EXECUTIVE SUMMARY

To Whom It May Concern:

The MART Corporation, in consideration of the aviation industry's concerns regarding hydrogen embrittlement, obtained several certifications for this test and others on the MART Power-Kleen III L product.

The MART Power-Kleen III L product is a 100% Active Concentrate that was engineered for aircraft apparatus, assemblies and components. Specifically formulated for High Performance MART Power Washers systems, the MART Power-Kleen III L can be used at higher concentrations in lower performance jet spray washer applications.

The MART Power-Kleen III L has been formulated to provide excellent cleaning at low chemical concentrations while leaving no residue on the parts after rinsing. The benefit is cost effectiveness while ensuring that the required cleaning standards are achieved. It also provides longer bath life and cleaner parts over the life of the cleaning solution.

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Chemical & Environmental Services Manager

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Power-Kleen III L Table of Contents

Rev. 1.1/1998

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The MART Corporation
2450 Adie Road
Maryland Heights, MO 63043

Date: 04-Aug-1998

SMI/REF: 9804010-R
Reissued for name change only.

Product: **POWERKLEEN III L** (received 17-Apr-1998)

Dilution: As received and 4 oz / gallon

AMS 1526B
Cleaner for Aircraft Exterior Surfaces
Water-Miscible, Pressure-Spraying Type

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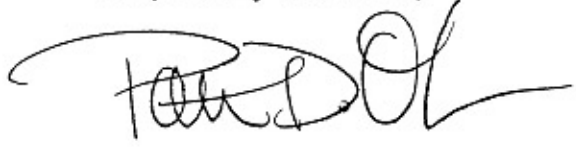
3.2.6	Effect on Unpainted Surfaces	Conforms
3.2.7	Storage Stability	Due April 1999

Respectfully submitted,



Patricia D. Otero, SMI Inc.

3.2.1.1 Sandwich Corrosion: Specimens, after test, shall show a rating not worse than 1 determined in accordance with ASTM F 1110.

	2024-T3 Anodized	2024-T3 Alclad	7075-T6 Anodized	7075-T6 Alclad
Concentrate	1	1	1	1
Dilute	1	1	1	1
Control	1	1	1	1

Result Conforms

3.2.1.2 Total Immersion Corrosion: The product shall neither show evidence of corrosion of the panels nor cause a weight change of any test panel greater than the following, determined in accordance with ASTM F 483:

PANEL	ALLOWABLE WEIGHT CHANGE $mg/cm^2/24hrs$	FOUND	
		As rec'd	Dilute
AMS 4037 Aluminum Alloy, anodized per AMS 2470	0.3	< 0.01	< 0.01
AMS 4041 Aluminum Alloy	0.3	< 0.01	< 0.01
AMS 4049 Aluminum Alloy	0.3	< 0.01	< 0.01
AMS 4376 Magnesium Alloy, dichromate treated as in AMS 2475	0.2	0.01	0.01
AMS 4911 Titanium Alloy	0.1	< 0.01	< 0.01
AMS 5045 Carbon Steel	0.8	0.01	< 0.01

Result Conforms

3.2.1.3 Low-Embrittling Cadmium Plate: Panels coated with low-embrittling cadmium plate shall not show a weight change greater than 0.3 mg/cm^2 per 24 hours, determined in accordance with ASTM F 1111.

As received: ***0.20 mg/cm^2 (no visible corrosion)***
Dilute: ***0.05 mg/cm^2 (no visible corrosion)***

Result Conforms

3.2.2 Hydrogen Embrittlement: The product shall be non-embrittling, determined in accordance with ASTM F 519, Type 1C.

As received: ***No failures within 150 hours.***
Dilute: ***No failures within 150 hours.***

Result Conforms

3.2.3 Flash Point: The flash point shall not be lower than 60°C (140°F), determined in accordance with ASTM D 56.

No flash to 141°F

Result Conforms

3.2.4 Effect on Transparent Acrylic Plastics: There shall be no crazing or staining of stretched MIL-P-25690 plastic, determined in accordance with ASTM F 484.

As received: PASS ***Dilute: PASS***

Result Conforms

3.2.5 Effect on Painted Surfaces: The product shall neither decrease the hardness of the paint film by more than 2 pencil hardness levels nor shall it produce any streaking, discoloration or blistering of the paint film, determined in accordance with ASTM F 502.

Result Conforms

3.2.6 Effect on Unpainted Surfaces: The product, tested in accordance with ASTM F 485, shall neither produce streaking nor leave any stains requiring polishing to remove.

Result Conforms

3.2.7 Storage Stability: The product shall neither show separation from exposure to heat or cold nor show an increase in turbidity greater than a control sample equally diluted to use concentration with ASTM D 1193, Type IV water, determined in accordance with ASTM D 1105.

