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| NOT MEASUREMENT SENSITIVE |
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MIL-PRF-85570D

19 June 2002

SUPERSEDING

MIL-PRF-85570C

11 June 1997

PERFORMANCE SPECIFICATION

CLEANING COMPOUNDS, AIRCRAFT, EXTERIOR

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. The cleaning compounds covered by this specification are used for cleaning the exterior surface of aircraft.

1.2 Classification. The cleaning compounds covered by this specification are furnished in the following types (see 6.2):

- | | | |
|----------|---|--|
| Type I | - | General purpose, aromatic solvent base |
| Type IA | - | General purpose, aromatic solvent base, aerosol |
| Type II | - | General purpose, non-solvent |
| Type III | - | Abrasive spot cleaner |
| Type IV | - | Rubberized spot cleaner |
| Type V | - | Gel-type wheel well degreaser, low solvent (less than 10%) |

| |
|---|
| <p>Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Air Warfare Center Aircraft Division, Code 414100B120-3, Highway 547, Lakehurst, NJ 08733-5100, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.</p> |
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AMSC N/A

FSC 6850

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2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications and standards. The following specifications and standards form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

DEPARTMENT OF DEFENSE

| | | |
|----------------|---|---|
| MIL-C-1164 | - | Cloth, Terry, Cotton, Cotton and Polyester |
| MIL-G-21164 | - | Grease, Molybdenum Disulfide, for Low and High Temperatures, NATO Code Number G-353 |
| MIL-PRF-23377 | - | Primer Coatings, Epoxy, High Solids |
| MIL-W-81381/11 | - | Wire, Electric, Fluorocarbon/polyimide Insulated, Medium Weight, Silver Coated Copper Conductor, 600 Volts, Nominal 8, 4 or 15.4 Mil Wall |
| MIL-PRF-83282 | - | Hydraulic Fluid, Fire Resistant, Synthetic Hydrocarbon Base, Aircraft, Metric, NATO Code Number H-537 |
| MIL-P-83310 | - | Plastic Sheet, Polycarbonate, Transparent |
| MIL-PRF-85285 | - | Coating, Polyurethane, High-Solids |

2.2.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

CODE OF FEDERAL REGULATIONS

| | | |
|------------------|---|--|
| 29 CFR 1910.1200 | - | Occupational Safety and Health Standards - Hazard Communications |
| 40 CFR | - | Protection of Environment |
| 40 CFR 796.3100 | - | Aerobic Aquatic Biodegradation |

(Application for copies of the Code of Federal Regulations (CFR) should be addressed to the Superintendent of Documents, US Government Printing Office, Washington, DC 20402.)

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NAVAL AIR SYSTEMS COMMAND

NAVAIR 01-1A-509 - Aircraft Weapons Systems Cleaning and Corrosion Control

(This document has limited distribution. Requests for copies by U.S. Government agencies and their contractors should be made to the Naval Air Systems Command, Code 4.3.4.1, Unit 5, Building 2188, 48066 Shaw Road, Patuxent River, MD 20670.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DoDISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

| | | |
|------------|---|---|
| ASTM-D93 | - | Flash Point by Pensky-Martin Closed Cup Tester, Standard Test Method for (DoD Adopted) |
| ASTM-D95 | - | Water in Petroleum Products and Bituminous Materials by Distillation, Standard Test Method for (DoD Adopted) |
| ASTM-D-523 | - | Gloss, Specular |
| ASTM-D1141 | - | Substitute Ocean Water, Standard Specification for (DoD Adopted) |
| ASTM-D3065 | - | Aerosol Product, Flammability of |
| ASTM-E70 | - | pH of Aqueous Solutions with the Glass Electrode, Standard Test Method for (DoD Adopted) |
| ASTM-E168 | - | General Techniques of Infrared Quantitative Analysis, Standard Practices For (DoD Adopted) |
| ASTM-F483 | - | Total Immersion Corrosion Test for Aircraft Maintenance Chemicals, Standard Test Method for (DoD Adopted) |
| ASTM-F484 | - | Stress Cracking of Acrylic Plastics in Contact with Liquid or Semi-liquid Compounds, Standard Test Method for (DoD Adopted) |
| ASTM-F485 | - | Effects of Cleaners on Unpainted Aircraft Surfaces, Standard Test Method For |
| ASTM-F502 | - | Effects of Cleaning and Chemical Maintenance Materials on Painted Aircraft Surfaces, Standard Test Method For (DoD Adopted) |
| ASTM-F519 | - | Mechanical Hydrogen Embrittlement Evaluation of Plating Processes and Service Environments, Standard Test Method for |
| ASTM-F1110 | - | Sandwich Corrosion Test, Standard Test Method For |
| ASTM-F1111 | - | Corrosion of Low-Embrittling Cadmium Plate by Aircraft Maintenance Chemicals |

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(Application for copies should be addressed to the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

| | |
|---------------------|---|
| SAE-AMS4377 | - Magnesium Alloy, Sheet and Plate -3.0 Al, 1.0 Zn, Cold Rolled, Partially Annealed (DoD Adopted) |
| SAE-AMS5046 | - Sheet, Strip, and Plate, Carbon Steel (SAE 1020 and 1025), Annealed (DoD Adopted) |
| SAE-AMS-M-3171 | - Magnesium Alloy, Processes for Pretreatment and Prevention of Corrosion on |
| SAE-AMS-QQ-A-250/4 | - Aluminum Alloy 2024, Plate and Sheet |
| SAE-AMS-QQ-A-250/12 | - Aluminum Alloy 7075, Plate and Sheet |
| SAE-AMS-T-9046 | - Titanium and Titanium Alloy, Sheet, Strip and Plate |

(Application for copies should be addressed to Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096-0001.)

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Qualification. The cleaning compounds furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable qualified products list before contract award (see 4.3 and 6.3). Cleaning compounds shall meet the requirements in table I.

