NAVAIR Composite Repair Working Group Overview & Milestones

March 2026

Presented to: JCAMS

Presented by: Chris Rethmel

Outline

- Overview of Working Group
  - Mission
  - Site Leads & Locations
  - Topic Summary
- Topic Breakdown
  - Background
  - Objective
- Recent Successes
- Priorities

NAVAIR Composite Repair Working Group (NAVCoRe)

- NAVCoRe is a national team of composite engineers from Fleet Readiness Centers (FRC) and Naval Aviation Warfare Centers (NAWC) who address materials and processing issues related to composite repair across all Naval aircraft platforms. First meeting was held in 2018 at NAS North Island in San Diego, CA.
- The mission of the group is to ensure that the Navy is well aligned technically and logistically for repair of composite aircraft. The goal of the group is to facilitate national consolidation or consensus on topics related to: training, materials, and repair processes, and inspection processes.
  - "When NAVCORE was initially established, there were significant technical disparities across various sites, including in training, analysis, and processing. Over time, these technical gaps have substantially narrowed because of our collaboration. "

    - Anonymous NAVCORE member
- Various teammates are also members of public committees such as ASTM, CMH-17, Composite Maintainers WG's, SAE (P-17), ASM and CACRC.
- Meetings: Semi-Annual 3-5 day meetings (Winter & Summer); Monthly phone conferences; Ad hoc sub-working group meetings.

SITE LEADS & LOCATIONS

SITES LEADS

NORTH ISLAND: Alyssa Zamora
CHINA LAKE: Frederick Henderson
LAKEHURST: Chris Mahendra
PAX RIVER: Chris Rethmel
CHERRY POINT: Rob Thompson
JACKSONVILLE: Steve Starnes

Lakehurst
NAWCAD

Patuxent River
NAVAIR HQ, PEOs, NAWCAD

China Lake
NAWC-Weapons Division

Cherry Point
Fleet Readiness Center East

North Island
Fleet Readiness Center Southwest

Jacksonville
Fleet Readiness Center Southeast

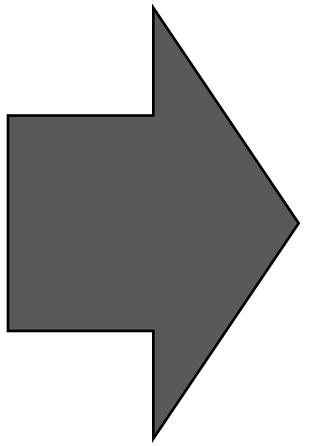
Topic Objectives

Standardization

Technology

Implementation

Collaboration



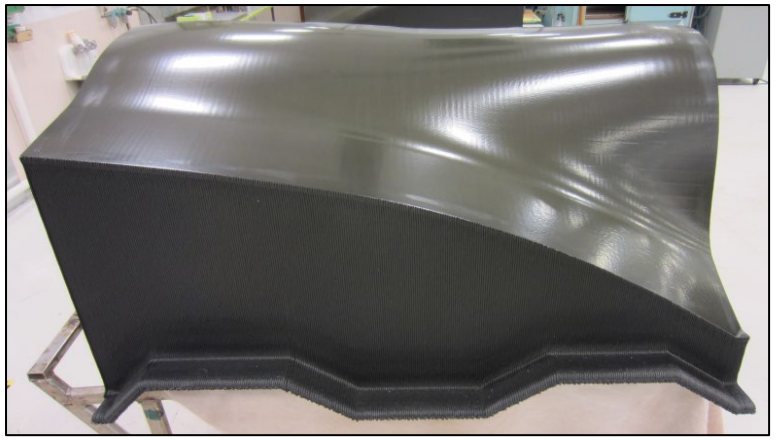
Increased Composite Maintenance Capability

