BOMBARDIER

de Havilland
Material Specification

TITLE:	**SLOW EVAPORATING, MANUAL WIPE, DEGREASING & CLEANING COMPOUNDS**
SPECIFICATION NUMBER:	**DHMS S 5.01**
ISSUE:	**B**
AMENDMENT:	**--**
DATE:	**May 27 , 2009**
PAGE:	**1 of 17**

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REVISION RECORD

Issue	Page	Description and Reason for Change
A		The DHMS has been re-issued in its entirety.
A Amd. 1	3	Para. 3.4 - Flash point for Class 2 fluid has been changed.
B		Updated overall format. Table 3: Specifies supplier to provide Composition C of C for every batch

1 SCOPE

This specification covers the requirements for slow evaporating, non-ozone depletive, manual wipe cleaners which are to be used at room temperature.

1.1 Classification

The material supplied to this specification shall be one of the following classes:

Class 1 Organic solvent blend with a vapour pressure of 60 mm.Hg maximum

Class 2 Organic solvent blend with a vapour pressure of 5 mm.Hg maximum

Class 3 Aqueous blend

2 APPLICABLE DOCUMENTS

The following documents shall form part of the specification of the cleaners defined herein. In the event of conflicting requirements between this and the specifications listed below, the requirements of this specification shall govern. Where a specific issue of a document is not stated, the current issue shall be used.

2.1 U.S. Government Specifications

2.1.1 Military Specifications

MIL-A-8625 - Anodic Coating, for Aluminum and Aluminum Alloys

MIL-C-5541 - Chemical Conversion Coatings for Aluminum Alloys

2.1.2 Federal Specifications

QQ-A-250/5 - Aluminum Alloy, Alclad 2024, Plate and Sheet

2.1.3 American Society for Testing & Materials

ASTM D56 - Flash point by Tag Closed Tester, Test for

ASTM D323 - Vapour Pressure of Petroleum Products (Reid Method)

ASTM D1876 - Peel Resistance of Adhesives (T-peel Test)

ASTM D1901 - Relative Evaporation Time of Halogenated Hydrocarbon Solvents and their Admixtures

ASTM D2794 - Resistance of Organic Coatings to the Effect of Rapid Deformation (Impact Resistance)

ASTM D3359 - Standard Test Methods for Measuring Adhesion by Tape Test.

ASTM F1110 - Standard Test Method for Sandwich Corrosion Test

2.2 de Havilland Inc. Specifications

2.2.1 de Havilland Material Specifications

DHMS A6.12	-	High Strength Epoxy Adhesive, Liquid Shim Materials
DHMS C4.01	-	Primer, Fluid Resistant, Epoxy
DHMS C4.04	-	Enamel, Polyurethane
DHMS C4.06	-	Coating, Corrosion Preventive for Aircraft, Integral Fuel Tanks
DHMS C4.18	-	Primer, Intermediate (F23)
DHMS P1.24	-	Aramid Fiber, High Modulus, 250^{o}F Cure Epoxy Resin Impregnated
DHMS S3.01	-	Sealing Compound, Temperature Resistant, Integral Fuel Tanks, High Adhesion
DHMS S3.06	-	Corrosion Inhibiting Sealant

2.2.2 de Havilland Source Control Drawing

DSC 378-2	-	Wiping Cloth

2.3 Boeing Material Specifications

BMS 3-11	-	Hydraulic Fluid, Fire Resistant

3 REQUIREMENTS

3.1 Appearance

The cleaning compound shall be clear, free from cloudiness and suspended matter, and shall only be coloured for identification purposes, as indicated in the Qualified Products List.

3.2 Composition

The mixture shall consist of the same chemicals, in their relative concentrations, as the approved sample upon which the qualification tests were conducted and approval granted, unless otherwise agreed to by de Havilland Inc.

3.3 Vapour Pressure

The vapour pressure of the cleaning blends, when tested per ASTM D 323 shall be no greater than 60 for Class 1 fluids and no greater than 5 for Class 2 and Class 3 fluids.

3.4 Flash Point

The flash point of Class 2 and Class 3 fluids shall be a minimum of 100 ^{o}F (38^{o}C) and 120^{o}F (50^{o}C) respectively, when tested per ASTM D56.

3.5 Evaporation Time

The evaporation rate (Butyl Acetate = 100) of the cleaning solution shall be as indicated in the QPL when tested in accordance with ASTM D1901.

3.6 Cleaning Ability

The cleaning compounds shall be capable of effectively removing the contaminants listed in **Table 2** from test panels B, C, D, G and H, in accordance with **Para.4.3**. Adhesion test values shall be the minimum specified in **Table 1**, when prepared as described in **Para.4.2**.

