

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

**C-130 Field Evaluation Report
for
29 August 2001 Inspection**

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

06 September 2001

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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 Military Aircraft and Missile Systems Group 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 Akzo Nobel, 10PW22-2/ECW-119 (Formerly Dexter Aerospace Materials) and PRC-DeSoto EWAE118A/B for field evaluations on operating aircraft.

2. BACKGROUND ON OPERATIONAL TESTING

Operational testing was originally scheduled for completion in December 1999. In September 1999 the project participants elected to extend the operational testing phase for two additional years, through December 2001. Rational for the extension was to observe the effects of additional six-month sea deployments on the seven F/A-18 test aircraft and to expand the operational testing to include additional test units. Additional test units include the C-130 described in this report, two F-15s painted in February and a C-17 painted in July.

This field evaluation report documents the performance of the PRC-DeSoto EWAE118 primer on sections of the C-130 after approximately 17 months of service. Areas primed with the nonchrome primer were the right-hand horizontal stabilizer, the right-hand side of the vertical stabilizer and an area of the fuselage aft of the jump door, approximately 3 feet by four feet. The aircraft was stationed at the Channel Islands Air National Guard (ANG), Port Hueneme, CA until late September when the aircraft was loaned to the New Orleans, ANG.

Table 1. Inspection and Flight Hour Data

Aircraft #	Date Painted	Flight Hours When Painted	Flight Hours on 11 January 2001	Flight Hours Since Painted
62-1811	03 March, 2000	20,104.4	20,532.7	428.3

The inspection team for this inspection included:

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Larry Triplett, prepared these inspection results and summary.

3. INSPECTION RESULTS

Horizontal Stabilizer Upper Surfaces: Leading edge erosion was noted on the left-hand and right-hand horizontals but approximately three times more bare metal was visible on the test primer side. The largest bare area was approximately one square inch with the majority of the sites less than 0.5 square inches. Many of the erosion sites initiated at fastener heads.

Minor peeling and blistered paint was noted around the access cover on the right hand side and adjacent to the sealant joints at the tip assembly of both horizontals, (Refs. Figure 1&2). The peeling adjacent to the inboard access cover was observed at the initial inspection and subsequent inspections. Evidence of touch-up topcoat was present and the touch-up paint is also peeling. The peeling paint was confined to within 0.2 to 1.0 inches of the sealant joint indicating potential contamination around the perimeter. There was no evidence of corrosion found on the aluminum substrates.

The varying thickness of anti-skid walkway coating on the upper surface of the left-hand horizontal stabilizer, noted at the previous inspection has not failed. There were several areas where the filler material was concentrated resulting in thick clumps of coating toward the center and outboard end. Sealant replaced between the tip assembly and the torque box noted at the last inspection has not been repainted.

Horizontal Stabilizer Lower Surfaces: Unpainted butt joint sealant and new fasteners installed in removable covers along the aft edge of the horizontals noted at the last inspection were still unpainted. There were also fasteners with chipped paint exposing the fastener heads. (Ref. Figures 3 & 4)

Vertical Stabilizer: As noted at the last inspection, small areas of chipped paint, resulting from erosion, were found on the leading edge of the vertical stabilizer. The erosion was more apparent on the right-hand, test side, than on the left. Total film thickness adjacent to the defect area was thin, ranging 2.5 – 2.9 mils. Four steel screws on each side of the vertical had rust stains penetrating the paint. There was no difference between the severity of rust between the test and control side.

Peeling paint and blisters were noted adjacent to removable access covers on the test and control sides of the vertical. (Ref. Figures 5 & 6) The peeling was up to approximately 0.8 inches wide and 8 inches long.

Color and gloss readings were taken at the same locations as those recorded after painting in March. (Ref. Tables 2 & 3). Delta E color readings were higher than expected, with readings ranging between 1.2 and 2.8, but the difference between the chromate and nonchromate primed surfaces are not significant. There was no evidence of touch-up paint application in areas where readings were taken, since the aircraft was painted.

