SMI, Inc.

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Attn: Dan Reid
HR Toughguard, LLC
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Tigard, OR 97223

Date: 03-Apr-2012

SMI/REF: 1201-227

Product: **TOUGHGUARD "STEP 1 POLARIZING WASH"** *(received 02-Feb-2012)*

Dilution: Concentrate (neat) and 2 ounces per gallon

Douglas Aircraft Company Customer Service Document
CSD No. 1
Reissued July 1997
Type I: Materials and Procedures for General Exterior Cleaning of Painted and Unpainted Surfaces
(General Purpose Cleaner)

Effect on Painted Surfaces	Conforms
Residue	Conforms
Sandwich Corrosion	Conforms
Stress Crazing Test on Acrylic Plastics	Conforms
Immersion Corrosion, Aluminum	Conforms
Cadmium Removal	Conforms
Hydrogen Embrittlement	Conforms

Respectfully submitted,

Patricia D. Viani, SMI Inc.

1. Effect on Painted Surfaces Test: The material shall not produce a decrease in paint film hardness greater than one pencil; that is the number of the next softer pencil, or any discoloration or staining when tested in accordance with ASTM F 502. At least two panels shall be used per test.

As received: ***No softening or discoloration of polyurethane topcoat when checked 24 hours after exposure per ASTM F 502.***

Dilute: ***No softening or discoloration of polyurethane topcoat when checked 24 hours after exposure per ASTM F 502.***

Result Conforms

2. Residue Test: The material shall leave no residue or stain when tested in accordance with ASTM F 485.

AMS 4911: (As received): ***PASS*** *Dilute:* ***PASS***

AMS 4049: (As received): ***PASS*** *Dilute:* ***PASS***

Result Conforms

3. Sandwich Corrosion Test: The compound shall not cause significant corrosion of aluminum alloy faying surfaces when tested in accordance with the following conditions of temperature and humidity:
   * Alternate intervals of 16 hours in the humidity cabinet and eight hours in an oven. Beginning with the humidity cabinet exposure, the cycling test shall be continued for a total of seven days.
   * The humidity cabinet shall be maintained at 100° ±2°F (37.8° ± 1.1°C) and 98 to 100 percent relative humidity.
   * The oven shall be maintained at 100° ± 5°F (37.8° ± 2.8°C)

   Corrosion Rating:

0	=	No visible corrosion
1	=	Very slight corrosion or discoloration
2	=	Slight corrosion
3	=	Moderate corrosion
4	=	Extensive corrosion

3. Sandwich Corrosion Test: continued

Corrosion on any panel exceeding that obtained using tap water shall be considered excessive.

ALLOY	CONTROL	AS RECEIVED	DILUTE
2024-T3 Bare/Alodined per MIL-C-5541	1	1	1
2024-T3 Bare/Anodized per MIL-A-8625	1	1	1
2024-T3 Clad/Alodined per MIL-C-5541	1	1	1
2024-T3 Clad/Anodized per MIL-A-8625	1	1	1
7075-T6 Clad/Alodined per MIL-C-5541	1	1	1
7075-T6 Clad/Anodized per MIL-A-8625	1	1	1

Result Conforms

4. Stress Crazing Test on Acrylic Plastics: The compound shall not cause crazing, cracking, or other attack on acrylic based plastics when tested in accordance with ASTM F 484, using Type C material at a stress level of 4500 psi.

As received: ***No crazing, cracking, or other attack.***

Dilute: ***No crazing, cracking, or other attack.***

Result Conforms

5. Immersion Corrosion Test: The average weight loss of aluminum alloy specimens shall not exceed 10 milligrams per coupon when tested per ASTM F 483. The aluminum alloy 7075-T6 alclad coupons shall conform to Federal Specification QQ-A-250/13 Temp-T6, with corners and edges smoothed.

As received: ***0.7 mg after 168 hours***

Dilute: ***0.3 mg after 168 hours***

Result Conforms

6. Cadmium Removal Test: The average weight loss of cadmium from low hydrogen embrittlement cadmium plated steel shall not exceed 10 milligrams per coupon when tested per ASTM F 483. The test duration shall be 24 hours. The test specimens shall be 1 x 2 x 0.040 inch 4130 steel panels (MIL-S-18729) with corners and edges smoothed and then plated with 0.003 to 0.006 inch of low hydrogen embrittlement cadmium plating (P/N 7452876-23)

Note: Specimens were cadmium plated in accordance with ASTM F1111.