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TABLE I. Physical properties.

| Property | Requirement | Test Method | Dilution |
|--|---|----------------------------|-----------------------------|
| COMPOSITION | | | |
| Composition | No carcinogens ¹ /, toxic pollutants ² / or ozone depleting substances ³ /. Type IA shall be a 1:4 dilution of a qualified type I product in an aerosol package. | Manufacturer Certification | |
| pH | 7.0 to 10.0 | ASTM-E70 | As received, Dilute |
| Non-volatile content | Record value | 4.5.9 | As received |
| Water content | Record value | ASTM-D95 | As received |
| Infrared spectrogram | Record spectrogram of non-volatile matter | ASTM-E168 | |
| Rubber content (type IV only) | 10.0 to 15.0 percent by weight particulate rubber | Manufacturer certification | |
| Solvent content, maximum weight percent type I, IA, and IV type II type V | 10.0 percent aromatic, 32.0 percent total solvent 1.0 percent total solvent 10.0 percent total solvent, no aromatics | Manufacturer certification | As received |
| Net weight (Type IA) | Net weight for a 16 and 20 fluid ounce can shall be no less than 13 and 17 ounces respectively. | 4.5.16 | |
| SAFETY & ENVIRONMENTAL | | | |
| Toxicity | No adverse effect on the health of personnel when used for its intended purpose | Manufacturer certification | |
| Flash point, Pensky-Martin | 140 °F (60 °C), minimum | ASTM-D93 | As received |
| Biodegradability (types II and V) | 85 percent in 28 days, minimum | 40CFR 796.3100 | |
| Flame extension (type IA only) | Less than 6 inches | ASTM-D3065 | As received |
| MATERIAL COMPATIBILITY | | | |
| Sandwich corrosion | Rating of 1 or less | ASTM-F1110 | As received, ⁹ / |
| Cadmium corrosion | 0.20 mg/sq. cm/day wt loss, maximum | ASTM-F1111 | As received, ⁹ / |

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TABLE I. Physical properties – Continued.

| Property | Requirement | Test Method | Dilution |
|---|--|--|---|
| Total immersion corrosion Al <u>4</u> /, Ti <u>5</u> /, Steel <u>6</u> / Mg <u>7</u> / | No visible corrosion and 0.04 mg/sq. cm/day wt. loss, maximum 0.20 mg/sq. cm/day wt. loss, maximum | ASTM-F483 | As received, <u>9</u> / |
| Hydrogen embrittlement | No failures in less than 150 hours when specimens are loaded to 45 percent of fracture strength and immersed in cleaner. | ASTM-F519, type 1a or 1c specimens. Cadmium plated in accordance with (IAW) Table II, Treatment B. | As received, <u>9</u> / |
| Unpainted surfaces, effect on | No streaks or stains | ASTM-F485 | <u>9</u> / |
| Painted surfaces, effect on | No softening in excess of 1 pencil hardness | ASTM-F502 | As received, <u>9</u> / |
| Plastics, effect on Acrylic, type A (Cleaner types I, IA,II, III, and IV only) Acrylic, type A (type V) Acrylic, type C Polycarbonate, MIL-P-83310 | No crazing after 8 hours No crazing after 4 hours No crazing after 8 hours No crazing after 2 hours at 2000 psi | 4.5.10 and ASTM-F484 | Diluted 1:1 with distilled water |
| Polyimide insulated wire, effect on | No dielectric leakage, no visual effect greater than that of distilled water | 4.5.11 | As received |
| Abrasiveness type III type IV | No more than 10 percent gloss reduction 0.5 increase in gloss, maximum | 4.5.1 | As received |
| PERFORMANCE | | | |
| Cleaning efficiency type I, II, and IV type I and IV | Not less than freshly made <u>8</u> / control formula cleaning efficiency on hydraulic fluid and grease soils Not less than freshly made <u>8</u> / control formula cleaning efficiency on wire rope lubricant soil | 4.5.4 | <u>9</u> / |
| Cleaning efficiency, type IA only | Not less than freshly made <u>8</u> / type I control formula diluted 1:4, on hydraulic fluid and grease soils | 4.5.4 | As Received |
| Embedded soil cleaning efficiency, type III | Complete removal of embedded carbon black | 4.5.15 | As received |

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TABLE I. Physical properties – Continued.

| Property | Requirement | Test Method | Dilution |
|---------------------------------------|--|-------------|-------------|
| Cleaning of vertical surfaces, type V | Complete removal of wire rope lubricant soil or comparable to control | 4.5.5 | As received |
| Foaming properties, type I and II | 80 ml liquid after 6 minutes, maximum | 4.5.7 | <u>9</u> / |
| Consistency type IV type V | 10 to 20 cm flow in 10 seconds 13 to 23 cm flow in 10 seconds | 4.5.6 | As received |
| Sprayability, type I and V | Uniform spray when applied from finger pump spray bottle or aerosol. Type V clings to vertical panel | Visual | As received |
| Service evaluation (when required) | Satisfactory | 4.5.13 | |
| Leakage, type IA only | Aerosol cans shall not leak nor become distorted | 4.5.17 | |
| STABILITY | | | |
| Appearance | Homogeneous, no foreign matter | Visual | As received |
| Low temperature stability | No separation | 4.5.8 | As received |
| Accelerated storage stability | No separation or effect on steel strip. Cleaning efficiency shall be no less than freshly made <u>8</u> / control formula. Particulate matter in types III and IV shall not settle or float appreciably. | 4.5.2 | As received |
| Storage stability | <u>After one year's storage:</u> No cleaner separation, crystallization, or deterioration. No container incompatibility, corrosion, distortion, or leakage. Shall meet qualification requirements for cleaning efficiency, sandwich corrosion, cadmium corrosion, total immersion corrosion, hydrogen embrittlement, pH, foaming properties, and appearance | 4.5.14 | As received |

1/ as specified by the National Toxicology Program's Annual Report on Carcinogens

2/ as specified in 40 CFR 401

3/ as specified in 40 CFR 82.

4/ Aluminum alloy: SAE-AMS-QQ-A-250/12

5/ Titanium: SAE-AMS-T-9046 (6Al-4V alloy)

6/ Steel: SAE-AMS5046 (1020 alloy)

7/ Magnesium alloy: SAE-AMS4377, Chrome Pickled: SAE-AMS-M-3171, type VI

8/ Freshly made is not more than six weeks old.

