

MIL-C-87936A
18 October 1985
SUPERSEDING
MIL-C-87936
13 April 1984

MILITARY SPECIFICATION

CLEANING COMPOUNDS, AIRCRAFT EXTERIOR SURFACES, WATER DILUTABLE

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

1. SCOPE.

1.1 Scope. This specification covers two types of concentrated cleaning compounds for removal of soils from aircraft surfaces. Requirements listed in this specification apply to both types unless otherwise noted. (See 6.1).

1.2 Types.

TYPE I - Alkaline Water Base Aircraft Cleaning Compounds

TYPE II - Solvent Base, Water Dilutable Aircraft Cleaning Compounds (Not for Lacquer Painted Aircraft)

2. APPLICABLE DOCUMENTS

2.1 Government Documents.

2.1.1 Specifications, Standards, and Handbooks. Unless otherwise specified, the following specifications, standards, and handbooks of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation and form a part of this specification to the extent specified herein.

Beneficial comments (recommendations, additions, deletions) and pertinent data to which may be of use in improving this document should be addressed to: SA-ALC/SFRM, Kelly AFB TX 78241-5000, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

FSC 6850

"DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited."

MIL-C-87936A

SPECIFICATIONS

Federal

O-S-642	Sodium Phosphate, Tribasic, Anhydrous, Dodecahydrate, and Monohydrate, Technical
O-T-236	Tetrachloroethylene #Perchloroethylene# Technical Grade
O-T-620	Trichloroethane-1,1,1, Technical, Inhibited, #Methylchloroform#
P-D-680	Dry Cleaning Solvent
QQ-A-250/4	Aluminum Alloy, 2024, Plate and Sheet
QQ-A-250/12	Aluminum Alloy, 7075, Plate and Sheet
QQ-A-250/13	Aluminum Alloy, Alclad, 7075 Plate and Sheet
QQ-M-44	Magnesium Alloy, Plate and Sheet (AZ31B)
TT-E-781	Ethylene Glycol, Monoethyl Ether, Technical (208 liters)
PPP-D-729	Drums, Shipping and Storage, Steel, 55 Gallons
PPP-P-704	Pails, Metal: (Shipping, Steel, 1 through 12 gallons)

Military

MIL-M-3171	Magnesium Alloy, Processes for Pretreatment and Prevention of Corrosion on
MIL-S-7952	Steel, Sheet and Strip, Uncoated, Carbon #1020 and 1025# #Aircraft Quality##ASG#
MIL-P-7962	Primer Coating, Cellulose-Nitrate Modified Alkyl Type, Corrosion-Inhibiting, Fast-Drying (For Spray Application Over Pretreatment Coating) (AG)
MIL-A-8625	Anodic Coatings, for Aluminum and Aluminum Alloys
MIL-C-8514	Coating Compound, Metal Pretreatment, Resin Acid #ASG#
MIL-T-9046	Titanium and Titanium Alloy, Sheet, Strip and Plate
MIL-L-19538	Lacquer, Acrylic Nitrocellulose Camouflage #For Aircraft Use#
MIL-P-23377	Primer Coating, Epoxy Polyamide, Chemical and Solvent Resistant
MIL-C-22750	Coating, Epoxy Polyamide
MIL-C-83286	Coating Urethane, Aliphatic Isocyanate, for Aerospace Application
MIL-P-25690	Plastic, Sheets and Parts, Modified Acrylic Base, Monolithic, Crack Propagation Resistant
MIL-C-43616	Cleaning Compound, Aircraft Surface

STANDARDS

Federal

FED-STD-141	Paint, Varnish, Lacquer and Related Materials, Methods of Inspection, Sampling and Testing
FED-STD-313	Material Safety Data Sheets, Preparation and the Submission of

MIL-C-87936A

Military

MIL-STD-105	Sampling Procedures and Tables for Inspection Attributes
MIL-STD-109	Quality Assurance Terms and Definitions
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-147	Palletized Unit Loads

(Copies of specifications, standards, drawings, and publications required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other Publications. The following documents form a part of this specification to the extent specified herein.