TOPIC SUMMARY

A. Composite Tooling
B. Shelf Life Consolidation
C. Material Consolidation
D. Process Consolidation
E. General Series Manuals
F. Depot/Fleet/Engineer Training
G. Composite Cleanroom
H. Composite Repair Kits
I. Site Surveys
J. Common Repair Materials
K. Material Substitution Database
L. Joint Topics w/ Composite Structures Working Group (CSWG)
M. Surface Preparation Quality Assurance
N. Mechanical Testing Standardization
O. Composite NDI Standards
P. Thermal Damage Evaluation
Q. Material Obsolescence
R. Aircraft Battle Damage Repair (ABDR)

A. COMPOSITE TOOLING

- **Chairperson:** Rob Thompson (FRCE)
- **Background:** Composite tooling for repair and low rate or one-off manufacturing is often expensive and time consuming to produce. NAVAIR has differing approaches and technologies that are site specific.
- **Objective(s):** Identify standardized approaches to design, material selection, fabrication, and inspection for tooling for use at FRC's via a NAVCORE National Guidance Document (NGD).
- **Milestones:**
  - Consolidation and sharing of current FRC tooling fabrication processes including additive manufacturing techniques/materials, machinable foam, and tooling pre-impregnated materials.
  - Integration of tooling engineering into FRCs.
  - Collaboration of testing fabrication methods with additive manufactured tooling.

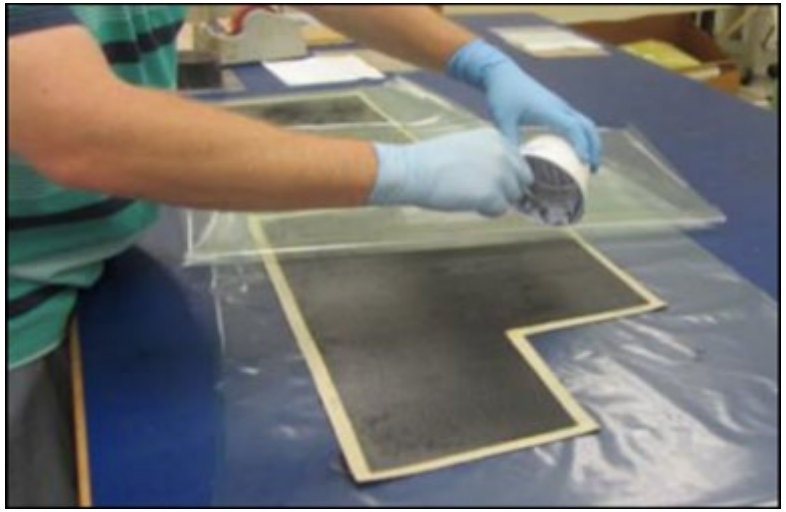


B. SHELF LIFE CONSOLIDATION

- **Chairperson:** Steve Starnes (FRCSE)
- **Background:** Consolidate and share shelf-life extension and induction/reception policies for NAVAIR repair sites with regards to Hazardous Materials (HazMat) used for composite and polymeric repair.
- **Objective(s):** Determine what deficiencies are found by each site for shelf-life extension and how NAVAIR could align and standardize shelf-life extension of HazMat related to polymers and composites.
- **Milestones:**
  - Consolidation of shelf-life extension procedures from each FRC for polymers and pre-impregnated composite materials.
  - In-work to evaluate chemical and thermal analysis techniques to use in lieu of mechanical test methods for shelf-life extension testing.
  - Completed initial aging investigation of EA9390.
  - Inputs for the DoD shelf life program.

C. MATERIALS CONSOLIDATION

- **Chairperson:** Justin Massey (FRCSW)
- **Background:** As new aircraft programs have been adopted by the Navy, new bonded repair materials are being implemented with each program. The amount of different repair materials used to perform similar purposes are trending towards an unsupportable future for composite repair.
- **Objective(s):** Consolidate common repair materials with their respective alternatives, properties, and allowables to authorize use in common repair methods in various TMS aircraft. Provide a path forward with common repair materials.
- **Milestones:**
  - Task closed.
  - NAVCORE released white paper released to acquisition and fleet support teams which lists recommended repair materials such as repair fabrics, repair adhesives, film adhesives, foam adhesives, and laminating resins (Distribution D).