Table 1:

Adhesion Test	Minimum Specified Value
T-Peel (lb/in.)	10
Gardner Impact (in.lb/in)	80
Wet Tape	**Para.4.3**

3.7 Compatibility With Painted Surfaces

The cleaning materials shall not cause streaking, fading or blistering of the aircraft paint systems, and shall not cause a reduction in surface hardness of more than one (1) pencil hardness, when tested in accordance with **Para.4.4**.

3.8 Corrosiveness

There shall be no evidence of corrosion on the test panels when tested as described in ASTM F1110.

3.9 pH Value

The pH value of the Class 3 cleaning compound shall be maintained at 6.0 - 10.0.

4 TEST METHODS AND MATERIALS

4.1 General

Unless otherwise specified, tests shall be conducted at $23 \pm 2^{o}C$ and a relative humidity of 50± 10%. At least three (3) specimens shall be used per test and the results averaged.

4.2 Test Panels

Test panels A, B, C, D and E shall be 0.032" x 6" x 3" 2024-T3 clad aluminum alloy, conforming to QQ-A-250/5. Pretreatment shall be as follows:

A - No pretreatment.

B - Chromate conversion coating per MIL-C-5541, Class 1A.

C - As per B plus application of epoxy primer per DHMS C4.01, Type 2, to a cured thickness of 0.4 to 0.6 mils, followed by quv aging for 40 hours.

D - Anodic coating per MIL-A-8625 plus integral fuel tank primer per DHMS C4.06.

E - As per C with intermediate polyurethane compatible primer per DHMS C4.18, Type III, Class A, Grade A, to a cured thickness of 0.3 to 0.5 mils., plus polyurethane topcoat enamel per DHMS C4.04, Type 4 or Type 6.

F - As per A, except that the cladding shall be removed by milling approximately 0.005 in. from the test surface.

G - 0.020" thick 2024-T3 clad aluminum alloy conforming to QQ-A-250/5, with the dimensions as specified in ASTM D 1876 and with the finish treatments per panel C.

H - 3 ply aramid/epoxy laminate per DHMS P1.24, Type 2.

A thin coating of each of the following compounds shall be smeared on the surface of the above test panels and shall be heat aged by placing the panels in an oven at 170 ± 10°F for a minimum 16 hours.

Table 2:

CONTAMINANT	MATERIAL CLASS		
	1	2	3
Boelube	x	x	
Acculube	x	x	
BMS 3-11G	x	x	x
Dinitrol AV8	x	x	x
Masking Tape Residue	x	x	
Lubriplate Grease	x	x	x
Stick Wax	x	x	x
Uncured DHMS S3.01, S3.06 Sealants	x	x	
Uncured DHMS A6.12 Adhesive	x	x	

4.3 Cleaning Ability

A clean dry cotton wiper per DSC 378-2 shall be dampened with the cleaning material and applied to the surface of the test panel in twenty even strokes. The solvent wiped area shall be wiped with a second clean/dry wiper to remove all traces of contaminant and residual solvent.Surface cleanliness shall be established by visual examination and by the following adhesion tests:

4.3.1 T-peel Test - conducted on a test panel, consisting of two (2) G type panels bonded with DHMS S3.01 sealant, per ASTM D1876.

4.3.2 Impact Test - conducted per ASTM D2794, on C type panels after application of the finish treatments specified for E type panels.

4.3.3 Wet Tape Adhesion Test - conducted per ASTM D3359, Method B on C type panels, following application and cure of the finish treatments specified for E type panels, and after 24 hours immersion in water at standard conditions.

4.4 Compatibility

The test fluid shall be applied to test panels C, E and F and the panels allowed to sit for 7 days at ambient conditions. Test panels shall be examined at the conclusion of the exposure period for evidence of discolouration, blistering, cracks, flaking or other surface defects, and the pencil hardness shall be recorded before and after exposure to the test.

5 QUALITY ASSURANCE

5.1 Qualification

5.1.1 A supplier is responsible for the performance of all qualification testing, as specified in **Table 3**.

5.1.2 A supplier desiring qualification shall submit one copy of a report showing actual qualification test data and a sufficient quantity of product for de Havilland evaluation tests.

5.1.3 Upon review of supplier's data and de Havilland tests, the supplier will be advised either of product qualification or reasons for disqualification.

5.1.4 Products that are qualified will be listed in the Qualified Products List of this specification.

5.1.5 No changes in the method of manufacture and/or formulation shall be made without notification and prior written approval of DHI Materials Technology Department.

5.1.6 Re-qualification of the product may be requested by the purchaser if there are any changes in the method of manufacture and/or formulation.

