

Date: April 28th, 2004
To: Robert McHugh
From: Mark P. Johnson
Subject: IWA 030295 – Test Wax and Polish
NuPower II paint cleaner Testing per D6-17487, Revision P, 2003

At the request of the US Air Force One, Boeing Materials Technology tested the Nuvite **NuPower II** to the tests called out in D6-17487, Rev. P (2003) – “Evaluation of Airplane Maintenance Materials; Certification Testing of Airplane Maintenance Materials; Qualification Testing of Airplane Maintenance Materials”.

Testing was performed under BMT Lab Work Requests 200400870-S00 and the **NuPower II** paint cleaner passed all of the required tests. These tests included sandwich corrosion, acrylic crazing, paint softening and hydrogen embrittlement. The paint-softening portion of the evaluation was performed on the BMS10-72, Ty VIII paint system (Akzo 10P20-44 primer + PRC-DeSoto Desothane HS topcoat). See the attached test report for the complete test results (attachment A).

Successful passage of these tests ensures that the referenced cleaner will not damage the airplane or its components through normal uses of cleaners and polishes. However, Boeing makes no claims or guarantees as to the actual performance of the wax and polish. Lab testing indicated that the **NuPower II** has a less detrimental affect on subsequent paint adhesion than the currently-used wax, but enough residual material of almost any material can negatively affect coating adhesion.

Boeing has no technical objection to the use of the **NuPower II** by maintenance facilities for maintenance purposes.

If you have any questions, please feel free to contact the undersigned.



Mark P. Johnson
Boeing Commercial Airplanes
Materials and Process Technology -Boeing Materials Technology
425-237-7163

[NuPower II Online details LINK](#)

Attachment A

D6-17487 Tests for General Paint Cleaners: Nuvite “NuPower II”

Job # 5-M510P-0008-030295
LWR # - 200400870-S00

Perform hydrogen embrittlement, paint softening, acrylic crazing and sandwich corrosion testing on the Nuvite “NuPower II” per D6-17487, Revision P, 2003.

Test #7

7 SANDWICH CORROSION TEST PROCEDURES

Specimen preparation, testing, and interpretation shall be in accordance with ASTM F 1110 using the following materials and with the following exceptions:

a. Reagents and materials exceptions:

- (1) Clad 7075-T6 aluminum alloy in accordance with QQ-A-250/13 (AMS 4049 or AMS-QQ-A-250/13 optional) (2024-T3 Al clad specimens are neither required nor optional.)
- (2) Bare 7075-T6 aluminum alloy in accordance with QQ-A-250/12 (AMS 4045 or AMS-QQ-A-250/12 optional) anodized in accordance with BAC 5019 or MIL-A-8625, Type I. Anodize shall be sealed. (2024-T3 non clad specimens are neither required nor optional.)
- (3) Distilled or deionized water may be used in place of ASTM F 1193, Type IV reagent grade water for control specimens.
- (4) The filter paper may be Whatman No. 5 or equivalent in place of Whatman GFA glass fiber paper.

b. Procedure exceptions:

- (1) The filter paper strips shall be 1 by 3 inches and shall be placed in the center of the sandwiched specimens.
- (2) Each sandwich specimen shall be held together with waterproof tape, with no more than 1 piece of tape (maximum width 0.75 inch) on each of two opposite edges.

c. Interpretation of results exceptions:

- (1) Leaching or lightening of the chromate sealed anodize coating shall not be cause for rejection.
- (2) Deposits or residues from the material being tested that are not products of corrosion of the test panel surface shall not be cause for rejection.
- (3) Special procedure for evaluation of fire extinguishing foams and liquids. Panels with very light darkening or staining, which have no obvious metal attack or pitting, may be swabbed (cotton-tipped swabs or cotton gauze) with a 0.26 mole/liter sulfuric acid solution and re-examined. If the coloration is substantially removed and there is no evidence of metal attack or pitting, the condition shall not be cause for rejection. (The 0.26 mole/liter sulfuric acid solution can be prepared by adding 1.5 cc of concentrated sulfuric acid(S.G.= 1.84) to 100 cc of distilled or deionized water.)
- (4) Panels shall have a rating of 1 (no more than 5 percent of the surface area shall be corroded) or better in accordance with ASTM F1110. The preferred method of determining the corroded area is by using image analysis. Other means approved by the purchaser may be substituted.
- (5) Any corrosion in excess of that shown by the control group shall be cause for rejection.

Sandwich Corrosion Test Results:

Specimen Type	Corrosion Rating (one rating per specimen)				Corrosion Result (Pass/Fail)			
Clad 7075-T6/Control, DI Water	0	0	0	0	Pass	Pass	Pass	Pass

Clad 7075-T6/Nu-Power II	0	0	0	0	Pass	Pass	Pass	Pass
Bare 7075-T6/CAA Sealed/Control, DI Water	0	0	0	0	Pass	Pass	Pass	Pass
Bare 7075-T6/CAA Sealed/Nu-Power II	0	0	0	0	Pass	Pass	Pass	Pass

5.4 Relative corrosion severity rating system:

Appearance/Corrosion:

0—No visible corrosion and no discoloration present

1—Very slight corrosion or discoloration, and/or up to 5 % of area* corroded

2—Discoloration and/or up to 10 % of area* corroded

3—Discoloration and/or up to 25 % of area* corroded

4—Discoloration and/or more than 25 % of area* corroded, and/or pitting present

* "Area" refers to area under the filter paper, or if no filter paper is used, the area where the test material was applied.