AMERICAN SOCIETY FOR TESTING AND MATERIALS**ASTM Standards**

D 93-80	Flash Point by Pensky-Martens Closed Tester, Test for
D 460-84	Chemical Analysis of Soaps
D 3951-82	Commercial Packaging, Practice for
F 483-77	Total Immersion Corrosion Test for Aircraft Maintenance Chemicals
F 484-77	Stress Craze Test of Acrylic Plastics in Contact with Liquid and Semi-Liquid Compounds
F 485-76	Effects of Cleaners on Unpainted Aircraft Surfaces
F 502-77	Effects of Cleaning and Chemical Maintenance Materials on Painted Aircraft Surfaces
F 503-77	Preparing Aircraft Cleaning Compounds, Liquid Type, for Storage Stability Testing
F 519-77	Mechanical Hydrogen Embrittlement Testing of Plating Processes and Aircraft Maintenance Chemicals
E-70-77	pH of Aqueous Solutions with the Glass Electrode

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia PA 19103.)

SOCIETY OF AUTOMOTIVE ENGINEERS**SAE Standards**

ARP 1511	Corrosion of Low Embrittling Cadmium Plate by Aircraft Maintenance Chemicals
ARP 1512	Corrosion of Aluminum Alloys by Aircraft Maintenance Chemicals

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

Uniform Freight Classification Rules (Current Issue)

(Application for copies should be addressed to the Uniform Classification Committee, Room 1106, 222 South Riverside Plaza, Chicago IL 60606.)

MIL-C-87936A

(Industry association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

2.3 Order of Precedence. In the event of a conflict between the text of this specification and the reference cited herein, the text of this specification shall take precedence.

3. REQUIREMENTS

3.1 Qualification

3.1.1 Qualification (Initial). The cleaning compound furnished under this specification shall be a product which has been tested and has passed the qualification tests specified herein and has been listed or approved for listing on the applicable Qualified Products List (QPL).

3.1.2 Qualification (Practical Cleaning). After the cleaning compound has passed all tests specified herein, practical cleaning tests shall be performed in accordance with paragraph 4.4.7 to meet the requirements in paragraphs 3.1.2.1 and 3.1.2.2.

3.1.2.1 General Practical Cleaning Test. When evaluated in accordance with 4.4.7.1, the cleaning compound shall remove carbonaceous soils including exhaust deposits, oily soots, and other oxidized organic fluids associated with jet engine operations. (See 3.1.2.2)

3.1.2.2 Practical Cleaning Comparison Test. When evaluated in accordance with paragraph 4.4.7.2, the cleaning compound shall clean equal to or better than the comparison formula.

3.1.3 Qualification (Periodic). The cleaning compound furnished under this specification must be retested or recertified by the qualifying activity at least every two years for the product to remain listed on the qualified products list. Qualification retesting will also be accomplished on any qualified cleaning compound on which a using activity issues a valid material deficiency report. Any cleaning compound which does not conform to all the qualification tests specified herein on periodic requalification testing will be removed from the qualified products list.

3.2 Materials. The composition and formulation of the cleaning compound shall be optional with the manufacturer within the restrictions specified herein. Type I compound shall consist of surfactants, builders, water conditioning agents, and corrosion inhibitors to produce a stable, homogeneous product, conforming to the requirements of this specification. Type II will consist of the same materials allowed for Type I with the addition of non-halogenated organic solvents. The cleaning compounds shall not contain any phosphates, abrasives, chromates, phenols, cresols, heavy metals or any inert fillers such as sodium chloride, urea, sodium sulfate, nitrates, nitrites, sucrose or any other sugars. The cleaning compound shall not contain any materials which alone or in combination will be corrosive to aerospace structural metals or metal alloys. It also shall not contain any known toxins or carcinogens such as benzene.

3.3 Toxicity. The cleaning compound shall have no adverse effect on the health

MIL-C-87936A

of personnel when used for its intended purpose. Questions pertinent to this effect shall be referred by the procuring activity to the appropriate medical service who will act as adviser to the procuring activity. The manufacturer shall certify that the cleaning compound contains no substance known to be toxic or carcinogenic to the user under normal conditions of use. Material safety data sheets shall be prepared in accordance with FED-STD-313. One copy shall be forwarded to the qualifying activity, the preparing activity of this specification and to the procuring activity. In addition, the manufacturer shall submit to the qualifying activity; SA-ALC/SFTT, Kelly AFB TX 78241-5000, a complete formulation including the chemical name and weight percent of each ingredient. Trade names alone will not be considered satisfactory. (See 4.3.2 and 4.7)

3.3.1 Biodegradability. The supplier of the cleaning compound shall furnish certification from the surfactant and surface active agent manufacturer(s) of the total percent activity and percent biodegradability of the surfactants and other surface active agents.

