



PROJECT ID:
639

Aerospace Class N Primer Crack Initiation Validation and Inner Mold Line (IML) Demonstration for Authorization



T-44C Pegasus aircraft are critical assets within the Navy for advanced multi-engine pilot training. (U.S. Navy photo by Lt. Michelle Tucker)

OBJECTIVE

The objective of this project is to evaluate non-chromium aircraft primers by comparing their performance against the chromium-based primers currently used. Testing will focus on crack initiation and growth under simulated operating conditions. The highest-performing candidates will be selected for on-aircraft trials to collect production and maintenance data, supporting potential authorization of Class N primers for inner mold lines (IML) use.

PROBLEM STATEMENT

To get approval for using Class N (non-chromate) primers, data is needed to show products are safe to use and perform well in the relevant environment. Currently, NAVAIR has only authorized these primers for painting the outside of aircraft on certain surfaces like treated aluminum, anodized aluminum, and scuff-sanded composites. They are not yet approved for other areas, such as IML or removable components.

DESCRIPTION

This project will focus on the approval and transition of non-chromate (Class N) primers for IML touch-up repair painting on Naval aircraft. Full authorization of these primers requires three development steps: (1) touch-up repair painting, (2) removable components/structures, and (3) full Original Equipment Manufacturer (OEM) IML priming. This effort addresses the immediate need to reduce hexavalent chromium exposure while establishing a foundation for future development toward removable component and OEM priming applications during manufacturing.

Leveraging NAWCAD iSprint funding, Class N primers will be tested for corrosion performance, with results compared to existing chromate primers under standard test methods - ASTM B117 - and fleet-relevant conditions using: 1) Multivariate Dynamic Accelerated Corrosion Test (MDACT; to replicate outdoor, marine exposures), and 2)



Static Load Environmentally Assisted Cracking (SLEAC) testing apparatus. Testing will prioritize products already in common fleet use to ensure practical relevance.

Demonstration data will be generated through Fleet Readiness Center (FRC) depot maintenance on selected aircraft (E-2/C-2, T-45, T-6, T-44). Findings will be documented in a final report, and NAWCAD will issue an authorization letter allowing qualified Class N primers for IML touch-up repairs across the Naval Aviation Enterprise.

RETURN ON INVESTMENT

Adopting Class N primers for IML touch-up repairs represents a high-return investment for the Navy. Upfront costs for testing, validation, and training are outweighed by fleet-wide benefits, including reduced maintenance downtime and streamlined touch-up

procedures. Most importantly, eliminating hexavalent chromium exposure significantly lowers long-term health risks for personnel, reducing potential medical and regulatory costs. By improving safety, compliance, and operational efficiency across O, I, and D-level maintenance (O - Organizational, I - Intermediate, D - Depot), this transition delivers measurable value across the Naval Aviation Enterprise.

NAVY BENEFITS

NAVAIR authorization for IML touch-up use of Class N primers is currently at a technology readiness level (TRL) 5. The SLEAC testing will advance it to TRL 6, leading to on-aircraft demonstration (TRL 7) and final process approval (TRL 8) for Fleet Support Team/Program Office adoption.

Transitioning to Class N primers will provide substantial benefits across the Navy, reducing hexavalent chromium exposure—

a known carcinogen and respiratory/kidney hazard—while lowering maintenance risks and costs at all levels. Widespread adoption will enhance fleet safety, efficiency, and readiness.

TRANSITION DESCRIPTION

This project will produce multiple technical reports. Two Materials Engineering Reports (MERs) will be developed: 1) aluminum crack initiation and growth in MDACT; and 2) demonstration/validation of applications, and periodic inspections. A final NESDI report summarizing all data will culminate this effort. Pending successful lab and on-aircraft testing, a NAVAIR authorization letter will be issued for non-chromate primers approved for IML use.

CONTACT

For more specific information about this project, contact the Principal Investigator at joshua.g.walles.civ@us.navy.mil



ABOUT THE NESDI PROGRAM

The Navy Environmental Sustainability Development to Integration (NESDI) program is the Navy's environmental research and development demonstration and validation program, sponsored by Office of the Chief of Naval Operations (OPNAV) Compliance and Mission Readiness Division (N411) and managed by the Naval Facilities Engineering Systems Command (NAVFAC) from the Engineering and Expeditionary Warfare Center (EXWC) in Port Hueneme, CA.

The mission of the NESDI program is to support Fleet readiness by minimizing operational constraints associated with environmental and human health risks and to reduce cost of environmental compliance by demonstrating, validating, and integrating innovative technologies, processes, materials, and by filling knowledge gaps.

For more information, visit the program's web site at www.navfac.navy.mil/nesdi or contact the NESDI Program Managers at NESDI@us.navy.mil