9/ Unless otherwise specified dilute with distilled water (volume concentrate : volume water): type I (1:9), type II (1:14), type III (not diluted), type IV (not diluted), type V (not diluted)

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3.2 Product identification and instructions for use. All containers of cleaning compound shall be clearly labeled with the manufacturer's name and product designation, date of manufacture, and pH of the cleaning compound. Instructions for use labels for each container shall be as follows:

3.2.1 Type I.

EXTERIOR AIRCRAFT CLEANER, GENERAL PURPOSE, AROMATIC SOLVENT,
MIL-PRF-85570, TYPE I

Directions for use:

Light soils: Mix 1 part cleaner in 14 parts water

Moderate soils: Mix 1 part cleaner in 9 parts water

Heavy soils: Mix 1 part cleaner in 4 parts water

Apply with foam generator (see NAVAIR 01-1A-509, Section 2), spray, sponge, brush, or cloth. Scrub, then rinse with fresh water.

3.2.2 Type IA.

EXTERIOR AIRCRAFT CLEANER, GENERAL PURPOSE, AROMATIC SOLVENT,
AEROSOL, MIL-PRF-85570, TYPE IA

Directions for use: Spray cleaner onto surface to be cleaned.
 Allow up to 3 minutes dwell time.
 Scrub with a brush or rub with a clean cloth.
 Rinse thoroughly with fresh water or wipe dry.

3.2.3 Type II.

EXTERIOR AIRCRAFT CLEANER, GENERAL PURPOSE, NON-SOLVENT,
MIL-PRF-85570, TYPE II

Directions for use:

Light soils: Mix 1 part cleaner in 14 parts water

Moderate soils: Mix 1 part cleaner in 9 parts water

Heavy soils: Mix 1 part cleaner in 4 parts water

Apply with foam generator (see NAVAIR 01-1A-509, Section 2), spray, sponge, brush, or cloth. Scrub, then rinse with fresh water.

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3.2.4 Type III.

EXTERIOR AIRCRAFT CLEANER, ABRASIVE SPOT CLEANER (FOR GLOSS PAINT SURFACES ONLY), MIL-PRF-85570, TYPE III

Directions for use: Apply full strength with damp cloth.
 Rub with a circular motion.
 Rinse thoroughly, then dry with a clean cloth.
 Do not allow cleaner to dry on surface.

3.2.5 Type IV.

EXTERIOR AIRCRAFT CLEANER, RUBBERIZED SPOT CLEANER, MIL-PRF-85570, TYPE IV

Directions for use: Apply full strength with a non-abrasive cleaning pad.
 Allow 1 to 3 minutes dwell time.
 Rub with a circular motion.
 Rinse thoroughly, then dry with a clean cloth.
 Do not allow cleaner to dry on surface.

3.2.6 Type V.

EXTERIOR AIRCRAFT CLEANER, GEL-TYPE WHEEL WELL DEGREASER, LOW SOLVENT, MIL-PRF-85570, TYPE V

Directions for use: Apply full strength with brush or pump spray device.
 Allow 5 minutes dwell time.
 Brush if necessary, then spray with fresh water to rinse.

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4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. Qualification inspection (4.3).
- b. Conformance inspection (4.4).

4.2 Inspection conditions. Standard conditions shall be a temperature of 22 ± 2 °C (72 ± 4 °F) and a relative humidity of 50 ± 20 percent. All tests shall be conducted at standard conditions unless otherwise specified.

4.3 Qualification inspection. The qualification inspection (see 6.3) shall consist of all tests and examinations of this specification.

4.3.1 Qualification samples.

4.3.1.1 Laboratory test samples. Each laboratory qualification sample shall consist of three 1-gallon (3.785 liters) containers of cleaning compound. Storage gallon samples shall be constructed of the same material as those in which the manufacturer intends to supply contract quantities of the cleaner. One gallon of each sample shall be used for the storage stability test. Samples submitted under type IA shall consist of six individual units of issue. The samples shall be plainly identified by securely attached durable tags or labels marked with the following information:

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Sample for qualification inspection

CLEANING COMPOUND, AIRCRAFT, EXTERIOR

Type

Name of manufacturer

Product code number

Batch or lot number

Date of manufacture

Submitted by (name) (date) for qualification inspection in accordance with the requirements of MIL-PRF-85570D.

4.3.1.2 Service test samples. When the service evaluation (see 4.5.13) is required by the qualifying activity, test samples shall consist of a 5-gallon pail for types I, II, IV, and V, and one case of twelve individual units for types IA. The cleaning compound shall be packaged in containers that afford protection during shipment. Samples shall be forwarded in accordance with instructions contained in the letter requesting the service evaluation.

4.4 Conformance inspection. The conformance inspection of the cleaning compound shall consist of all the examinations and tests specified in table II.

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TABLE II. Conformance inspection.

| Inspection | Requirement | Test Method |
|-------------------------------------|---------------------------|-------------|
| Appearance | Homogeneous | Visual |
| Cadmium corrosion <u>1/</u> | Table I | ASTM-F1111 |
| Cleaning Efficiency | Not less than Control | 4.5.4 |
| Flash point | Table I | ASTM-D93 |
| Non-volatile content | ± 2 percent <u>2/</u> | 4.5.9 |
| pH | <u>2/</u> ± 0.5 | ASTM-E70 |
| Plastics, effect on | Table I | ASTM-F484 |
| Total immersion corrosion <u>1/</u> | Table I | ASTM-F483 |
| Water content | ± 2 percent <u>2/</u> | ASTM-D95 |

1/ 24 hour test duration for conformance testing

2/ Permitted variance from recorded qualification value.

4.4.1 Conformance test samples. Conformance test samples shall be selected in accordance with table III. Unless otherwise specified (see 6.2), two 1-gallon (3.785 liters) composite samples shall be subjected to the tests specified in table II.

TABLE III. Conformance samples.

| Lot Size (Units) | Sample Size (Units) |
|------------------|---------------------|
| Up to 50 | 5 |
| 51 to 500 | 7 |
| 501 to 35,000 | 8 |
| over 35,000 | 11 |

4.4.1.1 Net content. The sample unit for this examination shall be one filled container. The sample size shall be as specified in table III. A lot (see 6.4) shall be unacceptable if the average net content per container for all units examined is less than specified.

4.5 Test methods. Tests shall be conducted in accordance with the conditions specified in 4.2. Control formulations for comparison purposes shall be as specified in tables IV through VII.

