

Field Evaluation Report

8 August 2003

Date of Trip: 9-18 June 2003

Location: Naval Air Station (NAS) Brunswick, ME
Cape Canaveral Air Force Station (AFS), FL
Patrick Air Force Base (AFB), FL
Naval Station (NS) Everett, WA

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Purpose of Trip:

Visit all test locations and document gloss and color measurement readings and inspect test articles for coating failure and corrosion.

Summary:

This survey completes the 18-month field test evaluation. All field evaluation report (FER) findings will be compiled into a final project report. Overall, the test topcoat materials were comparable with the baseline topcoat, MIL-PRF-85285. With exception being the Deft 0-VOC topcoat, semi-gloss green color number 24052. This material exhibited far more gloss loss and chalking at the 18-month point, than when initially identified at the 12-month inspection. Figure [1](#), [2](#), and [3](#) illustrate the typical

fading and chalking experienced on the 0-VOC test sections. Our conversation with the Deft Coating government sales representative, Mr. Chris Anthanasopoulos, (847) 698-7535, indicated his belief that the green, being a lab batch, contain substandard resins that were not UV resistant. The white coating was formulated earlier using a different resin batch number. Both the white and green 0-VOC materials were applied per the manufacturer's instructions on the same day. The white 0-VOC did not exhibit the same fading and chalking characteristics as was shown on the Cape Canaveral AFS and Patrick AFB FL test panels. The semi-gloss green 0-VOC coating applied to the de-icing truck panel located in Brunswick ME, was protected from UV exposure, and did not exhibit chalking or fading. Based upon this information, we concur with the coating formulator that the chalking and fading exhibited on the semi-gloss green was the result of a substandard resin used by the coating formulator for the semi-gloss green test coating batch.

Coatings 1 and 2 are both thermoset powder coating systems. Both systems performed exceptionally well except when the test articles were exposed to high heat. Both powder coating systems exhibited micro-cracking/crazing on the Navy A/S47A-1 Enclosure panel that was assigned to the USS Abraham Lincoln, see Figure 4. This panel was exposed to almost continual use on-board the USS Abraham Lincoln while deployed at sea for approximately 10.5 months. We are unable to determine at what point the powder coated sections began to exhibit the micro-cracking/crazing. However, the panel in question is positioned directly over two turbine engine exhaust vents, see Figure 5. The baseline coating displayed heat damage in areas approximately 12-inches in diameter in the baseline coating area and 6 inches in diameter in the 0-VOC coating area, see Figure 6 and 7. Thermal profiling of the affected heat zones were not accomplished, however based upon the visual discoloration exhibited the damage is consistent with coating being in a range capable of visual discoloration of the baseline coating. The micro-cracking/crazing did not result in chipping or peeling of the coating. There was one area of corrosion noted in the coating 2 and coating 5 area where a part had been removed and the coating had deteriorated, see Figure 8.

All of the primer systems exhibited overall excellent corrosion protection and adhesion properties.

Test Panel Control # J-99-OC-014-02 and J-99-OC-014-03 were removed from testing on 18 Dec 02 as the panels had been repainted by US Navy personnel while awaiting installation at NADEP Jacksonville.

Findings:

As noted in the initial and follow-on reports there were several coating defects purposely induced in the initial coating application as a part of this test, see Figure 9. Those areas will not be part of the coating comparison scoring. However, the coating defects will be evaluated subjectively as to any coating deterioration or corrosion propagation noted during the 18-month test. The induced defects are those such as rust formed in the hinge and/or seam areas (e.g. missed in hidden areas; opened piano hinge and Faraday Effect of the powder coating) during the initial coating application.

Cape Canaveral AFS, FL

Aircraft Generator, USAF Registration No. 80X1005, Field No. 140, Test Panel Control # J-99-OC-014-07

All five of the coatings have a faded and chalking appearance, but are otherwise sound except as noted below. The fender was cleaned with a wet rag and wiped dry to remove any dust and dirt. Coatings 3 (Deft three part coating) and 4 (Aqua Poxy 912 with Deft Zero VOC topcoat) have faded more than any of the other coatings. Coatings 3, 4, and 5, (baseline coating), all had spots of corrosion. The spot in coating 3, had some minor undercutting taking place, but was not severe. The upper edge of coating 5 has begun to rust the entire length of the panel. Additionally, the right hand top corner is blistering with visible rust approx 3”L x ¼” W, see Figure [10](#). Coating 2 aft edge has been damaged and has begun to rust; probable cause of the coating damage may have been from being hit by another object. Pre-existing corrosion located in a seam weld area has not progressed beyond the surface rust previously reported. Wash schedules and materials are the same as reported on our initial visit.

