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

# Field Evaluation Report VIII:

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

## January 21, 1999

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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# 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 EWAE118A/B for field evaluations on operating aircraft.

This field evaluation report documents the post carrier deployment inspection of BUNO (aircraft number) 164638, one of the F/A-18s being used for the operational testing. This aircraft has been deployed for six months on the USS Abraham Lincoln, serving mostly in the Persian Gulf region. 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 following text and sketches document the results of the post-deployment inspection of aircraft BUNO 164638. This aircraft was painted at Naval Aviation Depot (NADEP) North Island, San Diego, California in early January 1998.

Much of the metal substrates of this aircraft were chemically stripped and the composite surfaces were scuff sanded to remove all but a minimal thickness of paint before priming and repainting.

Primer was applied to the stripped surfaces as the first step of the depot maintenance cycle. Spraylat EWAE118 A/B, MIL-P-85582 Type II, Class N, nonchromate primer was applied to the right-hand side. The left-hand side was primed with chromate MIL-P-85582 Type II Class C1 primer (Deft 44-GN-8A).

After completion of depot maintenance the aircraft was washed, sanded, and primed over the entire surface of the aircraft (tie-coat) prior to topcoat application. The nonchromate primer was applied as a tie-coat to the right-hand side before topcoating. Chromate primer was used as tie-coat on the left side. The topcoats applied after tie-coat application were MIL-C-85285 products manufactured by Deft.

**Table 1. Data for F/A-18 BUNO 164638 Test Aircraft**

| Date of Final Painting | Date Inspected | Aircraft Location | Total Flight Hours When Primed | Total Flight Hours When Inspected | Flight Hours Since Primed |
|---|---|---|---|---|---|
| Jan 98 | 12-17-98 | Lemoore | 2648 | 3099.5 [a] | 451.5 |

[a] Hours provided by squadron.

These inspection results and summary were prepared by Larry Triplett, Boeing, Aircraft & Missiles Systems, and reviewed by Tim Woods, NADEP North Island, and F. D. Kisor, representing Wright Laboratories, Wright Patterson Air Force Base (AFB).

## 3. INSPECTION RESULTS

Aircraft #164638 was inspected on December 17, 1998, at Naval Air Station (NAS) Lemoore. There was less touch-up than expected based on the amount seen on other aircraft after similar periods at sea. All touch-up that was visible had been performed with a roller applicator using TT-P-2756 (self-priming topcoat). Squadron personnel noted that they used no conversion coating or primer prior to application of touch-up paint. Squadron personnel also stated, when asked, that this aircraft did not require additional maintenance, when compared to other aircraft, nor did one side require additional maintenance compared to the other side.

There were several areas of corrosion identified on the upper surfaces mainly around fasteners and at the periphery of some skins as shown in Figures 1 and 2. The corrosion was filiform type corrosion initiated at the fasteners or the edge of the skins. Corrosion extended less than one-eighth inch from initiation points except one location on the left-hand side noted in Figure 2.