3.3.2 Solvent content. Non-halogenated organic solvents used in Type II compounds shall not exceed 45 percent by volume when tested in accordance with 4.6.18. Type I shall not contain more than 1%.

3.3.3 Compositional assurance. The cleaning compound shall be tested for non-volatile content as specified in paragraph 4.6.1 and recorded in the Qualified Products List (QPL). This will become the baseline for use in Quality Conformance Inspections. Quality conformance inspection results shall not differ from this recorded value by more than 2 percent absolute. At the option of the procuring activity, infrared spectrograms may be obtained which shall show no significant difference when compared to the original qualifying spectrogram.

3.4 Chemical Properties.

3.4.1 Chemical Requirements. The cleaning compound shall meet or exceed the requirements listed in Table I.

TABLE I

QUANTITATIVE REQUIREMENTS

REQUIREMENT	TYPE I		TYPE II		TEST METHOD
	MIN	MAX	MIN	MAX	
	REPORT		REPORT		
Insoluble Matter (Wt%)	—	0.05	—	0.05	4.6.2
pH					
10% Solution	10.5	11.5	10.5	11.5	4.6.3
Conc. Solution	—	12.5	11	12.5	
Flash Point (Degrees C)	(None to	—	94	—	4.6.10
	IBP)				
Emulsibility (ml free water)	—	2.0	—	2.0	4.6.11
Hard Water Stability (ppm silica)	--	20.0	--N/A--		4.6.12

MIL-C-87936A

3.4.2 Volatility. For Type II cleaning compound, the volatility of a 10 percent solution in distilled water shall be less than or equal to the volatility of distilled water when tested in accordance with 4.6.4.

3.4.3 Residue Rinsibility. For both types, when a freshly prepared solution of the cleaning compound is tested in accordance with 4.6.5, it shall not leave any residue or stains. (A freshly prepared solution is defined as one being prepared no longer than 30 minutes prior to testing.) Weight change shall be no greater than that obtained with standard hard water (plus or minus 0.2 mg) tested under the same conditions.

3.5 Physical Properties (Both Types Unless Noted).

3.5.1 Heat stability - (Type II Only). The concentrated cleaning compound, when tested in accordance with 4.6.6, will show no marked color change or precipitation and shall not corrode or stain the low carbon test strip. Layering or separation will constitute failure if it does not return to its original homogeneous state.

3.5.2 Cold stability. The concentrated cleaning compound shall return to its original homogeneous condition after being held to a temperature of 0 Degrees C for a period of one hour when tested in accordance with 4.6.7.

3.6 Effect on metals (Both Types).

3.6.1 Hydrogen embrittlement. When tested in accordance with 4.6.11, the concentrated cleaner and a 10 percent solution of the cleaner in distilled water shall not cause hydrogen embrittlement of cadmium plated AISI 4340 steel.

3.6.2 Total immersion corrosion. When tested in accordance with 4.6.12, the concentrated cleaning compound and a 10 percent solution of the cleaning compound in distilled water shall not cause pitting corrosion or cause a weight change of an average of three (3) test panels greater than shown in Table II. In order to obtain the best results on test panels in this very low weight category, the panels must be handled with gloves, cleaned in a very careful manner and dried in an oven. They are cooled and dried in a dessicator both before and after each weighing.

3.6.3 Low-embrittling cadmium plate corrosion. Steel panels coated with low-embrittling cadmium plate immersed in the concentrated cleaning compound and a 10 percent solution of the cleaning compound in distilled water shall not show a weight change greater than 0.14 mg/cm² for 24 hours when tested in accordance with 4.6.13.

3.6.4 Effects on unpainted metal surfaces. A 10 percent solution of the cleaning compound in distilled water shall not cause streaking, stains or other deposits that cannot be easily removed with water when tested in accordance with 4.6.14.

MIL-C-87936A

3.7 Effect on painted surfaces. The concentrated cleaning compound and a 25 percent solution of the cleaning compound in distilled water shall not cause streaking, blistering, discoloration or a permanent decrease in film hardness of more than one pencil hardness level when tested in accordance with 4.6.15. The Type II material shall be tested using only the Polyurethane (P) Paint System.