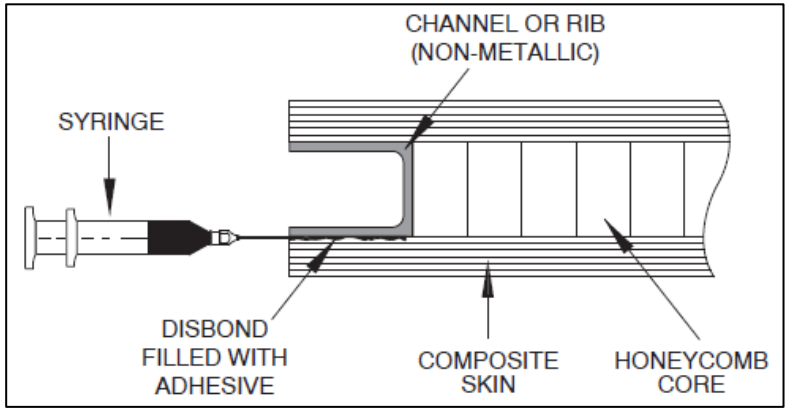


D. PROCESS CONSOLIDATION

- **Chairperson:** Rob Thompson (FRCE)
- **Background:** Polymeric and composite repair processes are performed at each site with differences depending on site location and supported platform.
- **Objective(s):** Evaluate processes for differences and similarity among all sites and if they are feasible for consolidation and standardization.
- **Milestones:**
  - Created a shared repository of processes from each FRC.
  - Created a cross-reference spreadsheet to identify the sites that perform each process and the process differences.
  - Released NAVAIR National Guidance Documents (NGD):
    - Composite Cleanroom (See Topic G).
    - Sol-Gel Metallic Bond Preparation
    - Vacuum Bag Fabrication
    - Bonding of Nut Plates and Studs

E. GENERAL SERIES MANUALS

- **Chairperson:** Alyssa Zamora (FRCSW)
- **Background:** Technical manuals are often created or revised by one site and could use input from each site for best practice for multiple airframes.
- **Objective(s):** Discuss and implement changes to technical manuals that reflect the repair materials and processing from multiple aircraft programs and repair sites including Organizational, Intermediate, and Depot level maintenance.
- **Milestones:**
  - Submitted draft of NAVAIR 01-1A-21 (O-/I-Level Composite Repair) to Technical Publications group for review and release.
    - FY24 full revision.
  - Performed initial consolidation of comments for revision of NAVAIR 01-1A-22 (O-/I-Level Radome Repair).
    - FY23 full revision.
  - Provided comments for sol-gel preparation and bonding for NAVAIR 01-1A-01 (General Structural Repair) in collaboration with USAF.



F. TRAINING

- **Chairperson:** Steve Starnes (FRCSE)
- **Background:** Standard training for artisans and engineers did not exist at a national level. Fleet training is not sustainable as sailors/marines are moved to different areas of duty.
- **Objective(s):** (1) For depot artisans, consolidate training programs from other sites/platforms to a more generic certification program. (2) Enable fleet maintainers to hold repair certifications and possible new MOS. (3) Create a national training curriculum for FRC engineers.
- **Milestones:**
  - Standardized depot training courses across all FRC's and released requirements via COMFRC Job Qualification Requirements (JQRs) documents.
  - Development of NGD for recommended engineering training for composite engineers in FRCs and NAWCs.
  - Established pilot program with Fleet maintainers to receive Depot level certifications.
  - Submitted technical comments to current AM school courses and recommendations for changes to CNATT/NETC.