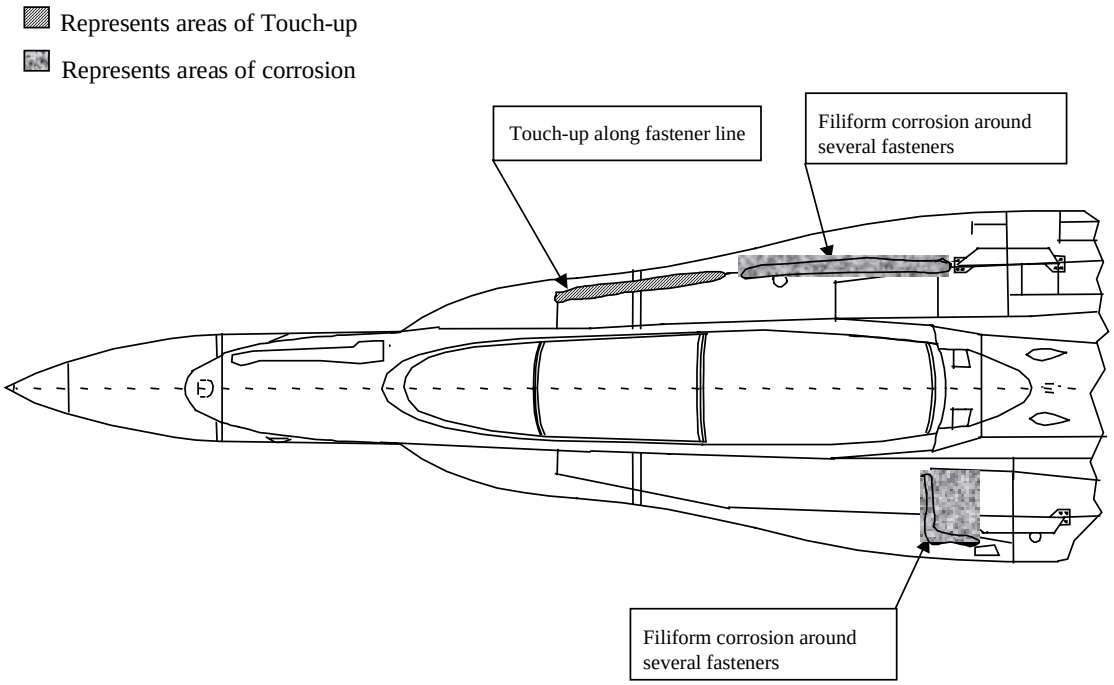


**Figure 1. F/A-18 #164638, View Looking Down**

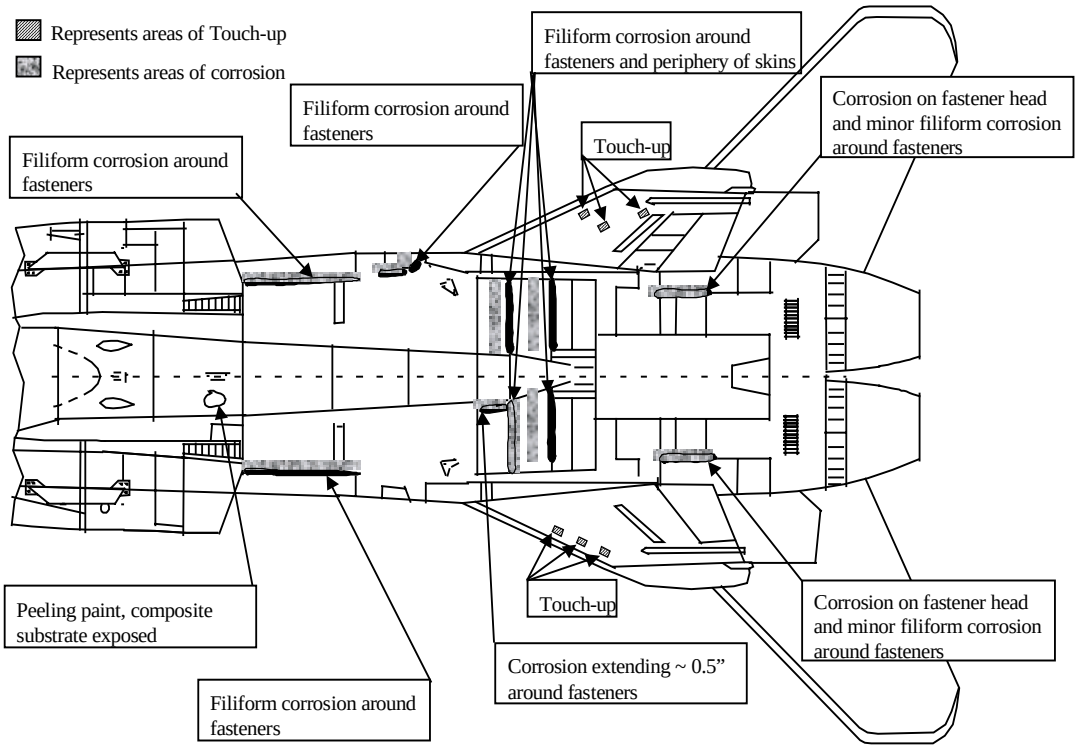


**Figure 2. F/A-18 #164638, View Looking Down**

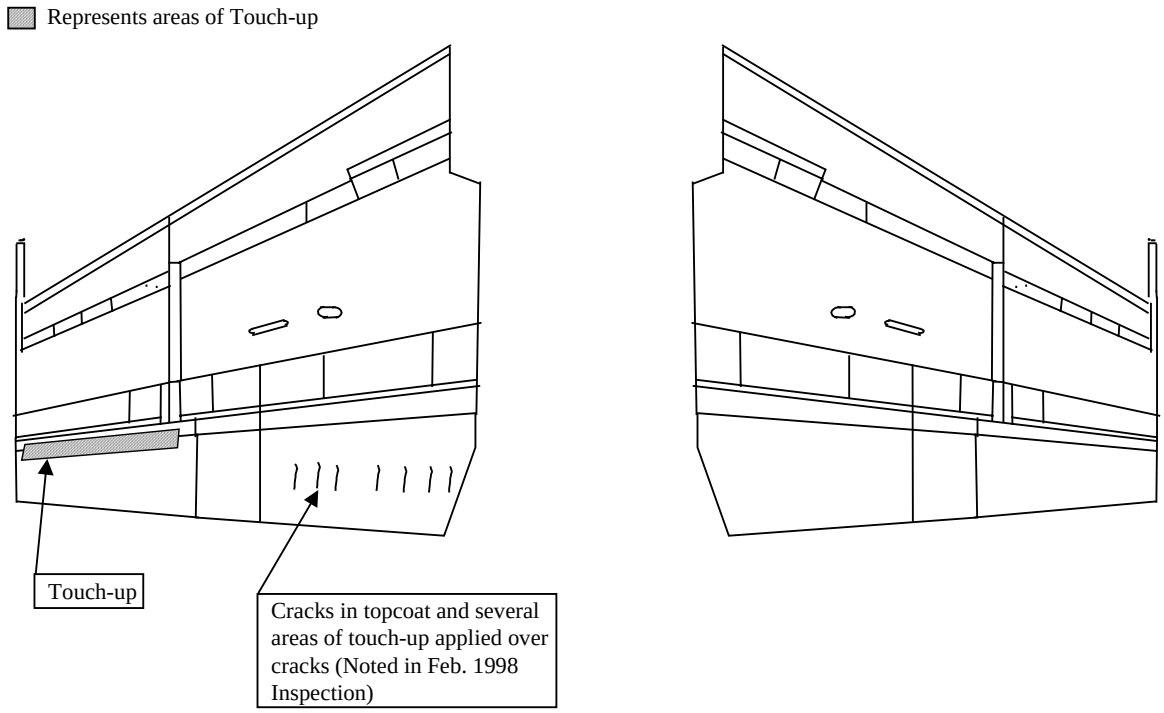


**Figure 3. F/A-18 #164638, View Looking Down**

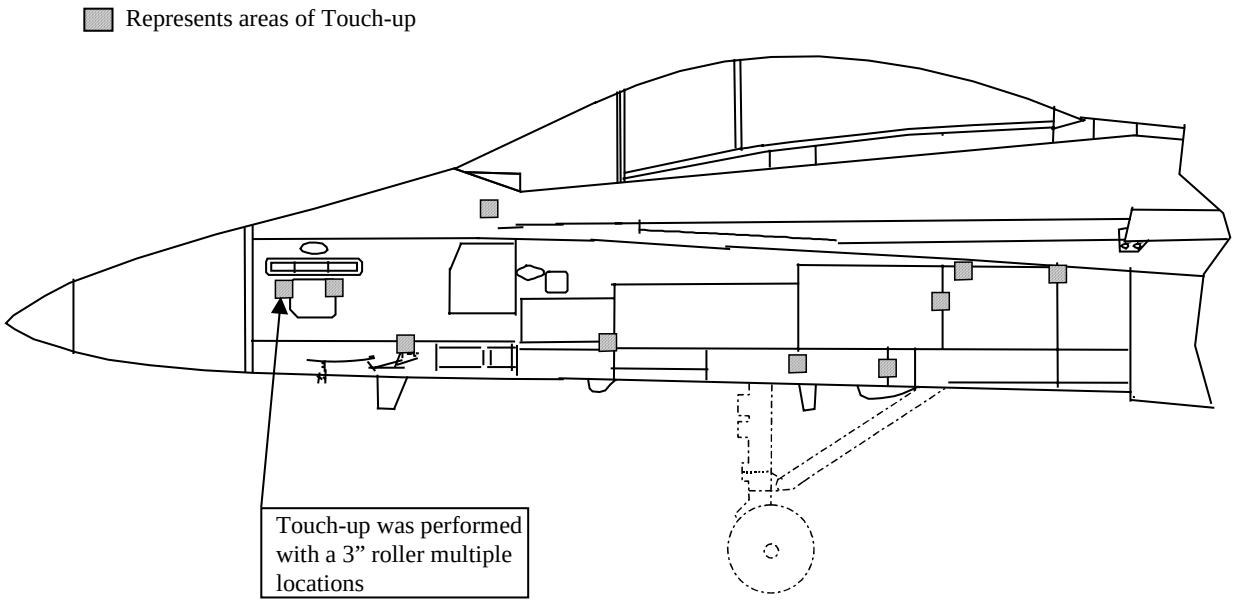


