime, defense, and energy. In addition to exhibits, educational seminars were held to educate and learn about key technologies, efforts, and issues surrounding Sea Services. The next Sea-Air-Space Exposition will be held on April 3-5, 2017 in National Harbor, MD. For additional information about the Conference, please visit: www.seaairspace.org/page.cfm/Link=1/t=m/goSection=1Newsport.

ATI and SCRA's Organizational Separation

Effective July 1, 2016, SCRA Applied R&D will return to operating under the name ATI (Advanced Technology International). This name change marks a return to the name used by the company until 2010 and formalizes a shift in the South Carolina Research Authority's (SCRA) overall corporate strategy that clearly differentiates ATI's business operations from the economic development mission of SCRA, its corporate parent. ATI's staff and corporate structure will not change and its mission, as a 501c(3) not-for-profit, will be to support SCRA and SC, while lessening the burdens of Government as a market leader in managing collaborative research and development programs for federal government, industry and academic clients. The new name is part of a larger re-branding initiative to align the company's name with its current business and future strategy.

The transition allows ATI to focus on its mission to build and lead technology development collaborations. As part of the process, both SCRA and ATI have launched new websites (www.scra.org and www.ati.org), allowing the organizations to maintain separate identities for their respective constituencies.

ATI also has a new logo to differentiate it as an affiliate. The new ATI logo is a combination of elements, some familiar and some new, designed to simultaneously convey who we are, what we do, and why.

Enabling Technologies for Integrated Manufacturing of Submarine Components

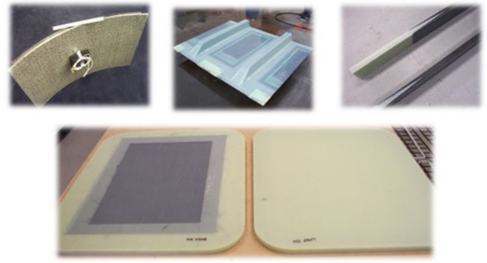

Figure 3: Enabling Technologies Submarine Composites

Problem/Objective:
Like other programs in the Department of Defense (DOD), the VIRGINIA Class submarine (VCS) program and the OHIO Replacement Class submarine (OR) program face substantial financial challenges due to the current fiscal environment. OR is additionally challenged because of considerable procurement cost for the lead ship and target costs for ships 2-12 of the class. Reaching the target procurement costs for the OR platform are only attainable through cost-effective designs that save money over the entire life of the submarine and manufacturing approaches that reduce acquisition costs. The objective of this project is to develop and validate repeatable manufacturing approaches, and their associated cost and weight impacts, for submarine applications. This project uses a systems-engineering approach to determine groups of components with similar requirements that can then be mapped to enabling technologies and/ or combination of technologies. Enabling technology and manufacturing approaches to be considered under this effort include: out-of-autoclave (OOA) processing to enable efficient use of carbon fiber; multi-material (glass/carbon hybrid) solutions for cost/weight reduction; integrated manufacturing of structural-acoustic windows; integrated manufacturing of laminates with structural damping treatments; and integrated manufacturing of laminates with polymer coatings. This project is one of Navy ManTech's Manufacturing Science and Technology projects, which typically do not meet all of ManTech's normal project criteria, as they are higher risk projects with longer transition timelines.

Accomplishments/Payoff:
Significant cost and weight can be removed from both platforms by replacing conventional metallic and/or traditional GRP components with state-of-the-art composite structure. While innovative composite materials and the integrated manufacturing opportunities that they afford offer cost/weight reduction opportunity, a platform-wide analysis of the systems/components that can benefit from these technologies is required in order to define the technology/ combination of technologies that result in the largest payoff. Understanding the technical and cost relationships between innovative composites and the spectrum of components that they can improve provides alternative design and manufacturing approaches for groups/families of components currently manufactured using GRP or steel on a broader level, thereby affording a comprehensive impact to cost/weight reduction initiatives compared to historical single component analysis. The deliverables developed as a result of this effort will also provide a valuable data attribute to be used by both the government and General Dynamics Electric Boat (GDEB) for performing design trades and component pricing estimates.

Implementation:
The techniques and processes developed in this project will be leveraged to all composites currently on the submarine and to future efforts. This project will demonstrate a production ready composite article that could transition at the end of this Manufacturing Science and Technology effort. Implementation is planned to occur beginning with SSN 792.

Timeline/Milestone:
Start Date: December 2014
End Date: July 2016

Funding:
Navy ManTech Investment: $691,000

Status: Active

Participants:
Materials Sciences Corporation and Seemann Composites