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TABLE IV. Type I control formulation.

| Component | Parts by Weight | Supplier (see 6.6) |
|---------------------------------|-----------------|--------------------|
| Igepal CO-630 | 10.0 | Rhone Poulenc |
| Igepal CO-730 | 10.0 | Rhone Poulenc |
| Monamid 150-CW | 5.0 | Uniqema |
| Dipropylene Glycol Methyl Ether | 10.0 | Fisher |
| Hexylene Glycol | 8.0 | Fisher |
| Aromatic 150 | 10.0 | Exxon Chemical |
| Deionized Water | 43.5 | N/A |
| Benzotriazole | 0.5 | Fisher |
| Monacor 4000 | 2.0 | Uniqema |
| Morpholine | 1.0 | Fisher |
| Total | 100.0 | |

Directions: Blend first eight components in the order given. Reduce pH to 8.0 with glacial acetic acid. Add Monacor 4000 and Morpholine. Blend until homogeneous.

TABLE V. Type II control formulation.

| Component | Parts by Weight | Supplier (see 6.6) |
|-----------------|-----------------|--------------------|
| Neodol 91-2.5 | 8.5 | Shell |
| Neodol 91-6 | 18.4 | Shell |
| Monamid 150-CW | 15.0 | Uniqema |
| Monateric 1000 | 1.0 | Uniqema |
| Sandocorin 8160 | 0.7 | Clariant |
| Benzotriazole | 0.7 | Fisher |
| Monacor 4000 | 0.7 | Uniqema |
| Deionized water | 55.0 | N/A |
| Total | 100.0 | |

Directions: Blend components in the order given until homogeneous. Reduce pH with glacial acetic acid to be in the range 9.0 to 10.0.

TABLE VI. Type IV control formulation.

| Component | Parts by Weight | Supplier (see 6.6) |
|-------------------------------|-----------------|--------------------|
| <u>Part A:</u> | | |
| Monamulse 653-C | 7.10 | Uniqema |
| Monamine 1-76 | 2.70 | Uniqema |
| Aromatic 150 | 7.50 | Exxon |
| Isopar M | 7.50 | Exxon |
| Diethylene Glycol Butyl Ether | 3.55 | Fisher |
| Decanol | 1.55 | Fisher |

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TABLE VI. Type IV control formulation – Continued.

| Component | Parts by Weight | Supplier (see 6.6) |
|-----------------------------------|-----------------|--------------------|
| <u>Part B:</u> | | |
| Trisodium Phosphate Dodecahydrate | 2.7 | Fisher |
| Deionized water | 55.0 | N/A |
| Pluronic F98 | 1.8 | BASF |
| Hycar 1422 | 10.6 | BF Goodrich |
| Total | 100.0 | |

Directions: Blend Part A and Part B separately in the order given. Combine the two and blend until homogeneous. After 48 hours, reduce pH to 9.5 with glacial acetic acid and blend until homogeneous. Consistency may be adjusted to comply with the requirements of table I by adding single drops of decanol to increase viscosity or diethylene glycol butyl ether to decrease viscosity.

TABLE VII. Type V control formulation.

| Component | Parts by Weight | Supplier (see 6.6) |
|-----------------------|-----------------|--------------------|
| <u>Part A:</u> | | |
| Neodol 23-1 | 5.0 | Shell |
| Neodol 91-2.5 | 5.7 | Shell |
| Neodol 91-6 | 10.6 | Shell |
| Neodol 91-8 | 10.7 | Shell |
| Monateric 1000 | 4.9 | Uniqema |
| Prep-solve <u>1</u> / | 6.7 | Glidco |
| Isopar M | 2.9 | Exxon |
| Dipropylene Glycol | 9.0 | Fisher |
| Benzotriazole | 0.5 | Fisher |
| <u>Part B:</u> | | |
| Sodium Bicarbonate | 1.0 | Fisher |
| Deionized water | 43.0 | N/A |
| Total | 100.0 | |

1/ D-limonene with proprietary stabilizer.

Directions: Blend part A and part B separately until homogeneous. Gradually add part B to part A, while blending, until homogeneous. Product may thin slightly in the first 24 hours following preparation. Consistency can be adjusted to conform to the requirements of table I by adding single drops of Neodol 91-2.5 to increase viscosity or dipropylene glycol to decrease viscosity.

4.5.1 Abrasiveness (type III and IV only). A heavy duty wear tester (see 6.6, table IX) shall be used for this test. A block fitted with a white cotton terry cloth conforming to MIL-C-1164 shall be inserted in the instrument holder. The combined weight of the block, cloth, and holder shall be $1,360 \pm 20$ grams. The area of contact with the specimen shall be 1.5 square

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inches. Type III and IV cleaning compounds shall be tested using panels conforming to designation A and B in table VIII respectively. Test panel gloss shall be measured using a 60 degree calibrated glossmeter conforming to ASTM-D523. The panel shall then be placed on the wear tester. Pour 10 ml of the concentrate onto the last panel and 15 ml onto the terry cloth attached to the cleaning block in the instrument holder. After three minutes, place the terry cloth on the cleaning block in contact with the panel and start the tester. The cleaning block shall travel completely across the panel and return (one cycle) at a speed of two seconds per cycle. After 50 cycles, the test panel shall be removed and rinsed under cold, running tap water and blotted dry with terry cloth. Repeat this procedure four times using the same panel. Each time the procedure is repeated, a new terry cloth and additional cleaning compound shall be used. At the completion of the fifth run, the gloss shall again be measured for conformance to table I. When rinsing the test panel, the paint surface shall be observed for the presence of a water break.

4.5.2 Accelerated storage stability.

4.5.2.1 Preparation of test sample. A 5 oz (41.9 ml) portion of a well-shaken cleaning compound shall be poured into a clean 12 oz (254.9 ml) pressure resistant clear glass bottle approximately 9.5 in. (24.1 cm) in height and 2.5 in. (6.4 cm) in outside diameter. A strip of steel 6 x 0.5 x 0.02 in. (5.2 x 1.27 x 0.05 cm) conforming to SAE-AMS5046 shall be polished with 280-grit silicon carbide paper to remove surface contamination and then cleaned by boiling for one minute in mineral spirits and one minute in isopropyl alcohol. The steel strip shall be placed in the test bottle and the bottle capped. The bottle shall then be inverted to completely coat the steel strip.