**Figure 4. F/A-18 #164638, Left Hand View**

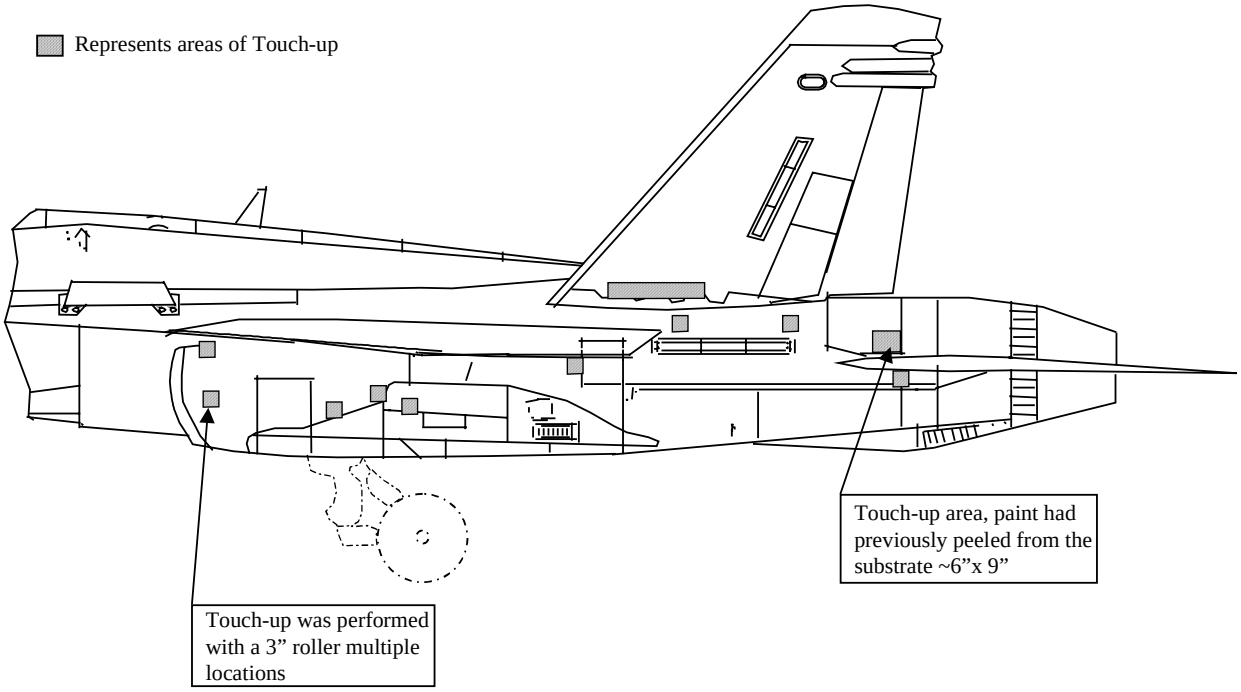


**Figure 5. F/A-18 #164638, Left Hand View**

Represents areas of Touch-up

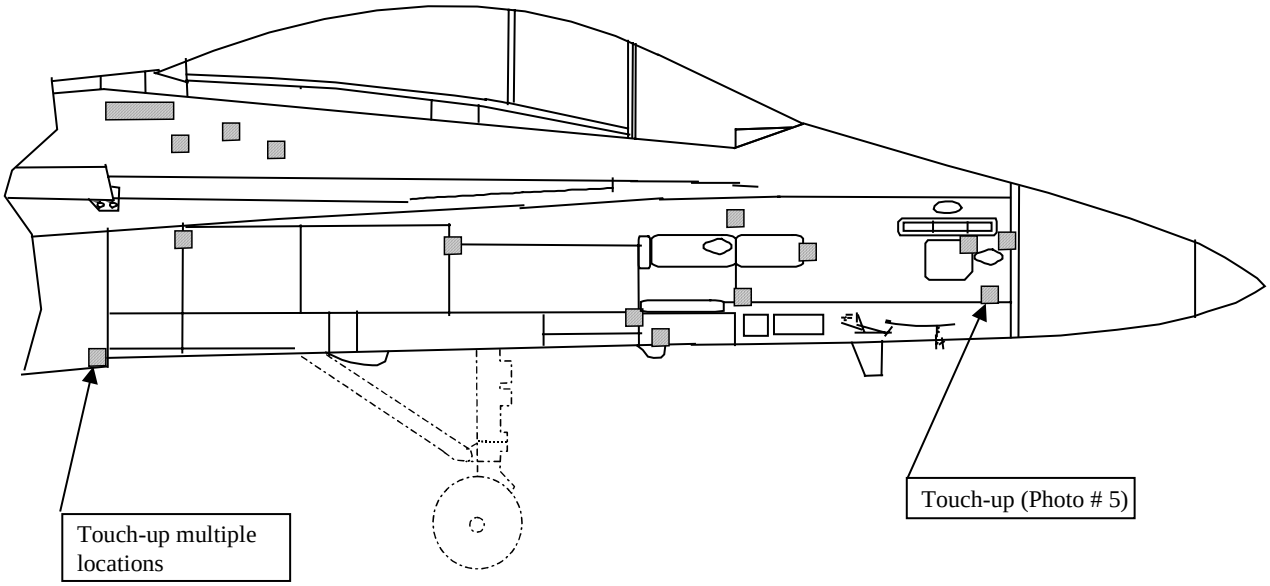


**Figure 6. F/A-18 #164638, Right Hand View**

Represents areas of Touch-up

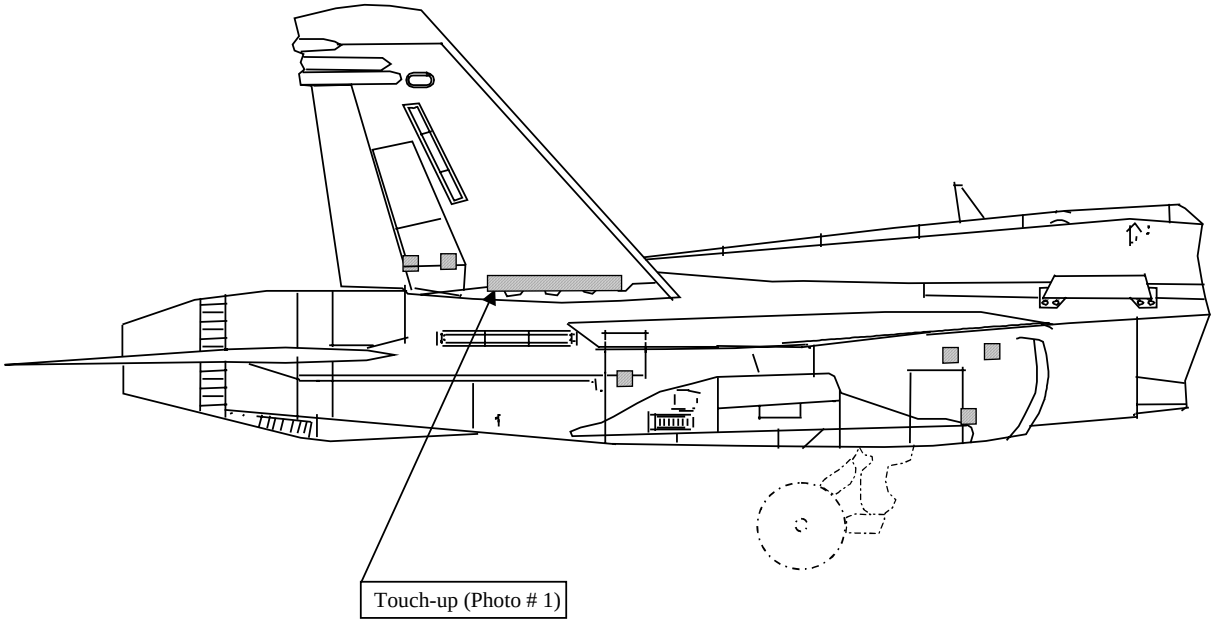