TABLE II

Total Immersion Corrosion Requirements

Alloy	Average of 3 Panels Weight Change, Max (mg/cm ² /24 hrs)
Magnesium (AZ 31B-H24) QQ-M-44 surface treated in accordance with Type II of MIL-M-3171	0.03
Aluminum, QQ-A-250/4, T3 surface treated in accordance with Type II, Class I of MIL-A-8625	0.03
Aluminum, QQ-A-250/4, Bare T3 Alloy	0.03
Aluminum, QQ-A-250/12, Bare T6 Alloy	0.03
Titanium, MIL-T-9046, 6AL-4V Class III, Composition C	0.05
Steel, MIL-S-7952, Grade 1020	0.22

3.8 Stress Crazing of Stretched (Type C) Acrylic Plastics. A 10 percent solution by volume of the cleaning compound in distilled water shall not cause stress crazing or staining acrylic plastics when tested in accordance with 4.6.16.

3.9 Long-term storage stability. After being stored for a period of 12 months, in accordance with 4.6.17, the cleaning compound shall not separate, precipitate or cause corrosion of the shipping container and shall meet all requirements of this specification excluding the practical cleaning test.

3.10 Infrared spectrogram. Two certified copies of an infrared spectrogram shall be furnished by the Government approved qualification laboratory as part of the qualification test report (See 4.9).

3.11 Workmanship. The cleaning compound shall be manufactured from materials

MIL-C-87936A

entirely suitable for the purpose intended and shall be processed in a manner that will produce a product harmless to metal surfaces and humans when used as directed.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification when such inspections are deemed necessary to assure supplies and services conform to prescribed requirement.

4.2 Classification of tests. The inspection and testing of the cleaning compound shall be as follows. The inspection terms used herein are as defined in MIL-STD-109.

- a. Qualification inspection (4.3).
- b. Quality conformance inspection (4.4).

4.3 Qualification inspection. Qualification inspection shall consist of all inspections and tests specified herein.

4.3.1 Qualification samples. The initial qualification samples shall consist of 7.6 liters (two gallons) of the cleaning compound. The practical cleaning qualification samples shall consist of two (2) 18.9 liter (5-gallon) pails of the cleaning compound. The cleaning compound shall be furnished in containers of the type to be used in filling contract orders. Samples shall be identified as follows and forwarded to the activity responsible for testing, as designated in the letter of authorization from the activity responsible for qualification (See 6.3):

- Samples for Qualification Tests.
- Cleaning Compound, Aircraft Surfaces, Type __
(I or II).
- MIL-C-87936A.
- Manufacturers Product and Code Number.
- Name and Address of Contractor.
- Submitted by (Name), (Date) for Qualification
Testing in Accordance with the Requirements
of MIL-C-87936A Under Authorization (Reference
Authority Letter).
- Mixing and Other Important Instructions.
- Safety Information and Precautions.

4.3.2 Test reports. In addition to the qualification test samples, the contractor shall furnish a certified test report showing that the material conforms to all the requirements of this specification with the exception of the practical cleaning test and storage stability. Additionally, a certified statement shall be furnished to the qualifying activity that specifically identifies each ingredient including solvent in the cleaning compound by a readily recognizable chemical name, source and percentage by weight contained

MIL-C-87936A

in the compound. Trade names alone will not be considered satisfactory.

4.3.3 Qualification required. Prior to actual procurement, the cleaning compound shall pass the qualification inspections and requirements specified herein. If the product is later modified in any way, the modified form shall be subjected to and shall pass the same qualification inspections (See 3.1). Any changes or modifications from the formulation used at the initial qualification shall be approved by the qualifying activity and may require requalification. All qualifications will be granted contingent upon compliance with the long term storage stability requirement specified in paragraph 3.9. (Government conducted). QAR shall verify that each batch/lot consists of the same formulation as used in the initial qualification.

4.4 Quality Conformance Tests. Quality conformance tests for acceptance of the cleaning compound shall consist of the following tests.

TYPE I

- A. Cold Stability
- B. Immersion Corrosion*
- C. Emulsibility
- D. Nonvolatile Matter
- E. pH
- F. Flash Point
- G. Insoluble Matter
- H. Hard Water Stability

TYPE II

- A. Cold Stability
- B. Insoluble Matter
- C. Immersion Corrosion*
- D. Emulsibility
- E. Nonvolatile Matter
- F. Heat Stability
- G. pH
- H. Flash Point

*Immersion Corrosion Quality Conformance Test ran on Aluminum QQ-250/4, Bare T3 alloy panel only.