4.5.2.2 Procedure. The capped bottle containing the steel strip shall be placed in a hot water bath held at 140 ± 4 °F (60 ± 2 °C) for 8 hours. The bath and the bottle shall then be allowed to cool for 16 hours and the 24 hour cycle repeated each day for a total of seven days. On the eighth day, the bottle shall be removed from the bath, uncapped, examined for separation, and the steel strip withdrawn and examined for corrosion. The aged sample shall be tested for cleaning efficiency in accordance with 4.5.4 or 4.5.5, as applicable.

4.5.3 Aerosol container (type IA only).

4.5.3.1 Leakage. A pressurized can of cleaning compound shall be immersed completely for five minutes in water maintained at 130 ± 3 °F (54 ± 2 °C). The can shall be observed for emission of bubbles or distortion during this period.

4.5.3.2 Net weight. A pressurized can of cleaning compound shall be weighed to the nearest gram. The can shall spray for three minutes, followed by a one minute pause. This procedure shall be repeated until the can is empty. The empty can shall then be reweighed and the weight of the contents calculated.

4.5.4 Cleaning efficiency (types I, II, and IV).

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4.5.4.1 Panel preparation. Aluminum alloy panels measuring 6 x 2.5 x 0.02 inches (15.2 x 6.4 x 0.05 cm) shall be prepared in accordance with panel B of table VIII. At least three panels shall be used for each product tested and the control formulation. The set of panels used in one test run shall have the same gloss readings (± 0.1 gloss units) as those used for the control run. The gloss is to be measured by 85 degree reflectance and shall be in the range of 2-5 gloss units. The lightness value (L value in a L-a-b color system) shall be measured using a Colorimeter (illuminant C) or equivalent. Record the initial lightness value as L_i .

4.5.4.2 Soil preparation. Hydraulic fluid soil shall be prepared by blending 50 grams of carbon black (see 6.6) and 500 grams of MIL-PRF-83282 fluid first by hand, then with a high speed Cowles type dispersator or other high shear mixer for 15 minutes. Molybdenum disulfide grease soil shall be prepared by blending 50 grams of carbon black and 500 grams of MIL-G-21164 grease, first by hand, then with a mechanical grease worker for 15 minutes.

4.5.4.3 Application of hydraulic fluid and grease soils. Thoroughly mix hydraulic fluid before using. Using a soft bristle brush, gently paint the coated surface of a test panel with the test soil. Remove excess hydraulic fluid soil by covering the test panel with folded absorbent tissue and exerting pressure by rolling over the tissue with a five-pound rubber cylinder. Repeat this blotting procedure twice. Using a 0.5 inch bristle acid brush, apply 0.12 grams of grease soil centered across the panel in a band 1.5 inches wide and perpendicular to the long dimension of the panel. The soil is then brushed the long dimension of the panel for 12 cycles (up and down being one cycle) with a hog bristle brush (see 6.6, table IX). Typical force applied when brushing is equivalent to approximately 1000 grams. The brush shall be rubbed on a clean tissue or towel in three separate places to remove excess soil before brushing the next panel. Each freshly soiled panel shall be baked at 221 ± 2 °F (105 ± 1 °C) for 60 minutes, then cooled to room temperature, and used within four hours. Record the soiled lightness value as L_s . The soiled lightness values shall be in the range of 20.0 to 25.0.

TABLE VIII. Test panel preparation.

| Panel Letter | Step | Material | Number of Coats | Thickness per Coat, mil | Drying Time Between Coats | Drying Time After Final Coat |
|--------------|------|---|-----------------|-------------------------|---------------------------------|--|
| A | 1 | Primer, coating conforming to MIL-PRF-23377 | 1 | 0.6 - 0.9 | 1 - 2 hours at room temperature | --- |
| | 2 | MIL-PRF-85285 (Color No. 17875) | mist coat | --- | 15 minutes at room temperature | --- |
| | 3 | MIL-PRF-85285 (Color No. 17875) | wet coat | 1.5 - 2.5 | --- | Air dry one week at room temperature plus one week at 150°F. |

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TABLE VIII. Test panel preparation – Continued.

| Panel letter | Step | Material | Number of Coats | Thickness per Coat, mil | Drying Time Between Coats | Drying Time After Final Coat |
|--------------|------|---|-----------------|-------------------------|---------------------------------|--|
| B | 1 | MIL-PRF-23377 | 1 | 0.6 - 0.9 | 1 - 2 hours at room temperature | --- |
| | 2 | MIL-PRF-85285 (Color No. 36440 or No. 36495) | mist coat | --- | 15 minutes at room temperature | --- |
| | 3 | MIL-PRF-85285 (Color No. 36440 or No. 36495) | wet coat | 1.5 - 2.5 | --- | Air dry one week at room temperature plus one week at 150°F. |

4.5.4.4 Application of wire rope lubricant. Spray wire rope lubricant (see 6.6) onto a test panel and immediately wipe back and forth using a piece of non-abrasive cleaning pad to achieve a uniform soil in the center of the panel. Bake the soiled test panels at 221 ± 2 °F (105 ± 1 °C) for 60 minutes then cool to room temperature.

4.5.4.5 Preparation of stock solution. A 10-grain hard water stock solution shall be prepared by dissolving 0.20 ± 0.005 gram of analytical reagent grade calcium acetate monohydrate and 0.14 ± 0.005 gram of analytical reagent grade magnesium sulfate heptahydrate in one liter of distilled water.

4.5.4.6 Cleaning. The test panel shall be cleaned using a heavy duty wear tester (see 6.6, table IX), fitted with a cellulose sponge (see 6.6). The sponge shall be cut such that the dimension parallel to the cleaning stroke is 3.5 inches (9 cm) and the width is 2.75 inches (7 cm). The cleaning head with the dry sponge attached shall be weighed to a mass of 600 ± 10 grams. Type I cleaning compound shall be prepared by diluting 1 part cleaner with 9 parts 10-grain hard water (4.5.4.5). Type IA shall be applied from aerosol can and compared to control formula diluted as specified in Table I. Type II cleaning compound shall be prepared by diluting 1 part cleaner with 14 parts 10-grain water (4.5.4.5). Type IV cleaning compound shall be tested as received. After placing a soiled test panel in the template at +45 degrees (see figure 1), the cleaning solution shall be applied to the sponge. A typical amount of diluted cleaner applied to the sponge for wetting is 40 ml. Twenty ml of the cleaner solution is applied over each individual test panel so that it is completely covered. To avoid cross-contamination, the apparatus is cleaned for each new cleaner and a new sponge is used. After allowing a 30-second dwell time, the test panel shall be cleaned using 5 cycles of the wear tester, then turned 90 degrees and cleaned for an additional 5 cycles. The panel shall then be rinsed under cold running tap water and allowed to dry.