Aircraft Generator, USAF Registration No. 87X1372, Field No. 150, Test Panel Control # J-99-OC-014-08

All five of the coatings have a faded and chalking appearance, but are otherwise sound except as noted below. The fender was cleaned with a wet rag and wiped dry to remove any dust and dirt. Coatings 3 (Deft three part coating) and 4 (Aqua Poxy 912 with Deft Zero VOC topcoat) have faded more than any of the other coatings. The upper edge of coating 5 has begun to rust the entire length of the panel. Pre-existing corrosion located in a seam weld area has not progressed beyond the surface rust previously reported. Wash schedules and materials are the same as reported on our initial visit.

Aircraft Generator, USAF Registration No. 83X1003, Field No. 137, Test Panel Control # J-99-OC-014-09

All five of the coatings have a faded and chalking appearance, but are otherwise sound except as noted below. The fender was cleaned with a wet rag and wiped dry to remove any dust and dirt. Coatings 3 (Deft three part coating) and 4 (Aqua Poxy 912 with Deft Zero VOC topcoat) have faded more than any of the other coatings. The upper edge of coating 5 has begun to rust the entire length of the panel. Pre-existing corrosion located in a seam weld area has not progressed beyond the surface rust previously reported. Wash schedules and materials are the same as reported on our initial visit. Minor corrosion reported on the edge of the wheel well opening, coating 3 (Deft three part coating) reported in our last visit has not progressed beyond surface rust.

Patrick AFB, FL

NF-2 Light Cart, Field No. R-96, Test Panel Control # J-99-OC-014-04

The overall coatings are sound, but the appearance of the door panel has significant fading and chalking with coatings 3 and 4 being more severe of the 5 coatings. The minor corrosion in coating # 3, (Deft three part coating) identified during our last visit has not progressed. During equipment operation the door would be open position and not be properly latched. This caused the corrosion and chipped paint that occurred when the door hit the gas cap. Pre-existing corrosion located in the hinge and latch area has not progressed beyond the surface rust previously reported. This unit was coated with Corrosion "X" Corrosion Preventative Compound (CPC), which is used by maintenance personnel to help reduce corrosion on assigned equipment. The Corrosion "X" was removed using a General Purpose Detergent, 7930-00-926-5280, Fed Spec P-D-1747C, Class 1. The 920 MXS maintenance personnel provided this product.

NF-2 Light Cart, Field No. R-97, Test Panel Control # J-99-OC-014-05

Overall the coatings are sound but the appearance of the door panel is exhibiting significant fading and chalking with coatings 3 and 4 being more severe of the 5 coatings. The minor corrosion in coating # 3, (Deft three part coating) identified during our last visit has not progressed. . During equipment operation the door would be open position and not be properly latched. This caused the corrosion and chipped paint that occurred when the door hit the gas cap. Pre-existing corrosion located in the hinge and latch area has not progressed beyond the surface rust previously reported. This unit was coated with Corrosion "X" (CPC), which is used by maintenance personnel to help reduce corrosion on assigned equipment. The Corrosion "X" was removed using a General Purpose Detergent, 7930-00-926-5280, Fed Spec P-D-1747C, Class 1. The 920 MXS maintenance personnel provided this product.

NF-2 Light Cart, Field No. R-98, Test Panel Control # J-99-OC-014-06

The overall coating is sound and the appearance of the door panel has significant fading and chalking with coatings 3 and 4 being more severe of the 5 coatings. Minor rust found inside the door bottom lip was caused by a piece of tape which was not removed during the initial coating application was completed, has not progressed beyond the surface rust reported during our last visit. None of the pre-existing corrosion previously reported has progressed beyond surface rust. This unit was coated with Corrosion "X", (CPC), which is used by maintenance personnel to help reduce corrosion on assigned equipment. The Corrosion "X" was removed using a General Purpose Detergent, 7930-00-926-5280, Fed Spec P-D-1747C, Class 1. The 920 MXS maintenance personnel provided this product.

NAS Brunswick, ME

De-Icing Truck Boom Cover Plate, Field No. T-46, Test Panel Control # J-99-OC-014-10

The overall appearance of the panel looks good. This panel does not show any signs of fading or chalking, (Note: test coatings were on the interior side of the panel away from the sun and Ultra-violet light). The panel had numerous scuffmarks and scratches in coating numbers 1, (Dupont powders), 2, (Morton powder with Zinc Rich primer), and 5, (base line coating). These discrepancies have not deteriorated beyond what was reported during our last visit. Pre-existing corrosion located in a seam weld area has not progressed beyond the surface rust previously reported.