G. COMPOSITE CLEANROOMS

- **Chairperson:** Rob Thompson (FRCE)
- **Background:** All FRC's had locally established, site-specific requirements for composite layup and bonding areas within production facilities.
- **Objective(s):** Develop nationally aligned guidance specification for composite cleanroom requirements.
- **Milestones:**
  - Task closed.
  - NAVCORE NGD for Composite Cleanroom Requirements has been released (Distribution D).

H. COMPOSITE REPAIR KITS

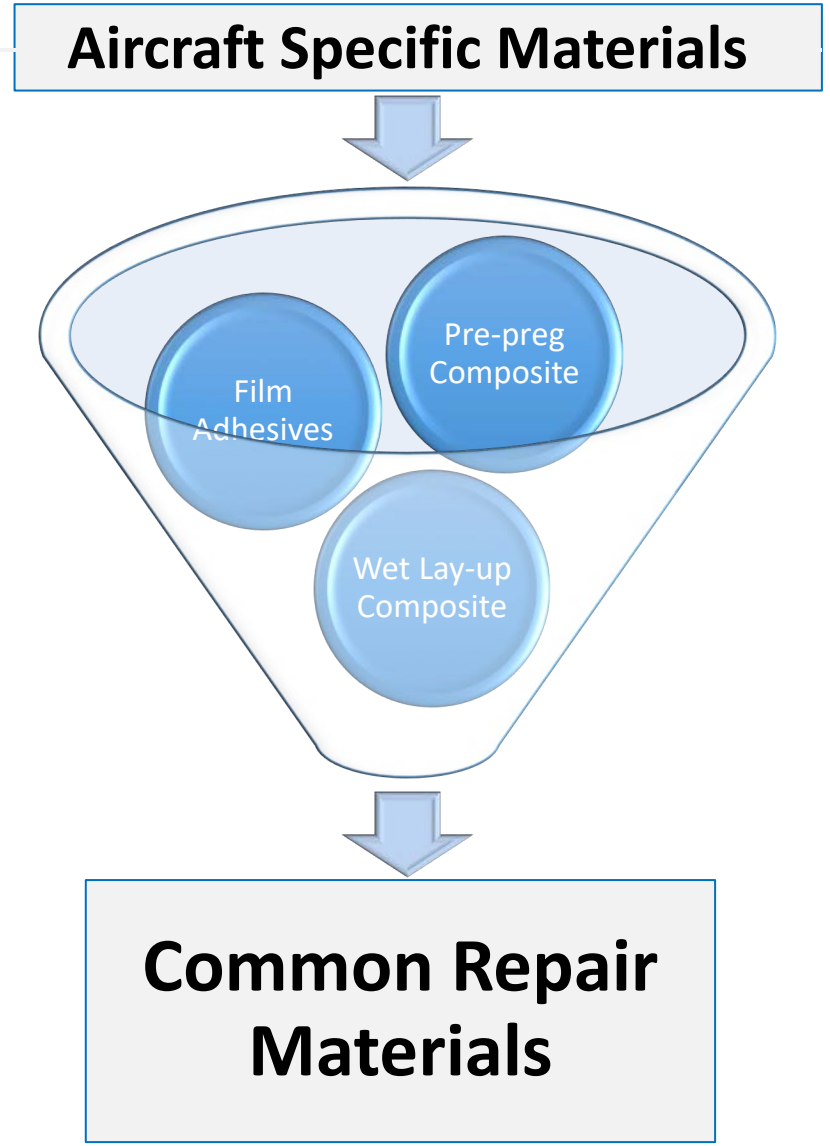
- **Chairperson:** Chris Mahendra (NAWC-AD Lakehurst)
- **Background:** Various USN aircraft platforms have designed and released TMS-specific composite repair kits. Most kits include the same or similar tools and accessories. Fleet is required to purchase, store, and inventory multiple kits for each aircraft.
- **Objective(s):** Consolidate commonly used composite repair equipment into a universal (cross-platform) repair kit.
- **Milestones:**
  - Consolidated tools from platform-specific repair kits and down-selected tools for universal kit.
  - Continue coordination with NAWC Lakehurst to develop and implement kit into Common Support Equipment program. Implementation anticipated for FY27.