5.2 Qualification by Similarity

Where a product has been qualified to another similar specification, the supplier may submit the qualification data applicable to this specification for consideration. The similar specification may be a government, company, or other specification where the requirements are similar to this specification.

5.3 Acceptance Tests

5.3.1 Unless otherwise specified in the contract or purchase order, the supplier is responsible for all acceptance tests, as specified in **Table 3**.

5.3.2 The supplier, performing acceptance tests per **Para.5.3.1** shall furnish with each batch of product one copy of an Acceptance Test Report showing actual test data conformance to the acceptance tests specified in **Table 3**. The report shall include the supplier's batch identification.

5.3.3 De Havilland . reserves all right to perform any or all of the tests set forth in this specification to ensure that the product continues to meet specification requirements. Any product not meeting the requirements of this specification will be retuned to the supplier at the supplier's expense.

Table 3: Qualification and Batch Acceptance Tests

Properties	Paragraph	Qualification	Acceptance
Appearance	Para.3.1	x	
Composition	Para.3.2	x	x [1]
Vapour Pressure	Para.3.3	x	
Flash Point	Para.3.4	x	
Evaporation Time	Para.3.5	x	
Cleaning Ability	Para.3.6	x	
Compatibility	Para.3.7	x	
Corrosiveness	Para.3.8	x	
pH Value	Para.3.9	x	

1. Supplier to provide Composition certification with each batch

5.4 Definitions

5.4.1 Batch is defined as the end product of all the raw materials mixed and/or manufactured at the same time and place. The weight or volume may vary, depending upon the capacity of the manufacturer's facilities.

5.4.2 Lot is defined as the total quantity of product in a shipment taken from the same batch.

6 ORDERING DATA

6.1 Prerequisite

Material furnished under this specification for production use shall be qualified and tested on the Qualified Products List prior to issuing a Purchase Order.

6.2 Procurement Documents

Procurement documents should specify the following:

- Title, Number, Issue and Amendment Number of this Specification

- Size of Container (Imperial or U.S. measure)
- Total Quantity (Imperial or U.S. measure)
- Acceptance Test Report.

7 PREPARATION FOR DELIVERY

7.1 Preservation and Packing

The material shall be packed in such a manner as to assure that, during shipment and storage, the product will be protected against damage from exposure to hazards which would affect adversely the property conformance to **Section 3** of this specification.

7.2 Marking

Each container shall be legibly marked with the follow information:

- Cleaning Compound
- DHMS S5.01, Class 1, 2 or 3
- Manufacturer's Name and Product Identification
- Date of Manufacture
- Date of Mixing
- Container Date
- Expiry Date
- Batch Number
- Net Quantity (Imperial or U.S. measure)

7.3 Shipping Documentation

The shipping document shall show:

- de Havilland Purchase Order No.
- DHMS S5.01, Class 1, 2 or 3
- Number of Containers
- Batch Number
- Total Quantity (Imperial or U.S. measure)
- Acceptance Test Reports

Each shipment shall contain a copy of the Material Safety Data Sheet.

8 HEALTH AND SAFETY DATA

When supplying samples for qualification per **Para.5.1.2**, the supplier shall submit a Material Safety Data Sheet as per the Ontario Occupational Health and Safety Act, Workplace Hazardous Materials Information System (WHMIS) Relations, which complies with the Canada Hazardous Products Act, Controlled Products Regulations.

Materials Technology, de Havilland Inc. must ensure that copies are provided to, and approved by, the Materials Safety Committee, Industrial Hygiene and Safety, de Havilland Inc.

These requirements are prerequisites to inclusion of any product on the Qualified Products List.

Any changes in the formulation of the material requires resubmission of the Material Safety Data Sheet.

QUALIFIED PRODUCTS LIST

MANUFACTURER'S NAME AND ADDRESS	MANUFACTURER'S PRODUCT IDENTIFICATION NO.	MATERIAL SAFETY DATA SHEET NO.	DE HAVILLAND QUALIFICATION SHEET NO.	DATE OF PRODUCT APPROVAL
Class 1				
Stanchem Inc. 43 Jutland Road, Etobicoke, Ontario, M8Z 2G6 (416) 252-9492	50161988 (Evaporation Rate = 100)	1938	N/A	February 5, 1997
Tristar Coatings Div. 18 Cadetta Road, R.R.#9, Brampton, Ontario, L6T 3Z8 (416) 798-4911	SB 14 (Evaporation Rate = 100)	1070	N/A	February 5, 1997
Class 2				
Dynamold Inc., Distributed by Bryce Industries Inc. 2299 Drew Road, Unit #36, Mississauga, Ontario L5S 1A3 (905) 678-1548	DS 108F (Evaporation Rate = 20)	2476	N/A	February 5, 1997