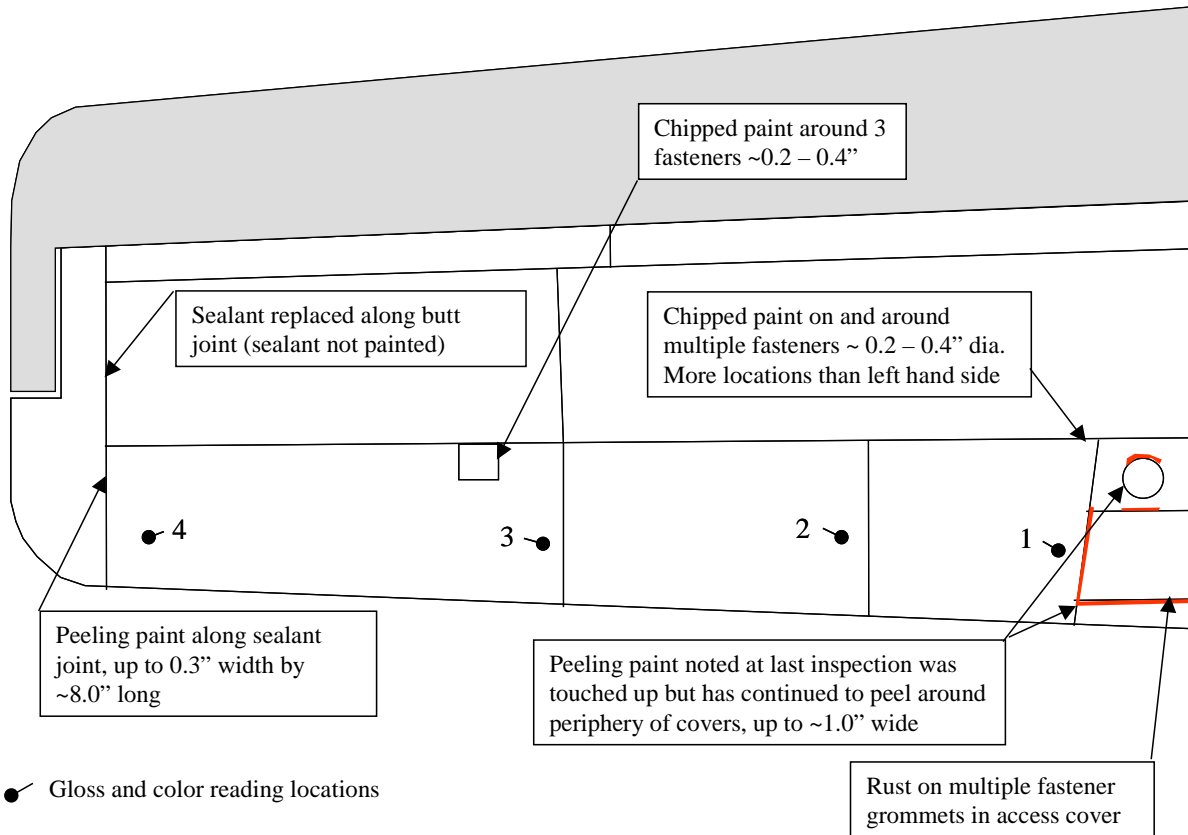


Figure 1. Right-hand Horizontal Stabilizer Looking Down



Figure 2. Left-hand Horizontal Stabilizer Looking Down

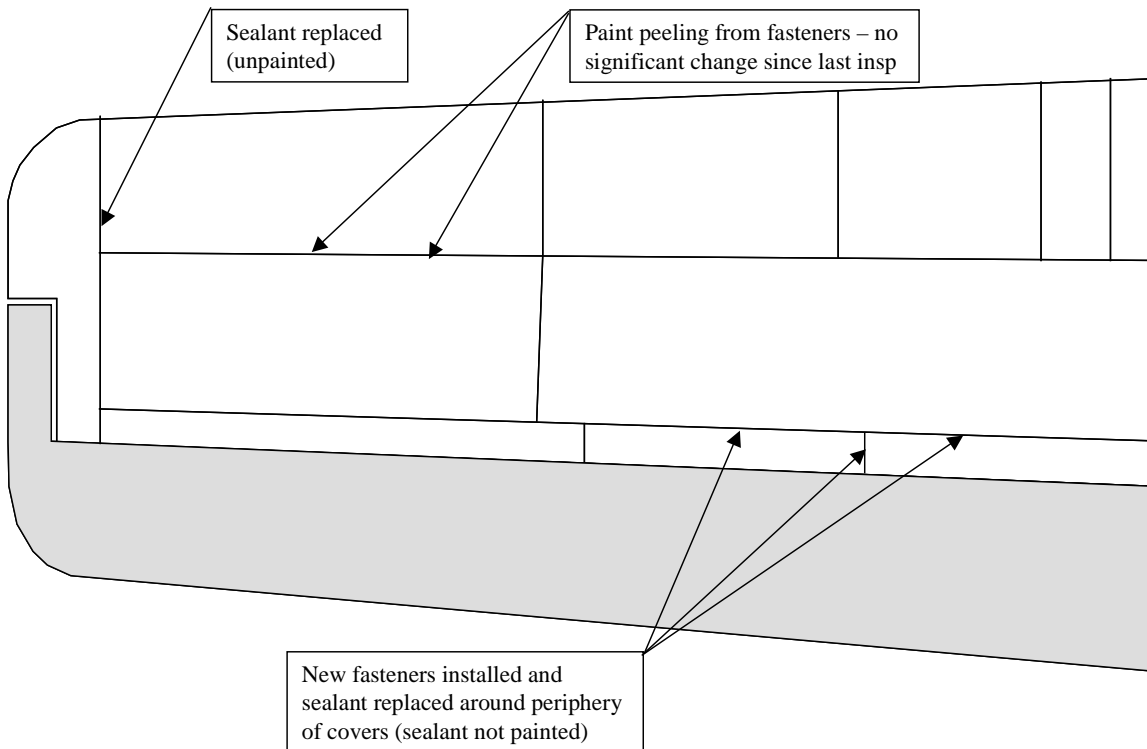


Figure 3. Right-hand Horizontal Stabilizer Looking Up

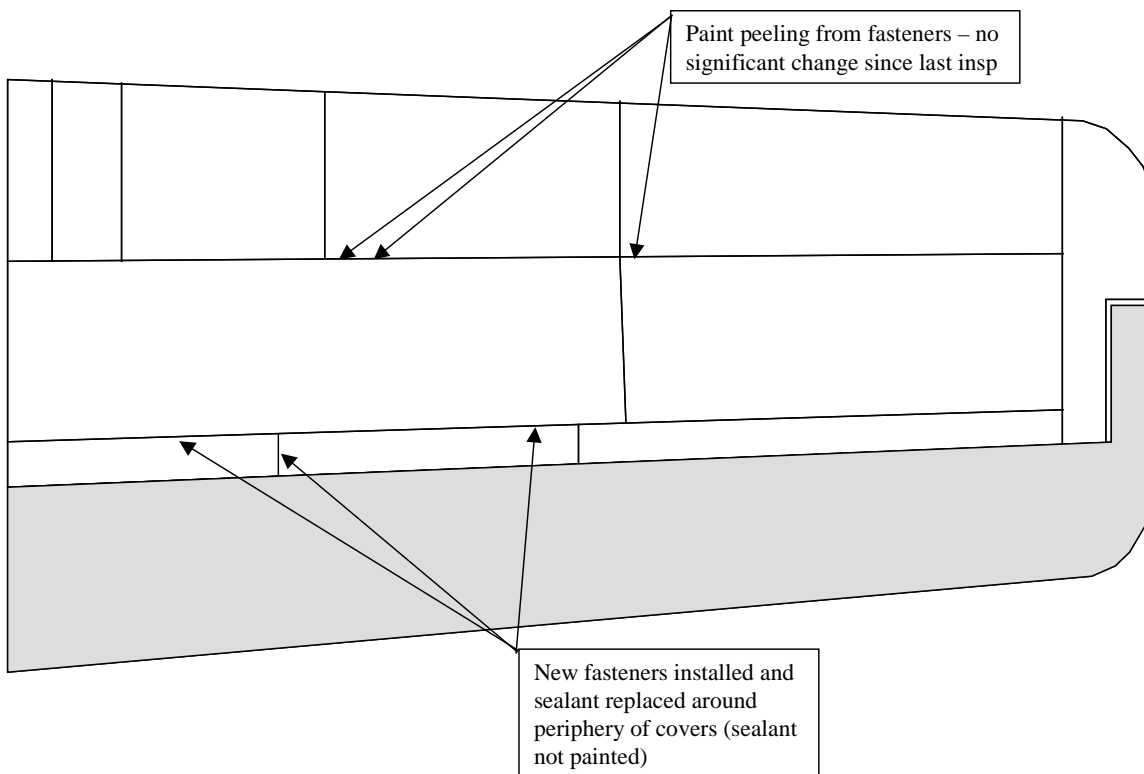


Figure 4. Left-hand Horizontal Stabilizer Looking Up

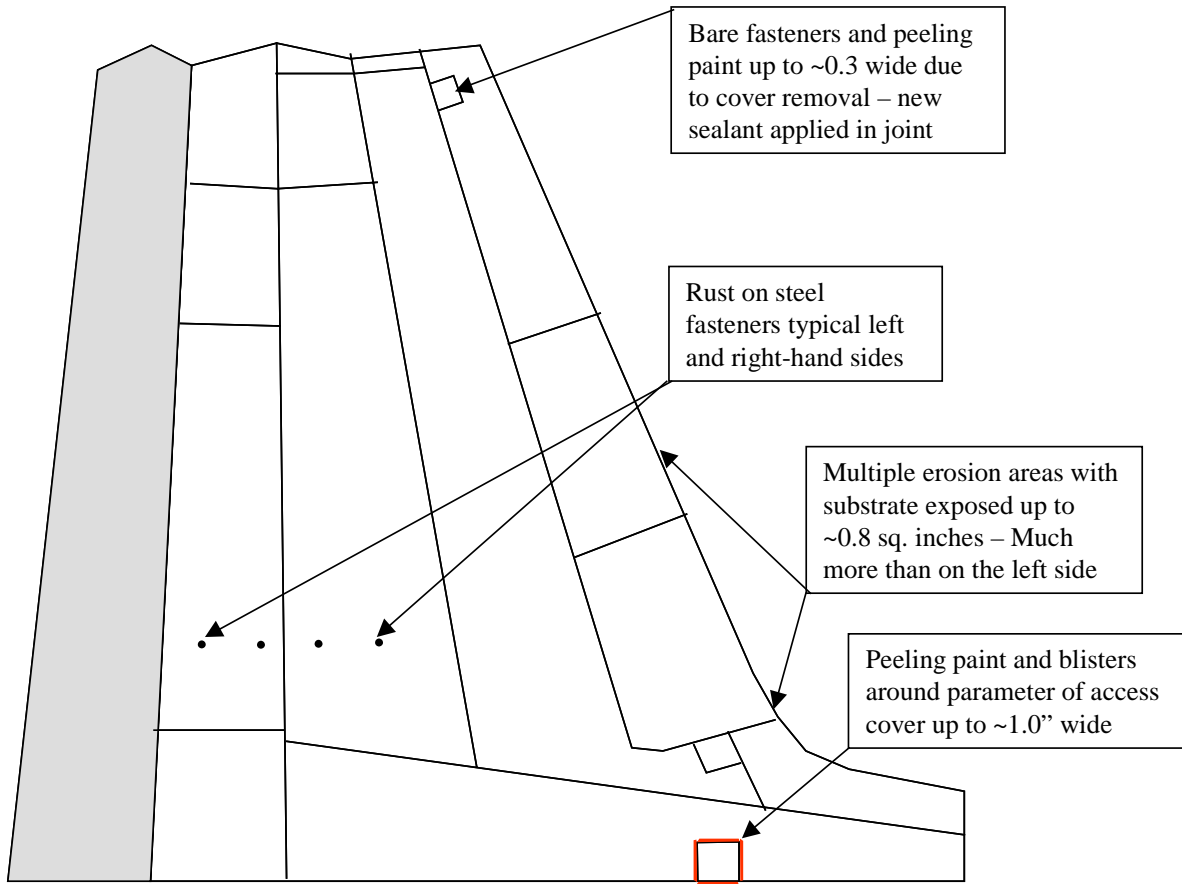


Figure 5. Vertical Stabilizer Right-hand View

