

**Engineering and Technical
Services for Joint Group on
Pollution Prevention (JG-PP)
Pilot Projects**

Field Evaluation Report VII:

**Inspection of Aircraft for
Validation of Alternatives to
Chromate-Containing Primer
Coatings for Aircraft Exterior
Mold Line Skins**

December 3, 1998

Contract No. DAAA21-93-C-0046

Task No. N.072

CDRL No. B001

*Prepared by
National Defense Center for Environmental Excellence
(NDCEE)*

Operated by Concurrent Technologies Corporation

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100 CTC Drive
Johnstown, PA 15904

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1. INTRODUCTION

The Joint Logistics Commanders (JLC) chartered the Joint Group on Acquisition Pollution Prevention (JG-APP) to coordinate joint service activities affecting pollution prevention issues identified during a weapon system's acquisition process. JG-APP has become the Joint Group on Pollution Prevention (JG-PP) to accommodate an expanded focus to address sustainment needs.

The Joint Logistics Commanders (JLC) and Headquarters National Aeronautics and Space Administration (NASA) co-chartered JG-PP to coordinate joint service/agency activities affecting pollution prevention issues identified during system and component acquisition and sustainment processes. The primary objectives of the JG-PP are to:

- Reduce or eliminate the use of hazardous materials (HazMats) at manufacturing, remanufacturing, and sustainment locations
- Avoid duplication of efforts in actions required to reduce or eliminate HazMats through joint service cooperation and technology sharing.

JG-PP projects typically involve an original equipment manufacturer (OEM) producing multiple defense systems for more than one of the Services, as well as at least one depot servicing one or more of the defense systems. JG-PP technical representatives for each project begin by selecting a target HazMat that is used in the production or sustainment processes and may cause environmental and/or worker health concerns. Project participants then identify alternative technologies for evaluation.

At the Boeing Company Aircraft & Missiles pilot site located in St. Louis, Missouri (formerly McDonnell Douglas Aerospace), chromium in primer coatings was identified as the target HazMat to be eliminated or reduced. The chromate primers are applied to aircraft exterior mold line skins by wet-spray coating. The main substrate is aluminum alloy that has been anodized or chromate conversion coated, but other substrates such as steel, carbon epoxy, and titanium are also present on aircraft exterior surfaces and will be coated by these primers.

The project technical representatives reached consensus on the critical technical and performance requirements that an alternative must satisfy to be qualified for use in the identified application. These requirements were documented in the *Joint Test Protocol (MD-P-1-1) for Validation of Alternatives to Chromate-Containing Primer Coatings for Aircraft Exterior Mold Line Skins*, dated December 23, 1997. The *Potential Alternatives Report (MD-A-1-1) for Alternatives to Chromate-Containing Primer Coatings for Aircraft Exterior Mold Line Skins*, dated May 1, 1998, provides a list of alternatives recommended for testing.

The testing was executed in three phases: two phases of laboratory testing and one of field evaluation. The *Joint Test Report (MD-R-1-1) for Laboratory Validation (Testing) of Alternatives to Chromate-Containing Primer Coatings for Aircraft Exterior Mold Line*

Skins, dated February 24, 1998, documents the laboratory testing accomplished on the potential alternatives. The results of the laboratory testing were analyzed to select a limited number of nonchromate primers to be applied to operating aircraft to allow further evaluation of the nonchromate primers. After examining the test panels and analyzing the test results, the project participants selected Dexter Aerospace Materials/Crown Metro Aerospace 10PW22-2/ECW-119 and Spraylat Corporation EWAE118 for field evaluations on operating aircraft.

This field evaluation report documents the first inspection of the AV-8B being used for the operational testing. The results of all field evaluations will be consolidated and reported in a subsequent JTR, *Joint Test Report (MD-R-1-2) for Field Evaluation and Validation of Alternatives to Chromate-Containing Primer Coatings for Aircraft Exterior Mold Line Skins* (in preparation).

2. BACKGROUND ON OPERATIONAL TESTING

As part of the JG-PP and Boeing effort to identify suitable nonchromate primers for application to aircraft exterior mold line skins, nonchromate primer has been applied to portions of operating aircraft by wet-spray techniques. The text and sketches in Section 3 document the first inspection of the nonchromate primer on the AV-8B aircraft at Marine Corp Air Station (Naval Aviation Depot) Cherry Point, North Carolina. This aircraft, AV-8B # 163858, is assigned to VMAT 203. The inspection was performed on October 29, 1998. The inspection team included:

- James Whitfield, Naval Aviation Depot (NADEP) Cherry Point
- Wesley Lamb, NADEP Cherry Point
- Larry Triplett, Boeing, Aircraft & Missile Systems

The test components of the aircraft were painted at NADEP Cherry Point on August 12, 1998, and the aircraft has since flown 30.7 hours. Spraylat EWAE118, Type II, Class N, (MIL-P-85582) nonchromate primer was applied on the left-hand strake and left-hand #60 door. (The strakes are composite structure and are slightly over ten feet in length located on the underside of the fuselage. The #60 door is titanium, approximately 2.5 x 1.5 feet and is located just aft of the engine exhaust.) The right-hand strake was primed with 44-GN-8A, Type II, Class C1 chromate (MIL-P-85582) primer. The topcoats applied were TT-P-2756 products manufactured by Deft. Color 36320 was applied on both strakes and 36231 on the #60 door.

The inspection results and summary were prepared by Larry Triplett.

3. INSPECTION RESULTS

During this inspection, no repainting or touch-up was noted on the components because they were painted in early August 1998. There were minimal defects identified; these defects are documented on the accompanying sketches.