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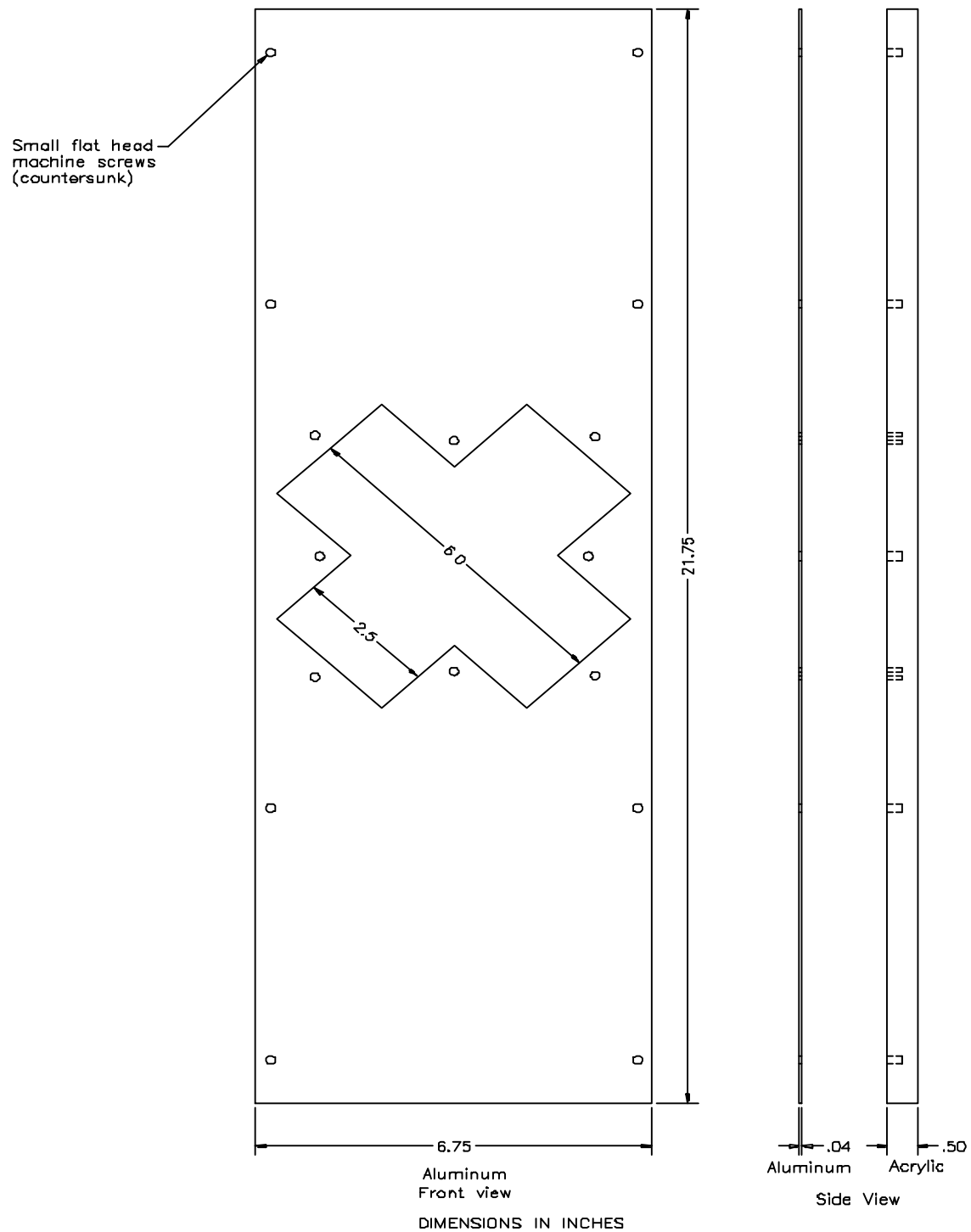


FIGURE 1. Template.

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4.5.4.7 Evaluation. The percent cleaning efficiency for each panel shall be determined as follows:

$$\text{Percent CE} = \frac{L_c - L_s}{L_i - L_s}$$

where: Percent CE = Cleaning efficiency

L_i = Initial lightness

L_c = Cleaned lightness

L_s = Soiled lightness

The average of the three panels tested shall be recorded.

4.5.5 Cleaning efficiency on vertical surfaces (type V).

4.5.5.1 Panel preparation. Panel shall be at least 5 by 16 inches (12 by 40 cm) in size and prepared as in panel A, table VIII. Spray wire rope lubricant (Sprayon No. 201, or equivalent) onto an aluminum test panel. Immediately wipe back and forth using a non-abrasive cleaning pad to achieve a uniform soil. Allow the soil to dry at room temperature for a minimum of 15 minutes.

4.5.5.2 Cleaning. Position the soiled test panel such that the short dimension is vertical and the long dimension is horizontal. Apply the product to the panel using a pump-spray applicator. After 5 minutes, rinse the test panel by spraying with distilled water using the same pump-spray applicator.

4.5.6 Consistency (type IV, V). A consistometer (see 6.6, table IX) shall be used as follows: Shake the container of cleaning compound by hand for 10 seconds. Fill the well of the consistometer completely with the compound. Release the gate and determine the extent of flow in 10 seconds.

4.5.7 Foaming properties (type I and II). One part of the undiluted compound shall be mixed with 9 parts 10-grain hard water (see 4.5.4.5) for type I and 14 parts 10-grain hard water for type II. One hundred ml of this mixture shall be placed in a 500 ml capacity blender with a maximum 3.15 inch (9.5 cm) outside diameter. The blender shall be turned on and run for 2 minutes at $8,000 \pm 1,000$ rpm. The blender shall be turned off after 2 minutes and the mixture allowed to stand undisturbed for 6 minutes. The compound shall be observed for conformance to table I.