If during quality conformance testing a lot fails any of the above acceptance tests, all tests required for qualification will be reinstituted. These qualification tests will be required until two successive lots meet all requirements of the specification, after which quality conformance testing will again be authorized. (See paragraph 4.4.6)

4.4.1 Sampling. Unless otherwise specified, not less than a 18.9 liter (5 gal) container of the cleaning compound shall be selected at random from each batch and subjected to the tests specified in 4.4.

4.4.2 Batch. A batch shall consist of all cleaning compound manufactured during one continuous operation, forming all or part of one contract or order for delivery.

4.4.3 Sampling of Product. Sampling for filled containers shall be in accordance with MIL-STD-105. The sample containers shall be subjected to the inspections specified in 4.4.5.

4.4.4 Inspection of Materials. The contractor is responsible for insuring that materials and components used are manufactured, tested, and inspected in accordance with the requirements of referenced subsidiary specifications and standards to the extent specified, or, if none, in accordance with this specification. (See 2.3)

4.4.5 Inspection of the end item. Examination of the end item shall be made in accordance with the following classification of defects, inspection levels and

MIL-C-87936A

acceptable quality levels (AQL). The batch size, for purposes of determining the sample size in accordance with MIL-STD-105, shall be expressed in units of filled primary containers for the examination specified in 4.4.5.1, 4.4.5.2, and 4.4.5.3, and in units of shipping containers for the examinations specified in 4.4.5.4.

4.4.5.1 Quantity. Examination of the end item containers for defects in appearance, closure, construction, workmanship, and markings. The sample unit for this examination shall be one filled primary container.

4.4.5.2 Sample size for examination for defects. The sample unit for this examination shall be one filled primary container. (See 4.4.5.1).

EXAMINATION	DEFECT
-Appearance, construction, and workmanship	Not in container specified, cracked, crushed, or any defect affecting serviceability. Not clean; any evidence of dirt, rust, or foreign matter.
-Closure	Any leakage or seepage of contents in either an upright or horizontal position. Closure not as specified.
-Markings	Omitted, illegible, incorrect, or not in accordance with contract requirements.

4.4.5.3 Examination for net contents. The quality of the batch shall be unacceptable if the average net content is less than the specified or indicated quantity. The sample unit for this examination shall be one filled primary container.

4.4.5.4 Examination of preparation for delivery. An examination shall be made to determine the packing, palletization, and markings comply with Section 5.

EXAMINATION	DEFECT
-Packing	Container not as specified. Arrangement or number of unit containers per pallet (as applicable) not in accordance with contract requirements. Loose or inadequate strappings, bulged or distorted containers.
-Palletization	Palletization not in accordance with contract requirements.
-Markings	Data illegible, incorrect, incomplete or not in accordance with contract requirements.

4.4.5.5 Inspection levels and AQLs for examinations. The inspection levels for

MIL-C-87936A

determining the sample size and the AQLs expressed in defects per 100 units, shall be as specified in Table III.

4.4.6 Rejection and retest. Rejected material shall not be resubmitted for acceptance without prior approval of the qualifying activity. The application for resubmission shall contain full particulars concerning previous rejections and all measures taken to correct those defects. Samples for retest shall be taken from previously unopened product containers.

TABLE III

Examination, Inspection Level, and AQL

Examination	Para	Inspection Level	AQL
Defects in appearance of closure, construction, workmanship, and markings.	4.4.5.1	1	2.5
Net contents.	4.4.5.3	S-2	2.5
Defects in preparation for delivery	4.4.5.4	S-2	2.5

4.4.7 Practical Cleaning Tests. The practical cleaning tests shall be performed by a field activity designated by the qualifying activity. A representative of the qualifying activity shall be present during the tests to verify the test results. These tests shall be accomplished in accordance with applicable Air Force technical orders using standard equipment and standard procedures for washing aircraft. Two 18.9 liter (5 gal) pails of cleaning compound shall be supplied to the field activity for the tests. A minimum of either one bomber or one cargo or one fighter aircraft shall be washed.

4.4.7.1 General Practical Cleaning Test. The cleaner shall be diluted with water in accordance with the dilution ratio given by the manufacturer. The aircraft shall be cleaned and examined visually for compliance with paragraph 3.1.2. For Type I alkaline compound evaluation on the exhaust paths and very oily areas, precleaning with P-D-680 Type II solvent is allowed.