Towing Tractor Hood, Field No. LTC-084, Test Panel Control # J-99-OC-014-11

The overall visual appearance of the hood looks good with no fading or chalking . No major corrosion was noted during this visit. Prior to taking gloss and color measurement readings a road film was removed. The hood was cleaned using a cleaner, Oasis 136, 7930-01-398-0955, manufactured by ECOLAB and rinsed with water. It is a mild detergent used by Navy maintenance personnel. As previously reported coating 5, (baseline coating), had a small chip that went to the substrate; probable cause may have been a dropped tool. Minor corrosion was observed on the substrate at the chip. Coatings 1, (DuPont powders), and 2, (Morton powder with Zinc Rich primer), were worn and scratched on the leading edge corners; probable cause was standing on end prior to installation. None of these discrepancies show any creepage or under cutting of the coatings.

NS Everett, USS Abraham Lincoln

TAC 4 Tow Tractor, Field No. QBPFQJ124, Test Panel Control # J-99-OC-014-01

A/S47A-1 Enclosure Panel, Test Panel Control # J-99-OC-014-01, is assigned to the USS Abraham Lincoln stationed at Naval Station Everett, Washington. We were unable to inspect this panel at the 12-month point due to a real world deployment. The tow tractor, upon which the panel is installed, is used exclusively on deck during deployments. The panel was cleaned with cleaning compound Oasis 136, Solvent-Detergent Cleaning Compound, Manufactured by ECOLAB Inc. Coating 2 had minor corrosion under a latch or bracket had been removed. The corrosion noted in the first visit has progressed from mild to moderate. Coatings 3 and 4 had yellowed significantly and each had a minor chip with minor corrosion noted on the bare metal. Coating 5 had mostly scuffmarks and scratches and some yellowing due to an exhaust heat source from the engine compartment. The outer edge corner had corrosion, with some minor undercutting taking place.

Metallized Support Equipment (Patrick AFB, FL)

We were asked to document the progress of support equipment, which were sprayed with Zinc/Aluminum 85/15 Metal Wire Arc Spray (MWAS). In 1999 the 920th MXS/LGMMG, Aerospace Ground Equipment personnel sandblasted four different pieces of support equipment due to severe corrosion, (a.) Aircraft -86 Generator, (b.) F-2 Utility Trailer, (c.) B-1 Maintenance Stand, (d.) MC-2A Air Compressor. Each piece had to be blasted to a two mil surface profile for the MWAS to adhere to the substrate. Once applied, the zinc/aluminum material would protect the steel substrate from corroding. After 4 years in-service corrosion has been eliminated in those areas where the surface was properly prepared and the MWAS material was applied. The field organization is extremely satisfied with the material and has acquired the necessary equipment to begin coating all appropriate support equipment once the MWAS process is included in the next change to T.O. 35-1-3, Cleaning, Corrosion Prevention and Control, Painting and Marking of USAF Support Equipment.

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Figure 1 – Side by side comparison of panel with chalked coating removed and not removed

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Figure 2 – Chalked 0-VOC coating removed

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Panel 3 – Typical color/shade variation noted on all of the 0-VOC coating, semi-gloss green test panels

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Figure 4 – Close-up enhanced photo of the micro-cracked/crazed powder coating on panel 01

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Figure 5 –Circled areas highlight typical heat vent source areas on the A/S47A-1 Enclosure panel

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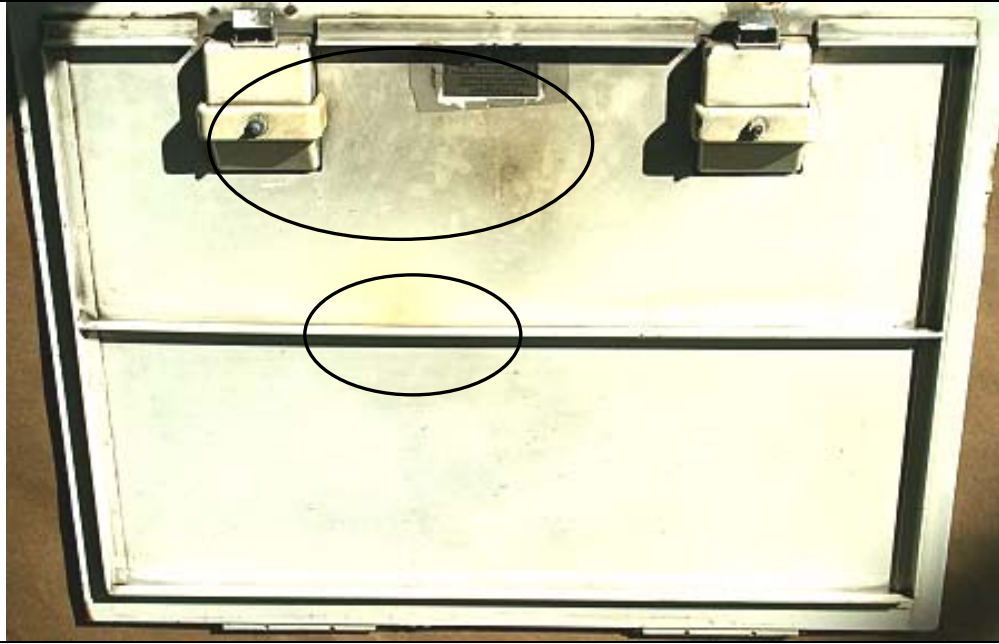