4.5.8 Low temperature stability. Approximately 50 ml of the cleaning compound shall be poured into a test tube and cooled to 0 ± 9 °F (-18 ± 5 °C) in a cold box. The sample shall be held at this temperature for one hour. The sample shall then be removed from the cold box and the

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temperature allowed to rise to standard room temperature. Invert the test tube five times and examine the content for homogeneity.

4.5.9 Nonvolatile content. Place approximately 0.5 grams of cleaning compound into each of three weighing dishes and record weight to within ± 0.0001 grams. Place the dishes in a forced draft oven for 1 hour at 100 ± 4 °F (38 ± 2 °C). Cool the dishes to room temperature in a dessicator and reweigh to determine the percent non-volatiles.

4.5.10 Plastics, effect on. Cleaning compound shall be tested in accordance with ASTM-F484 as follows:

| | |
|--------------------|------------------------------------|
| Types I, II, IV, V | - Diluted 1:1 with distilled water |
| Type III | - As received |
| Type IA | - As received (see below) |

Type IA products shall be sprayed onto the flannel patch through a metal panel with a 0.5 by 0.5 inch window which is placed directly on the patch prior to spraying. (This prevents edge contamination which can lead to premature failures.) The amount of cleaner applied to the patch shall be equivalent to that used for testing bulk packaged products.

4.5.11 Polyimide insulated wire, effect on. Approximately 24 inches (61 cm) of wire conforming to MIL-W-81381/11 shall be formed into a coil. Place the coil in a 4 ounce (118 ml) wide mouth jar. Add enough concentrated cleaning compound in the jar to completely cover the coil of wire. Cap the jar and store it at room temperature for 14 days. Repeat this procedure using distilled water as the test medium. At the end of the storage period, remove the coil and rinse thoroughly with tap water at room temperature. Suspend the coil and allow it to drain until completely dry. Each wire shall be wrapped tightly around a 0.125 inch (3 cm) mandrel and then unwrapped slowly, noting the appearance and number of any cracks in the insulation. The wire shall meet the requirements specified in table I. The wire shall be immersed in a 5 percent by weight sodium chloride solution and subjected to a one minute dielectric test of 2,500 volts (rms.).

4.5.12 Salt-coated surfaces, effect on. A test shall be conducted in accordance with ASTM- F502, with the addition that panels shall be sprayed with ASTM-D1141 synthetic ocean water and dried in a 70 ± 4 °F (38 ± 2 °C) convection oven prior to testing.

4.5.13 Service evaluation. The service evaluation tests, performed by an activity designated by the qualifying activity, shall consist of cleaning of two or more aircraft under actual service conditions. Test results shall be compared to the results obtained with the control formula.

4.5.14 Storage stability. A steel strip conforming to SAE-AMS5046 shall be added to the one gallon (3.785 liters) container of cleaning compound furnished for storage stability (see 4.3.1.1). The total surface area of the steel strip shall be 6 ± 0.5 sq. inches (30.7 sq. cm). The sample shall be stored for one year at 70 ± 5 °F (21 ± 3 °C). After the one year storage period, the

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sample shall be examined for evidence of separation, crystallization, deterioration, corrosion of the steel strip, container incompatibility, distortion, leakage, or container corrosion. Type IA containers of cleaning compound shall be exhausted or emptied, cut open, and examined for container incompatibility and corrosion.

4.5.15 Embedded soil cleaning efficiency (type III only) Lightly abrade the surface of a designation A (table VIII) test panel with 240 grit abrasive paper or cloth, then sprinkle on a small amount of carbon black and rub it into the surface using MIL-C-1164 terry cloth, or equivalent. If the test panel can be completely cleaned of all carbon using a non-abrasive eraser, repeat the panel preparation using more hand pressure on the abrasive. If the test panel can not be completely cleaned using the eraser, the above method is to be used for making test panels. Using soiled test panels, apply undiluted type III cleaner using terry cloth. Rub the cleaner over the soiled area for 30 seconds using moderate hand pressure and rinse thoroughly with cold tap water. Examine for soil residue.

4.5.16 Net weight (type IA). A pressurized can of cleaning compound shall be weighed to the nearest gram. The can shall spray for three minutes, followed by a one minute pause. This procedure shall be repeated until the can is empty. The empty can shall then be re-weighed and the weight of the contents calculated.

4.5.17 Leakage (type IA). A pressurized can of cleaning compound shall be immersed completely for five minutes in water maintained at 130 ± 3 °F (54 ± 2 °C). The can shall be observed for emission of bubbles or distortion during this period.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The cleaning compound exceeds commercially available cleaning compounds in order to provide for the cleaning of military aircraft high gloss and camouflage paint systems, low gloss tactical paint schemes, and cleaning exhaust track and gun blast soils. Specifically, the cleaning compounds are intended for use in cleaning painted or unpainted aircraft surfaces. Type I may be

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used in general cleaning of aircraft, provided that local regulations do not limit the use of aromatic solvents or volatile organic compounds. Type IA is a 1:4 dilution of Type I, packaged in an aerosol container. Type II may be used in general cleaning of aircraft, for both high gloss and camouflage paint systems. Type III contains a very fine abrasive and is designed for cleaning exhaust track and gun blast soils from high gloss paint systems. Type IV contains non-abrasive particulate rubber and can be used on low gloss tactical paint scheme coatings to clean stubborn areas such as boot marks and smudges, as well as gun blast and exhaust track soil. Type V can be used in wheel wells, wing butts, and other areas where complete rinsing with water can be tolerated.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of this specification.
- b. Type of cleaning compound required (see 1.2)
- c. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.2 and 2.3).
- d. Quantity of cleaning compound.
- e. Conformance test sample size, if different from 4.4.1.
- f. Packaging requirements (see 5.1).

6.2.1 Unit of purchase. The unit of purchase for the cleaning compound is the U.S. gallon. A U.S. gallon of liquid occupies 231 cubic inches (3.785 liters) at 15.6°C (60°F).

6.2.2 Container size. Container size guidelines are as follows:

Types I, II, IV, V: 5, 15, or 55 gallon
 Type III: 1 quart
 Type IA: 16 or 20 ounce
 self-pressurized can
 Type V: Optional size plastic trigger
 spray bottle

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Products List (QPL-85570) whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or purchase orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from the Naval Air Warfare Center Aircraft Division, Code 4.3.4.1, Bldg. 2188, 48066 Shaw Rd., Unit 5, Patuxent River, MD 20670-1908.