As received: < 0.1 mg after 24 hours

Dilute: 5.8 mg after 24 hours

Result Conforms

7. Hydrogen Embrittlement: Hydrogen Embrittlement testing shall be in accordance with ASTM F 519, Type 1C.

Specimens: Type 1c, cadmium plated per MIL-STD-870.
Load: 45% of notched fracture strength, 150 hours, 24°C

AS RECEIVED:
Specimen 1: No failure within 150 hours.
Specimen 2: No failure within 150 hours.
Specimen 3: No failure within 150 hours.
Specimen 4: No failure within 150 hours.

DILUTE:
Specimen 1: No failure within 150 hours.
Specimen 2: No failure within 150 hours.
Specimen 3: No failure within 150 hours.
Specimen 4: No failure within 150 hours.

Result Conforms

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Attn: Dan Reid
HR Toughguard, LLC
9430 SW Coral Street, Suite 202B
Tigard, OR 97223

Date: 26-Mar-2012

SMI/REF: 1201-215

Product: **TOUGHGUARD "STEP 2 PAINT PROTECTION SYSTEM"**
(received 02-Feb-2012 / 23-Feb-2012)

Dilution: As received

Douglas Aircraft Company Customer Service Document
CSD #1, Revised July 1997
Type V: Materials and Procedures for Polishing Aluminum Surfaces

Residue	Does not conform
Sandwich Corrosion	Conforms
Stress Crazing Test on Acrylic Plastics	Conforms
Immersion Corrosion, Aluminum	Conforms
Hydrogen Embrittlement	Conforms

Respectfully submitted,

Patricia D. Viani, SMI Inc.

Residue Test: The material shall leave no residue or stain when tested in accordance with ASTM F 485.

Note: This test method, ASTM F485, is used to ensure that candidate aircraft surface cleaners do not leave a residue which, on drying, would leave a permanent stain requiring polishing to remove. Polishes sometimes leave a residue that does not rinse off with water, and but can be wiped off without leaving a stain, but this condition will be reported as non conformance based on the wording of the requirement, "...shall leave no residue...".

Alloy	*Visible residue after water-rinsing?*	*Visible residue after wiping?*	*Visible stain after rinsing or wiping?*
AMS 4911	****Yes (Does not conform)***	***None***	***None***
AMS 4049	****Yes (Does not conform)***	***None***	***None***

Result *Does not conform

Sandwich Corrosion Test: The compound shall not cause significant corrosion of aluminum alloy faying surfaces when tested in accordance with the following conditions of temperature and humidity:

* Alternate intervals of 16 hours in the humidity cabinet and eight hours in an oven. Beginning with the humidity cabinet exposure, the cycling test shall be continued for a total of seven days.
* The humidity cabinet shall be maintained at 100° ±2°F (37.8° ± 1.1°C) and 98 to 100 percent relative humidity.
* The oven shall be maintained at 100° ± 5°F (37.8° ± 2.8°C)

Corrosion Rating:

0 = No visible corrosion
1 = Very slight corrosion or discoloration
2 = Slight corrosion
3 = Moderate corrosion
4 = Extensive corrosion

Corrosion on any panel exceeding that obtained using tap water shall be considered excessive.

ALLOY	Tap Water Control	PRODUCT
2024-T3 Bare/Alodined per MIL-C-5541	1	**1**
2024-T3 Bare/Anodized per MIL-A-8625	1	**1**
2024-T3 Clad/Alodined per MIL-C-5541	1	**1**
2024-T3 Clad/Anodized per MIL-A-8625	1	**1**
7075-T6 Clad/Alodined per MIL-C-5541	1	**1**
7075-T6 Clad/Anodized per MIL-A-8625	1	**1**

Result Conforms

Stress Crazing Test on Acrylic Plastics: The compound shall not cause crazing, cracking, or other attack on acrylic based plastics when tested in accordance with ASTM F 484, using Type C material at a stress level of 4500 psi.

As received: No crazing, cracking, or other attack.

Result Conforms

Immersion Corrosion Test: The average weight loss of aluminum alloy specimens shall not exceed 10 milligrams per coupon when tested per ASTM F 483. The aluminum alloy 7075-T6 alclad coupons shall conform to Federal Specification QQ-A-250/13 Temp-T6, with corners and edges smoothed.

As received: + 0.7 mg after 168 hours (no visible corrosion)

Result Conforms

Hydrogen Embrittlement: Hydrogen Embrittlement testing shall be in accordance with ASTM F 519, Type 1c.

Specimens: Type 1C, cadmium plated per MIL-STD-870

Load: 45%, 23°C, notch immersed in product for 150 hours

As received:

Specimen 1: No failure within 150 hours.
Specimen 2: No failure within 150 hours.
Specimen 3: No failure within 150 hours.
Specimen 4: No failure within 150 hours.

Result Conforms