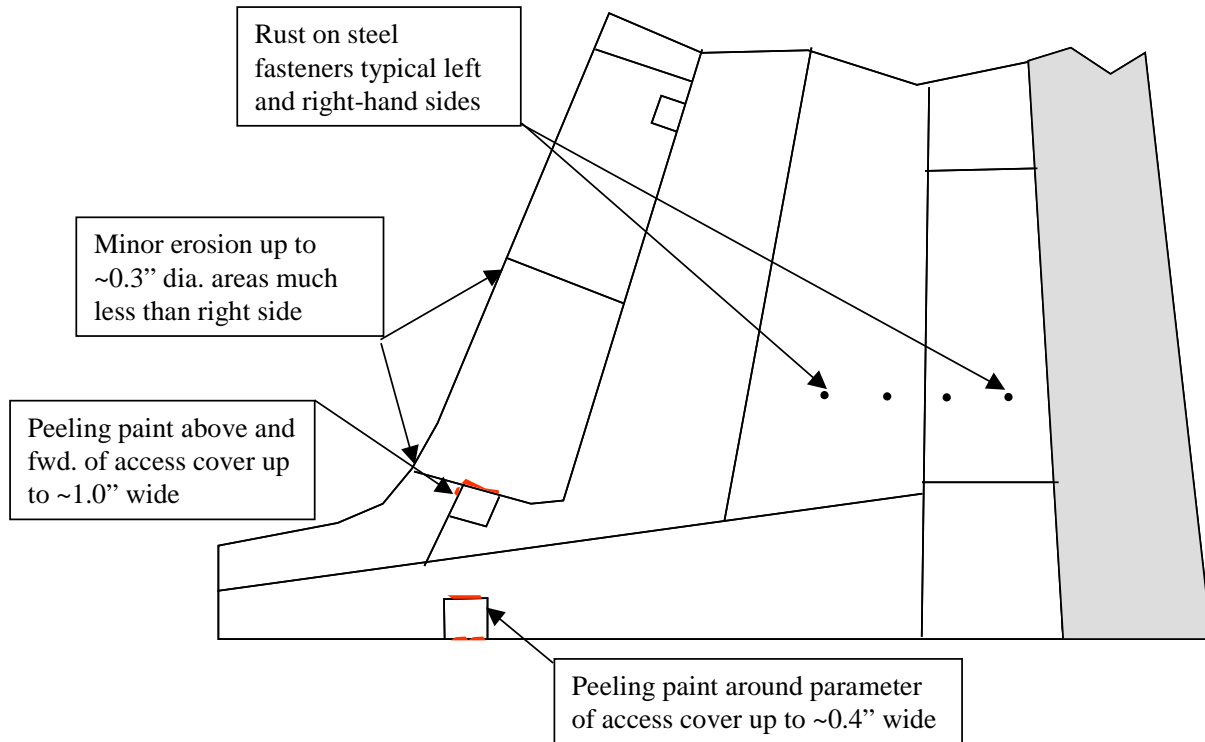


Figure 6. Vertical Stabilizer Right-hand View

Table 2. Color Data

Location	Delta*			
	ΔL	Δa	Δb	ΔE
R/H 1	2.2	-0.4	0.0	2.3
R/H 2	1.2	-0.3	0.0	1.2
R/H 3	2.3	-0.4	0.2	2.3
R/H 4	2.2	-0.3	0.1	2.2
L/H 1	2.8	-0.4	0.1	2.8
L/H 2	1.2	-0.2	-0.2	1.3
L/H 3	1.2	-0.2	-0.3	1.3
L/H 4	2.0	-0.4	-0.1	2.0

* Deltas are differences between the initial readings (3-13-00) after painting and inspection readings (8-29-01).

Table 3. 60° Gloss Data

Location	Initial 3-13-00	3rd Insp. 08-29-01	Delta
R/H 1	2.1	1.7	-0.4
R/H 2	2.7	1.7	-1.0
R/H 3	2.7	2.7	0.0
R/H 4	2.2	2.1	-0.1
L/H 1	2.6	1.9	-0.7
L/H 2	2.7	2.3	-0.4
L/H 3	2.1	2.2	0.1
L/H 4	2.4	2.2	-0.2

4. SUMMARY

This aircraft has been in the field for 17 months since it was painted and has accumulated 428 flight hours with 317 of those hours flown in the last seven months. The most significant change since the last inspection was the increase in erosion on the right-hand horizontal stabilizer and peeling paint around access covers on both sides of the vertical. All of the peeling paint defects were minor and localized indicating no overall paint system failure. Chipped paint on and around fastener heads were present on both sides but more prevalent on the test side of the upper horizontal.

No corrosion was found during this inspection.

One additional inspection is planned for this aircraft in late November or early December.