Figure 6 – TAC 4 Huffer panel interior view. Circled areas indicate discoloration from the auxiliary power unit heat exhaust

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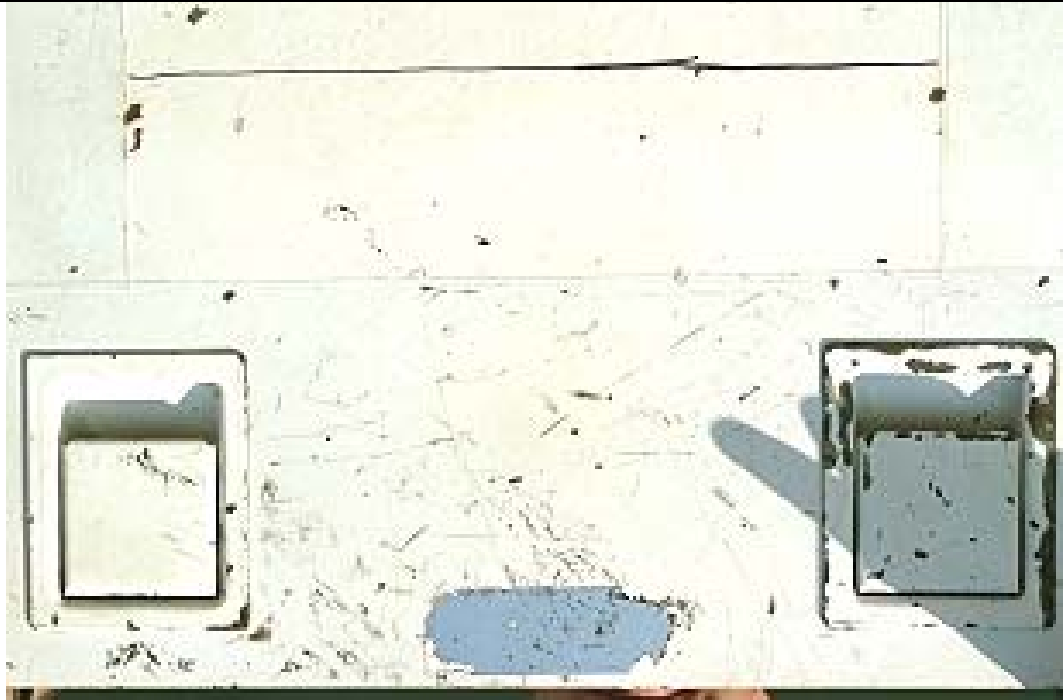


Figure 7 – External view of heat zones – Black line indicates stiffener location on the underside.

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Figure 8 – Panel 01 - Damage noted on coating system 2 and 5

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Figure 9 – Typical induced coating defect after 18-months exposure at Cape Canaveral AFS, FL

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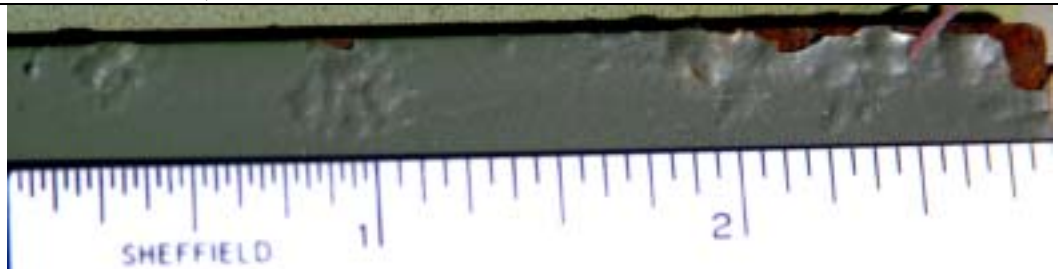


Figure 10 - Panel 07 Corrosion noted on edge of the panel in the baseline coating section