I. SITE SURVEYS

- **Chairperson:** Alyssa Zamora (FRCSW)
- **Background:** I-Level and BCMI shops (Depot-level detachments) that perform composite repair are required to maintain the requirements for facilities, materials, and equipment as FRCs.
- **Objective(s):** Perform periodic visits to various I-level composite repair shops to identify and address challenges to fleet readiness related to materials, equipment, training, and other repair capabilities.
- **Milestones:**
  - Co-located semi-annual meetings at FRC detachments to perform site surveys (FRC-Northwest Whidbey Island).
  - Coordinated with Fleet support team (FST) engineering to perform carrier and I-level visits.
    - Visits completed: USS Vinson, FRC-WP Iwakuni, USS Reagan, FRC-Mid Atlantic Oceana, MCAS New River, MCAS Miramar, USS Bush, USS Ford, USS Lincoln and USS Truman.
  - All site visit reports provided to FST and maintenance officers to improve fleet readiness.

J. COMMON REPAIR MATERIALS

- **Chairperson:** Chris Rethmel (NAWC-AD PAX)
- **Background:** Currently materials are approved for composite repairs on individual platforms. Repair material allowable data is not shared between platforms. Logistical and procurement challenges occur frequently. Commercial aircraft available repair materials (i.e. SAE spec) have published allowables, however gaps in data need to be identified and testing performed to qualify use on military aircraft.
- **Objective(s):** Identify and evaluate commercially available repair materials for use in cross-platform repair methods.
- **Milestones:**
  - This task led to development of Common Repair Materials Working Group
  - Created focused working group in collaboration with NAVAIR Composite Structures Working Group.
  - Received POM24 funding to evaluate commercially available materials and generate repair data for use on Naval aircraft.
  - Performed screening of commercially available out-of-autoclave prepreg, continuing testing to establish allowables.



K. MATERIAL SUBTITUTIONS

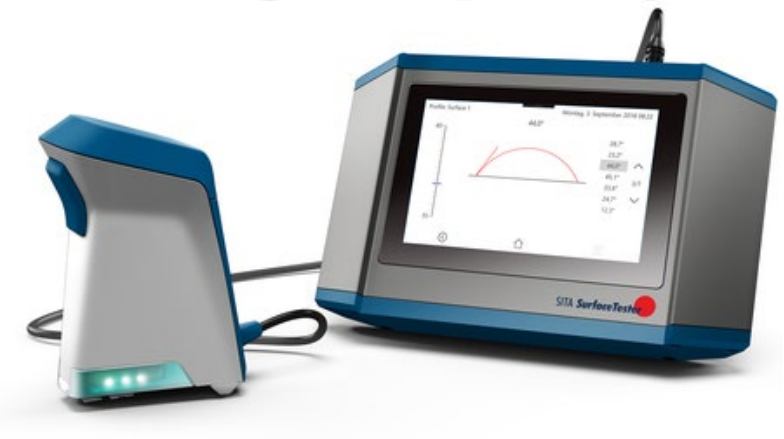
- **Chairperson:** Rob Thompson (FRCE)
- **Background:** Consolidation of common material alternatives and history of requests will aid to decrease turnaround time when evaluating materials for substitution requests.
- **Objective(s):** Develop repository of material substitutions as reference tool for all FRCs. Address recurring substitution requests as needed.
- **Milestones:**
  - Topic closed.
  - Database integrated into NAVCORE sharepoint site. Database is updated periodically as substitutions occur.

L. JOINT TOPICS W/ CSWG

- **Background:** Various NAVCORE and CSWG efforts require cross collaboration among both groups. This includes evaluation and implementation of new technologies, repair processes, and repair materials.
- **Objective(s):** Collaborate with CSWG on overlapping efforts to address fleet readiness needs and technology advancement.
- **Milestones:**
  - Collaborated on the development of the NAVAIR Materials Allowables for Repair of Composites (NMARC) database.
  - Collaboration of Aircraft Damage Repair Development (ADRD) framework.
  - Co-coordination of Common Repair Materials Working Group.
  - Continued collaboration on test plan development for evaluation of wet layup repair SBIR.