Test # 9

9 ACRYLIC CRAZING TEST PROCEDURE

The material being tested shall not craze, crack, or etch acrylic test specimens when tested in accordance with ASTM F 484 using Type C (stretched acrylic plastic in accordance with MIL-P-25690) stressed to an outer fiber stress of 4500 psi.

Test Specimen	10 min	30 min	1 hour	2 hour	4 hour	8 hour	Overall
ASTMF-484, Specimen C + Nu-Vite "Nu-Power II" Specimen 1	Pass	Pass	Pass	Pass	Pass	Pass	Pass
ASTMF-484, Specimen C + Nu-Vite "Nu-Power II" Specimen 2	Pass	Pass	Pass	Pass	Pass	Pass	Pass

Test #13:

13 PAINT SOFTENING TEST PROCEDURE

a. Testing shall be in accordance with ASTM F 502 using the following coating systems:

(1) BMS10-79, Type II primer applied in accordance with BAC5882 plus BMS10-60, Type II enamel in accordance with BAC 5845.

(2) BMS10-79, Type III primer applied in accordance with BAC5882, plus BMS10-100 coating in accordance with BAC5797.

b. Three specimens conforming to Section 13a.(1) and three specimens conforming to Section 13a.(2) shall be used for each test condition.

c. The material being tested shall not produce a decrease in film hardness greater than two pencils, or any discoloration or staining.

NOTE: Slight darkening of the BMS10-100 surface is acceptable.

From ASTM F-502:

7.3 Procedure:

7.3.1 Determine if cleaner causes discoloration:

1. Place the test panels in a horizontal position in an oven maintained at 100 ± 5°F (38 ± 2°C).
2. Apply the test solution to approximately one half the area of each panel and allow to remain on the panels for 30 min.
3. Then remove the panels from the oven and rinse with distilled or deionized water and allow to air dry for 24 h.
4. Examine for streaking, discoloration, or blistering of the finish.

7.3.2 Determine the hardness of the treated and untreated areas in the following manner:

1. Hold pencils of decreasing hardness by hand at a 45° angle (see Fig. 1) and push across the paint film with a firm uniform pressure until a pencil is found that will not cut the film but will leave a black mark on the surface, whereas the next hardest pencil will cut through the film without leaving a black mark.
2. The hardness number of the pencil that cuts the film shall express film hardness.
3. Make at least three determinations on both exposed and unexposed portions of the coated panel.

BMS10-79 type II to be used is 10P20-44/EC-265/TR-114

BMS10-60, type II enamel to be used is Desothane HS CA8000/CA8000B/CA8000C

BMS10-79 type III to be used is the 515X349/910X482

BMS10-100 “UltraFlex” 763-66-9200 + any one of the 4 thinners

Paint Softening Test Results:

Specification	Pencil Hardness Before Exposure (one specimen per box)			Pencil Hardness After Exposure(one specimen per box)			Discoloration or Staining (one specimen per box)		
	5H	5H	5H	5H	5H	5H	None	None	None
BMS10-79, Type II + BMS10-60, Type II	5H	5H	5H	5H	5H	5H	None	None	None
BMS10-79 Type III + BMS10-100	5H	5H	5H	5H	5H	5H	None	None	None

Test #14:

HYDROGEN EMBRITTLEMENT TEST PROCEDURE

Hydrogen embrittlement testing shall be in accordance with ASTM F 519–93 using cadmium plated Type Ia, 1c, or 2a specimens. All requirements of ASTM F 519–93 for specimens, preparation, testing, and reporting shall apply. Type Ia specimens shall meet the requirements of D6–4307.

10. Report

10.1 A test report shall produced upon completion of testing that bears the following minimum information:

10.1.1 A lot acceptance and sensitivity certification report.

10.1.2 The type and number of specimens tested.

Three of the Type 1a. specimens were tested

1.6.1 Type I-Notched:

1.6.1.1 Type Ia-Round bar, loaded in tension, under constant load.

10.1.3 A description of the plating process and test environment (concentration, temperature, and so forth) if other than ambient air.

The Nu-Power II was tested as supplied, with no dilution or conditioning.

10.1.4 The sustained or threshold load, or percent of notched fracture strength or notch bend strength of unplated specimens, or displacement as appropriate for the type of specimen tested.

8.2.6.1 **Type Ia**-Assemble a minimum of three test specimens and place in tension (example shown in Fig. 1 i).

Load specimens to 45 % of the notched ultimate tensile strength.

Fill cups with the test solution and record the time to failure if less than 150 h.

The test may be discontinued after 150 h (see 1.4).

10.1.5 The time under load in the test environments.

Specimen #	Time to Failure	Result (Pass/Fail)
Tower #1 –	150+	Pass
Tower #2 –	150+	Pass
Tower #3 -	150+	Pass

D6-17487 Test Specimens, Post Exposure, All Passing