6.3.1 Inspection report. When authorizing the forwarding of qualification samples, the qualifying activity will request along with the qualification sample a satisfactory Material Safety Data Sheet (see 6.5) in accordance with FED-STD-313 and 29 CFR 1910.1200 and a report that includes the following information:

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- a. The results of tests performed by the manufacturer.
- b. Toxicological information necessary to evaluate the safety of the compound.
- c. Weight percent of aromatic solvents, total organic solvents, water, and rubber (for type IV).
- d. Aerosol container construction and packaging company where applicable.

6.4 Definitions.

6.4.1 Batch. A batch is defined as that quantity of material which has been manufactured by some unit chemical process and subjected to some physical mixing operation intended to make the final product substantially uniform.

6.4.2 Lot. A lot is defined as all the cleaning compound produced by one manufacturer, at one plant, from the same materials, and under essentially the same conditions during a continuous operation not exceeding 24 hours. In the event the process is a batch (see 6.4.1) operation, each batch constitutes a lot.

6.4.3 Solvent. A solvent is defined as an organic liquid having a vapor pressure of greater than 0.1 mm Hg at 25 °C.

6.5 Material safety data sheets. Contracting officers will identify those activities requiring copies of completed Material Safety Data Sheets prepared in accordance with FED-STD-313. The pertinent government mailing addresses for submission of data are listed in Appendix B of FED-STD-313.

6.6 Supplier information.TABLE IX Item supplier information.

| Item | Identification | Supplier | Location |
|---------------------------|-----------------|-----------------|--|
| 5x12 Hog bristle brush | Gardner WG2000B | Paul N. Gardner | 316 NE 1 st St, Pompano Beach, FL 954-946-9454 |
| Optical Sensor | D25A | Hunter | Reston, VA |
| Cellulose sponge | Cat No. 63 | 3M | 3M Center #223-3N-05 Minneapolis, MN 651-736-3691 |
| Consistometer | ASTM F-1080 | Paul N. Gardner | 316 NE 1 st St, Pompano Beach, FL 954-946-9454 |
| Glossmeter | Novo-Gloss | Paul N. Gardner | Pompano Beach, FL |
| Washability / Wear Tester | Model D10V | Paul N. Gardner | Pompano Beach, FL |

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TABLE X. Chemical supplier information.

| Component | Supplier | Address |
|---|---|---|
| Igepal | GAF/International Specialty Products | 1361 Alps Road Wayne, NJ 07470 973-628-3000 |
| Monacor 4000 Monamid Monateric Monamine Monamulse | Uniqema | 76 E. 24th Street P.O. Box 425 Paterson, NJ 07544 973-345-8220 |
| Dipropylene glycol methyl ether Diethylene glycol butyl ether Trisodium phosphate dodecahydrate Hexylene glycol Benzotriazole Morpholine Sodium Bicarbonate | Fisher Scientific | 711 Forbes Avenue Pittsburg, PA 15219-4785 800-766-7000 |
| Sprayon #201 Open Gear and Wire Rope Lubricant | Sprayon Products Div., Sherwin Williams Paint Co. | 26300 Fargo Ave., Cleveland, OH 216-292-7400 |
| Neodol | Shell Chemical Co. | 910 Louisiana St. Houston, TX 713-241-6161 |
| Sandocorin 8160 | Clariant | 400 Monroe Road Charlotte, NC 28205 704-331-7000 |
| Aromatic 150 Isopar M | Exxon Chemical Co. | 13501 Katy Freeway Houston, TX 281-584-7600 |
| Pluronic F98 | BASF | 100 Cherry Hill Road Parsippany, NJ 07054 201-316-3000 |
| Pylam LX-6545 | Pylam Products | 371 Merrick Rd., Rockville Center, NY 516-825-4939 |
| Hycar 1422 | BF Goodrich | 9911 Brecksville Road Brecksville, OH 44141 800-337-1144 (216-447-5130) |
| Prep-solve | Glidco Organics | PO Box 389 Jacksonville, FL 32201 800-231-3728 |
| Carbon Black (Raven 1040 Pwd) | Columbian Chemical Co. | 1600 Parkwood Circle, Suite 400 Atlanta, GA 404-951-5700 |

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6.7 Subject term (key word) listing.

Aerosol
Degreaser
Gel
Hazardous air pollutant
Pump dispenser
Solvent
Volatile organic compound

6.8 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

CONCLUDING MATERIAL:

Custodians:

Army – MR
Navy - AS
Air Force - 68

Preparing activity:

Navy - AS
(Project 6850-1463)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7, and send to preparing activity.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

| | | |
|---|--|--|
| I RECOMMEND A CHANGE: | 1. DOCUMENT NUMBER MIL-PRF-85570D | 2. DOCUMENT DATE (YYYYMMDD) 19 JUNE 2002 |
| 3. DOCUMENT TITLE CLEANING COMPOUNDS, AIRCRAFT, EXTERIOR | | |
| 4. NATURE OF CHANGE <i>(Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)</i> | | |
| 5. REASON FOR RECOMMENDATION | | |
| 6. SUBMITTER | | |
| a. NAME <i>(Last, First, Middle Initial)</i> | b. ORGANIZATION | |
| c. ADDRESS <i>(Include ZIP Code)</i> | d. TELEPHONE <i>(Include Area Code)</i> (1) Commercial (2) DSN <i>(If applicable)</i> | 7. DATE SUBMITTED (YYYYMMDD) |
| 8. PREPARING ACTIVITY | | |
| a. NAME COMMANDER NAVAL AIR WARFARE CENTER AIRCRAFT DIVISION | b. TELEPHONE <i>(Include Area Code)</i> (1) Commercial (732) 323-2947 (2) DSN 624-2947 | |
| c. ADDRESS <i>(Include ZIP Code)</i> CODE 414100B120-3 HIGHWAY 547 LAKEHURST, NJ 08733-5100 | IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Standardization Program Office (DLSC-LM) 8725 John J. Kingman Road, Suite 2533 Fort Belvoir, Virginia 22060-6221 Telephone (703) 767-6888 DSN 427-6888 | |