**Figure 7. F/A-18 #164638, Right Hand View**

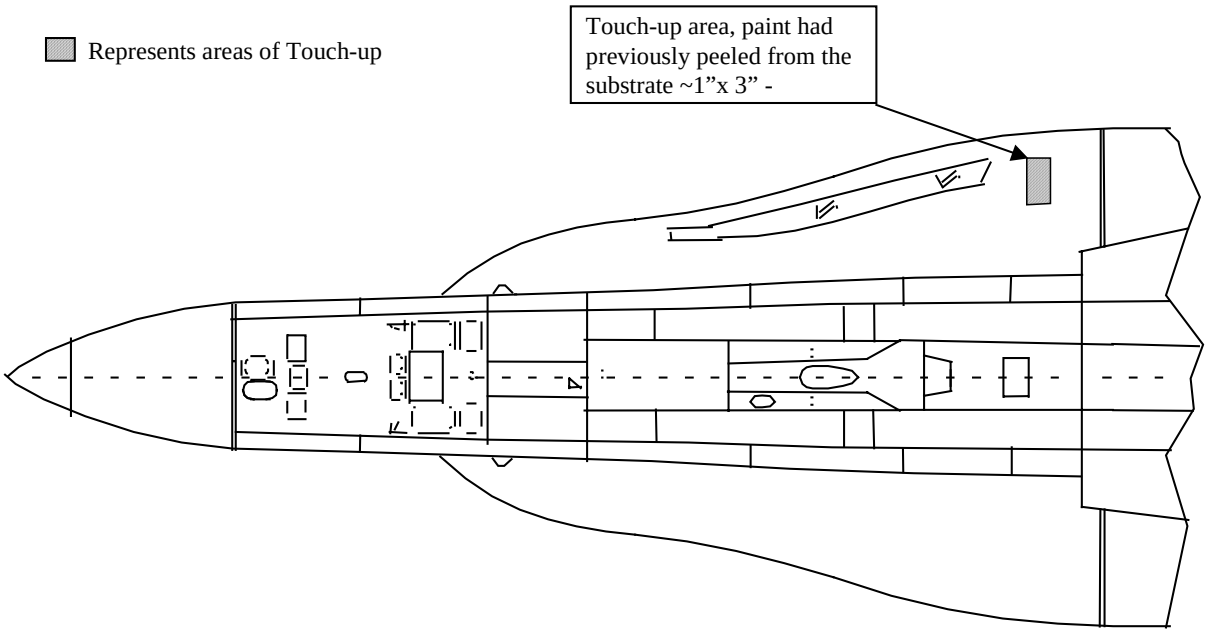


**Figure 8. F/A-18 #164638, View Looking Up**

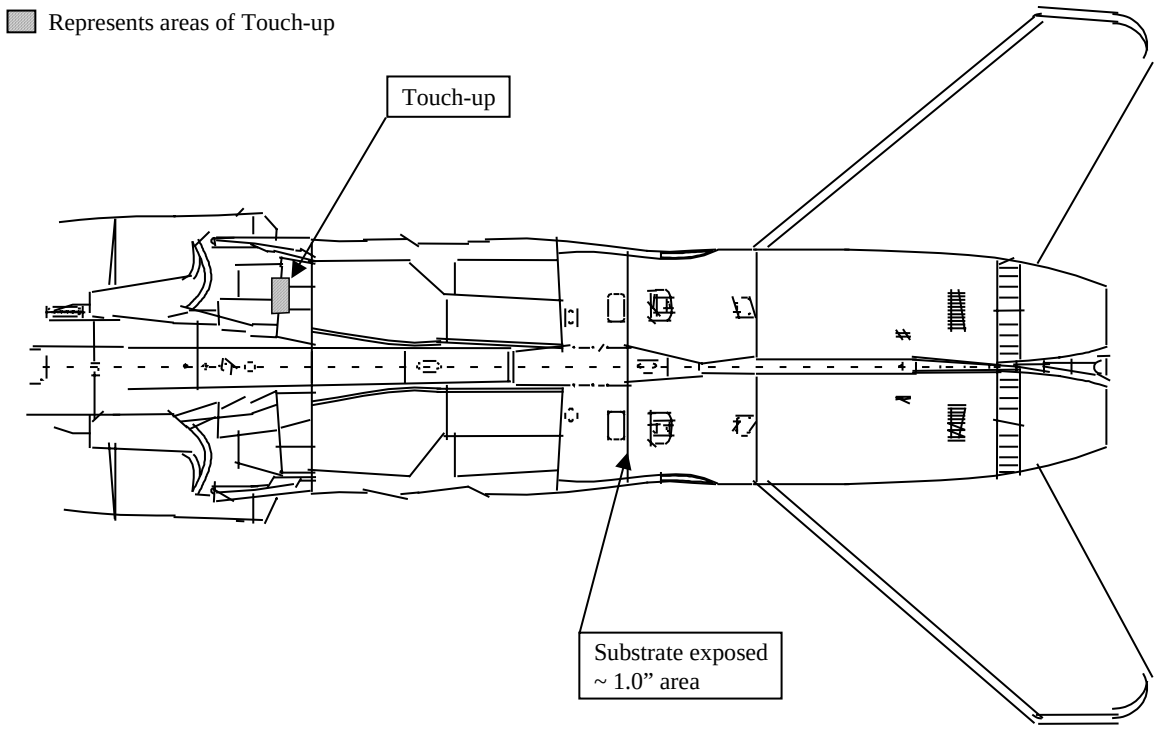


**Figure 9. F/A-18 #164638, View Looking Up**

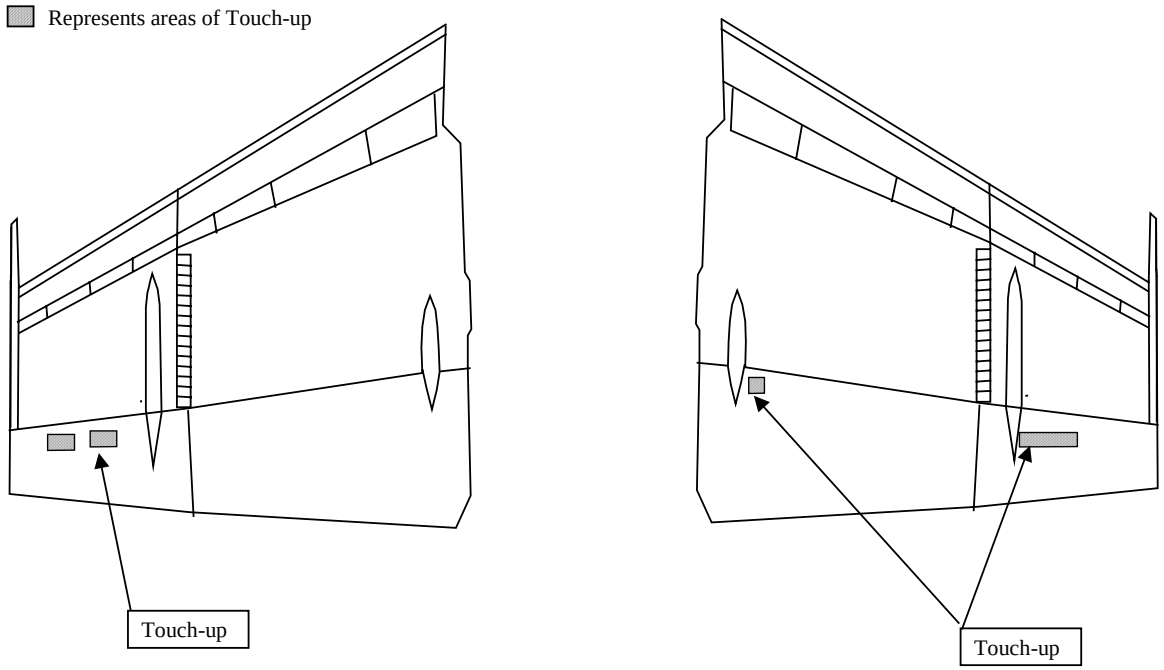


**Figure 10. F/A-18 #164638, View Looking Up**

## 4. SUMMARY

The amount of corrosion seen on this aircraft was not uncommon after a six-month deployment based on other aircraft inspections and the statements from squadron personnel. Aircraft BUNOs 164206 and 164258 were inspected in September after a six-month deployment on the USS John Stennis (Ref: Field Evaluation Report V, dated October 26, 1998). Both aircraft off the Stennis had considerably more touch-up paint in the areas where corrosion was seen on aircraft #164638. There were more corrosion locations on the right side but the location with the most severe corrosion was on the left side with the chromate primer. The major difference in the amount of corrosion was due primarily to the difference in the configuration of the aircraft Leading Edge Extension (LEX) in Figure 1. The corrosion on the right-hand LEX was adjacent to fasteners on removable panels, which are not present on the left-hand side.

There was no conclusive indication that the nonchromate primer is performing differently than the chromate primer.