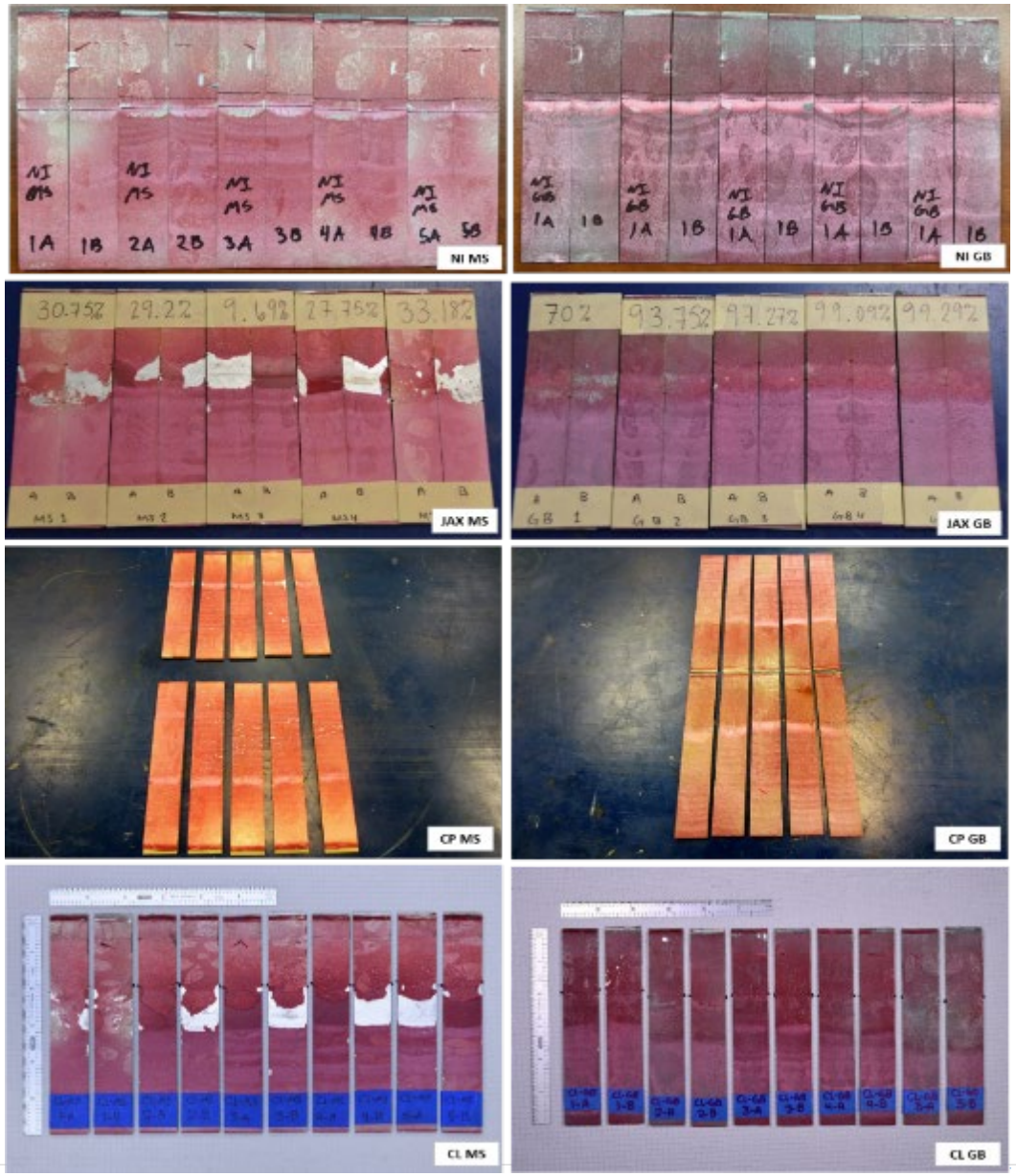
M. SURFACE PREP QUALITY ASSURANCE

- **Chairperson:** Mikaleen Morrell (FRCSE)
- **Background:** FRCs and NAWCs have individually evaluated various surface preparation technologies and methods. Collaborative efforts will allow application of technologies to multiple Naval aircraft platforms.
- **Objective(s):** Consolidate efforts for improvement of surface preparation methods for bonded repairs.
- **Milestones:**
  - Created repository of surface preparation quality assurance efforts.
  - Bonded Nut Plate and Studs (BoNuS) working group developed to specifically address surface preparation challenges for bonded nut plates.
  - NAVCORE National Guidance Document (NGD) created for bonded nut plate preparation and application.



N. MECH TEST STANDARDIZATION

- **Chairperson:** Chris Rethmel (NAWC-AD PAX)
- **Background:** Each site has individual local procedures for test coupon fabrication, mechanical testing, and evaluation. Shared knowledge of lessons learned, best practices and troubleshooting will allow team to standardize test methods when performing cross-site testing.
- **Objective(s):** Standardize mechanical test processes across all sites for material evaluation.
- **Milestones:**
  - First round of testing completed. Second round robin testing initiated for standardization of wedge crack test and evaluation procedures. NAVCORE National Guidance Document (NGD) is in-work.
  - Single lap shear round robin test plan is in-work.
  - Dynamic Mechanical Analysis (DMA) round robin to be developed.



O. COMPOSITE NDI STANDARD MANF.