3.1. Inspection Results for L/H Strake (Nonchromate Primer)

The strake showed no signs of coating failure except minimal erosion on the leading edge. The inboard side was heavily soiled but did not exhibit any softening or peeling of the coating. Figure 1 shows the location of the only coating defects observed on this component.

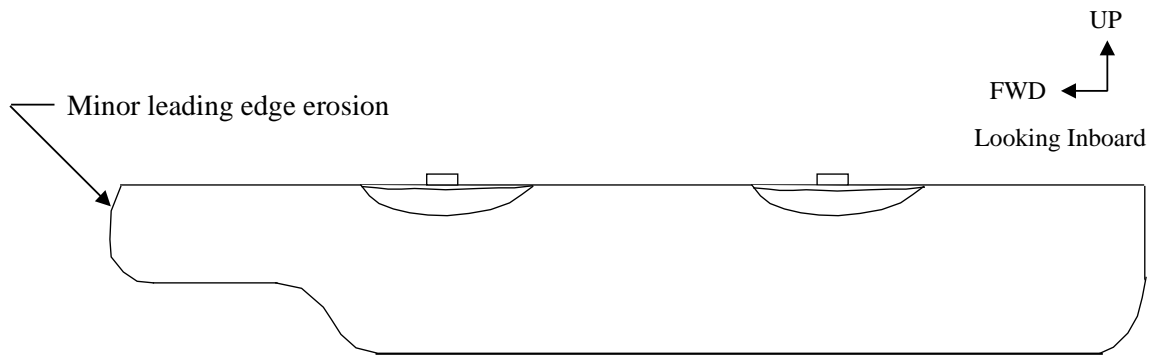


Figure 1. Left-hand Strake Looking Inboard

3.2. Inspection Results for R/H Strake (Chromate Primer)

The strake showed no signs of coating failure except erosion on the leading edge. Erosion was more pronounced than on the L/H strake. There was also a small mechanical damage defect approximately 0.4 inch in diameter that exposed and damaged the carbon fibers. As with the L/H strake the inboard side was heavily soiled but did not exhibit any softening of or peeling of the coating. Figure 2 shows the location of the erosion and mechanical damage.

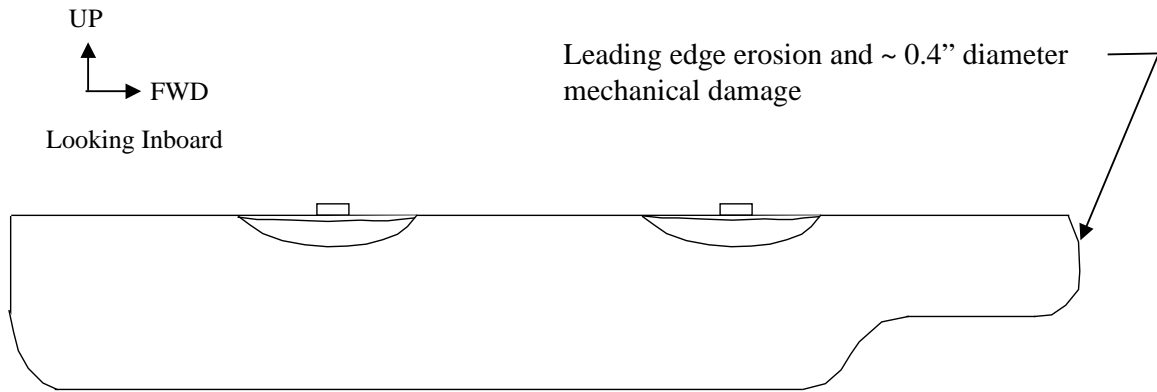


Figure 2. Right-hand Strake Looking Inboard

3.3. Inspection Results for the #60 Door

The #60 door showed no signs of coating failure or defects. There was some heat related discoloration of the topcoat on the lower half of the door and abrasion marks in the topcoat, that were apparently due to cleaning of engine exhaust residue. Figure 3 shows a sketch of the door and location of the abrasions.

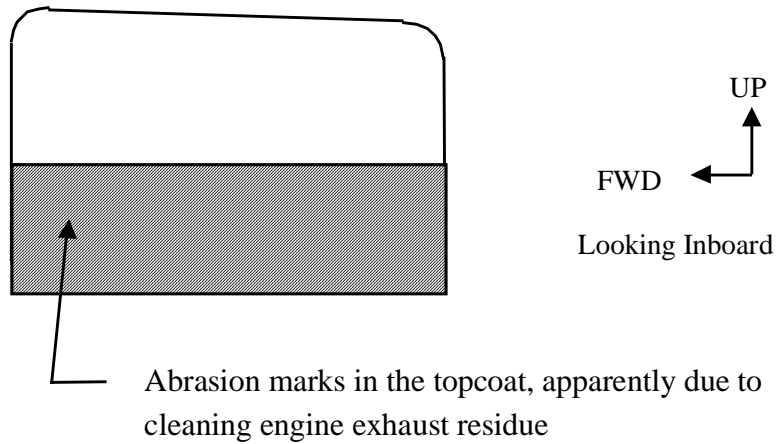


Figure 3. Left-hand #60 Door Looking Inboard

4. SUMMARY

Erosion resistance of the nonchromate primer appears to be better than the chromate control primer, based on the severity of erosion after only 30 flight hours. It should be noted, however, that additional mechanical damage might have contributed to the erosion even though only one area of damage was obvious.

The objective of this test was to evaluate heat resistance of the primer and there were no heat-related defects, other than topcoat discoloration, noted on the test components.