Storage in progress

Result Due April 1999

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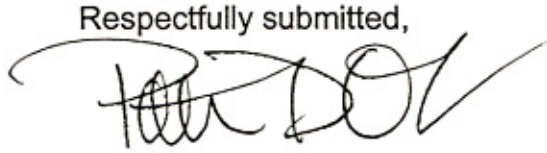
Product: **POWERKLEEN III L** (received 17-Apr-1998)

Dilution: As received and 4 oz / gallon

Douglas Aircraft Company Customer Service Document
CSD #1, Revised August 2, 1988
Type I: Materials and Procedures for General Exterior
Cleaning of Painted and Unpainted Surfaces

Effect on Painted Surfaces	Conform
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. Otero, 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 (4oz/gal): ***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	As Rec'd	Dilute	CONTROL
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: ***0.1 mg after 168 hours (no visible corrosion)***
Dilute (4 oz/gal): ***0.1 mg after 168 hours (no visible corrosion)***

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)

As received: ***5.1 mg after 24 hours (no visible corrosion)***
Dilute (4 oz/gal): ***1.3 mg after 24 hours (no visible corrosion)***

Result Conforms

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

As received: ***No failures within 150 hours.***
Dilute (4 oz/gal): ***No failures within 150 hours.***

Result Conforms

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Dilution: As received and 4 oz / gallon

BOEING D6-17487 REVISION L
Exterior and General Cleaners and Liquid Waxes

Sandwich Corrosion Test	Conforms
Acrylic Crazing Test	Conforms
Paint Softening Test	Conforms
Hydrogen Embrittlement Test	Conforms

Respectfully submitted,

Patricia D. Otero, SMI, Inc.

6. Sandwich Corrosion Test : Specimen preparation, testing and interpretation shall be in accordance with ASTM F1110 using the following materials and with the following exceptions:

Reagents and materials exception:

a. Clad 7075-T6 aluminum alloy in accordance with QQ-A-250/13 (2024-T3 Alclad specimens are neither required nor optional.)

b. Bare 7075-T6 aluminum alloy in accordance with QQ-A-250/12 anodized in accordance with BAC 5019 or MIL-A-8625, Type I.

NOTE: Anodize shall be sealed. (2024-T3 nonclad specimens are neither required nor optional).

c. Distilled or deionized water may be used in place of ASTM F1193, Type IV reagent grade water for control specimens.

d. The filter paper may be Whatman No. 5 or equivalent in place of Whatman GFA glass fiber paper.

Procedure exceptions:

a. The filter paper strips shall be 1 by 3 inches and shall be placed in the center of the sandwiched specimens.

b. 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.

Interpretation of result exceptions:

a. Leaching or lightening of the chromate sealed anodize coating shall not be cause for rejection.

b. 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.

c. 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 .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 .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.)

	Bare 7075-T6 Anodized per Mil-A-8625 Type I	Clad 7075-T6 (QQ-A-250/13)
As received	**1**	**1**
Dilute	**1**	**1**
Control	**1**	**1**

Result Conforms

8. Acrylic Crazing Test:
The material being tested shall not craze, crack, or etch acrylic test specimens when tested in accordance with ASTM F 484 using Type C acrylic stressed to an outer fiber stress of 4500 psi.
Type C (MIL-P-25690) ***As received: No crazing, cracking or etching.***
Dilute: No crazing, cracking, or etching.

Result Conforms

12. Paint Softening Test Procedure:
a. Testing shall be in accordance with ASTM F502 using the following coating systems.
(1) BMS 10-79, Type II primer applied in accordance with BAC 5882 plus BMS 10-60, Type II enamel in accordance with BAC 5845.
(2) BMS 10-79, Type III primer applied in accordance with BAC 5882, plus BMS 10-100 coating in accordance with BAC 5795.
b. Three specimens conforming to item (1) and three specimens conforming to item (2) above shall be used for each test condition.
c. The material being tested shall not produce a decrease in film hardness greater than 2 pencils, or any discoloration or staining.
NOTE: Slight darkening of the BMS 10-100 surface is acceptable.

As received:
Paint system 1: ***≤ 1 pencil hardness change after 24 hour post-exposure dry time.***
Paint system 2: ***≤ 1 pencil hardness change after 24 hour post-exposure dry time.***

Dilute:
Paint system 1: ***≤ 1 pencil hardness change after 24 hour post-exposure dry time.***
Paint system 2: ***≤ 1 pencil hardness change after 24 hour post-exposure dry time.***

Result Conforms

13. Hydrogen Embrittlement Test:
Hydrogen Embrittlement testing shall be in accordance with ASTM F 519-77, Section 7.2, using cadmium plated Type 1C specimens. All requirements of ASTM F519-77 for specimens, specimen preparation, testing, and reporting shall apply.
As received: ***No failures within 150 hours.***
Dilute: ***No failures within 150 hours.***

Result Conforms