- **Chairperson:** Frederick Henderson (NAWC-WD China Lake)
- **Background:** Currently FRCs and NAWCs do not have standardized procedures for the fabrication of composite NDI reference standards. Sites rely on OEMs for fabrication.
- **Objective(s):** Establish standard procedures for fabricating and qualifying composite non-destructive inspection reference standards for use in repairs and manufacturing. Serve as a joint topic to continue collaboration with NDIT Working Group on composite-related efforts.
- **Milestones:**
  - New topic established in Feb 2022 NAVCORE Winter meeting.
  - Kick-off meeting with NDIT working group to discuss common practices for reference standard fabrication.
  - Future plan to release white paper on best practices.
  - C/Ep to Titanium bond inspection.

P. THERMAL DAMAGE EVALUATION

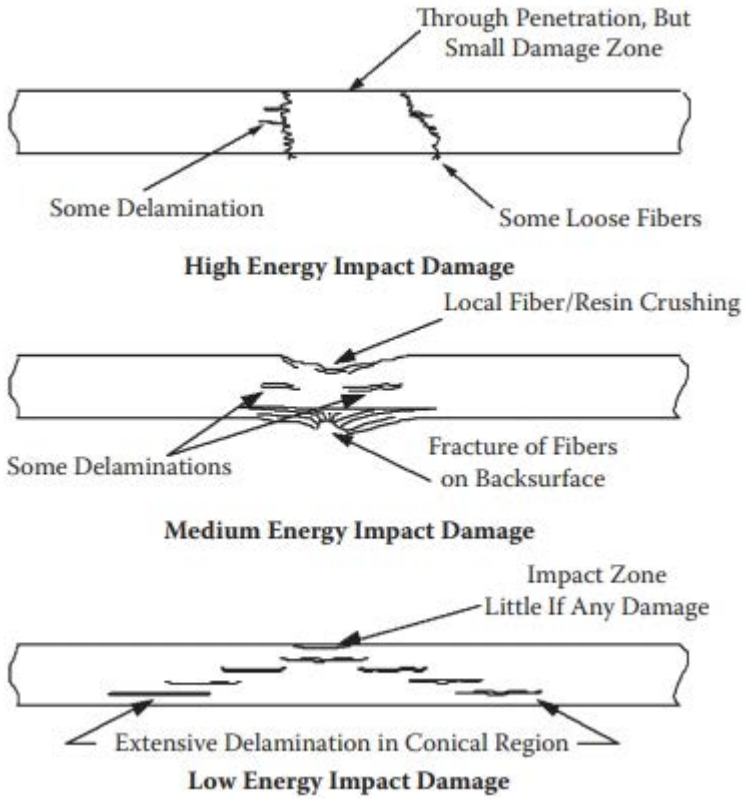
- **Chairperson:** Curtis Sharkey (PAX)
- **Background:** Advanced capability to evaluate and characterize thermal damage is needed in order to reduce scrap rate due to extreme thermal exposure and lightning strikes.
- **Objective(s):** Evaluate non-destructive inspection technologies (i.e. FTIR) and methodologies for thermal damage inspection. Collaborate with structural engineering to characterize thermally damaged materials for repair analysis.
- **Milestones:**
  - New topic established in summer 2022 as an extension of collaborative efforts to develop FTIR calibration methods and standards.
  - CSWG-NAVCORE joint team subgroup created for thermal damage of NAVAIR aircraft.
  - Gathered fleet data to determine economic effect of lightning strike on composites.

Q. MATERIAL OBSOLESCENCE

- **Chairperson:** Rob Thompson (FRCE)
- **Background:** Material obsolescence poses a significant challenge for NAVAIR's sustainment operations given our diverse inventory of aircraft, many of which are legacy platforms that have been in service for decades. As these aircraft age, the materials originally specified for their components become unavailable, leading to potential disruptions in maintenance and repair activities that are crucial for keeping these aircraft operational.
- **Objective(s):** Establish a framework for NAVAIR Engineering to manage material obsolescence events efficiently, ensuring fleet readiness and operational continuity.
- **Milestones:**
  - New topic established to better prepare for future material obsolescence issues.
  - Working to establish guiding principles that help NAVAIR teams manage material obsolescence events effectively and consistently.
  - Document is currently in review.

R. AIRCRAFT BATTLE DAMAGE REPAIR

- **Chairperson:** Chris Rethmel (NAWC-AD PAX)
- **Background:** Aircraft battle damage repair planning and requirements vary between aircraft. Planning for future needs in this area is an important factor in increasing future readiness.
- **Objective(s):** Evaluate status of current aircraft ABDR programs and develop guidance for future needs in this area.
- **Milestones:**
  - New topic established to create a focus on battle damage repair and forward deployed combat repair needs.
  - CSWG-NAVCORE joint team subgroup created for aircraft battle damage planning.



Recent Successes

- Identification of the necessary tooling changes for the universal composite tool kit.
- NAVCORE sites helped each other on autoclave processes.
  - Temperature uniformity testing.
  - Autoclave recipe design and certification.
- Finalized Sol-gel metallic bond preparation NGD.
- Began executing the test plans for composite common repair material prepreg and wet layup materials/processes.
- Standardization of training across NAVAIR for artisans and collaborative training for engineers.
- Receiving funding for multiple efforts born from NAVCORE
  - Common Composite Repair Materials
  - Improve composite wet lay-up
  - FDCR Initial Support
  - Bonded nutplate adhesive cure support
  - Thermoplastic Composite Repair
  - Room Temperature Storable Prepreg
  - Improved Heat Blanket Technology for Composite Bonding Operations
  - COTS DVD Tool Development
  - Shelf life extension of prepreg and film adhesive evaluation

Priorities

- Identifying the needs of the user in the composite repair arena and providing a means of evaluating the need with a national team of experts.
- Standardize NAVAIR composite practices across sites.
- Share and advance composite maintenance technology.
- Collaborate with DoD and industry partners in the technical field.
- Learning what can be done better to support fleet and depot level composite repair. Use those improvements on newer acquisition aircraft programs.

Questions?

Thank you!