4.4.7.2 Practical Cleaning Comparison Test.

4.4.7.2.1 Preparation of Comparison Formulation. The following comparison cleaning formula shall be prepared by the qualifying activity and used for evaluation:

<u>Component</u>	<u>Percent by Weight</u>
Sodium Metasilicate Pentahydrate	7.0
Trisodium phosphate (dodecahydrate) conforming to O-S-642	5.0
Nonionic surface active agent (Triton X-100 manufactured by Rohm and Haas Company) . . .	2.0
Ethylene glycol monoethyl ether conforming to TT-E-781	6.0
Distilled Water.	80.0

MIL-C-87936A

Compounding: Dissolve trisodium phosphate and sodium metasilicate in distilled water. Add the nonionic surface active agent and ethylene glycol monoethyl ether. Thoroughly mix the solution.

NOTE: This formulation is corrosive and solely intended for use as the referee for the practical cleaning comparison test. It will not qualify to the other requirements listed in this specification.

4.4.7.2.2 Comparison Test Procedure. The sample cleaning compound shall be diluted in accordance with contractor's stated dilution ratio. The comparison formula shall be diluted one part to three parts water, and comparable exhaust areas of the aircraft shall be cleaned with these solutions. The comparison formula shall also be diluted one part to nine parts water and other comparable areas of the aircraft cleaned. All the cleaned areas shall be examined visually for compliance with para 3.1.2.2.

4.5 Standard conditions. Standard conditions are defined by FED-STD-141, Section 9. All laboratory tests shall be conducted at standard conditions unless otherwise specified herein.

4.6 Test Methods.

4.6.1 Nonvolatile matter. The nonvolatile solids content of the cleaning compound shall be determined in accordance with ASTM D 460, Method A, Procedure 11.

4.6.2 Insoluble matter. The concentrated cleaning compound shall be thoroughly agitated and a 200-ml. test sample withdrawn. The insoluble matter shall be collected with the aid of a vacuum filtering apparatus consisting of a water tap filter pump, a 2,000 ml. Erlenmeyer flask, a size 4 (126 millimeter (mm.) I.D.) Buchner funnel and a piece of 12.6 centimeter diameter (126 mm.) Whatman No 5 filter paper, or equivalent. The filter paper shall be dried at 60 Degrees C (140 Degrees F) for 30 minutes in a gravity convection oven, cooled for 3 minutes in a dessicator, and weighed to the nearest 0.1 mg. The filter paper shall be placed in the Buchner funnel so that its circumference coincides with the circumference of the funnel. The vacuum shall be started and the filter paper wetted with approximately 10 cubic centimeters (cc.) of distilled water in order to secure it properly in place. The test sample shall be filtered. The sides of the beaker which contained the test sample shall be rinsed with 25 cc. of distilled water from a wash bottle, and the rinse transferred to the funnel, insuring that any remaining insoluble matter is completely transferred with the rinse. When all the initial liquid and the rinse have been transferred through the filter, the sides of the funnel shall be washed with 25 cc. of distilled water from a wash bottle and the rinse allowed to filter. The vacuum on the flask shall be relieved and the filter paper removed from the funnel. The filter paper shall be dried for 1 hour at 60 Degrees C (140 Degrees F) in a gravity convection oven, cooled for 3 minutes in a dessicator, and weighed to the nearest 0.1 mg. The percent insolubles shall be calculated as follows:

$$\frac{\text{Final filter paper weight} - \text{initial filter paper weight}}{\text{Weight of Sample}} \times 100 = \text{weight percent insolubles}$$

Care should be exercised throughout the final drying and weighing cycle to

MIL-C-87936A

maintain the flat surface of the filter paper in a horizontal position in order that none of the insoluble matter will be lost. Insoluble matter determinations shall be made on a minimum of two samples.

4.6.3 pH value. The pH value of the concentrated cleaning compound and required percent solutions of the cleaning compound in freshly boiled distilled water shall be measured using a suitable pH meter that is equipped with high pH glass electrodes.

4.6.4 Volatility. A petri dish, 9 centimeters in diameter and 1.5 centimeters deep shall be placed on each pan of a two-pan beam balance. Sufficient compound shall be added to cover the entire bottom of one of the dishes. Distilled water shall be carefully poured in the other dish until the dish containing the compound is counterbalanced. The balance with filled dishes on the pans shall be exposed for 60 minutes in a draft free atmosphere having a temperature of 25 ± 3 Degrees C (75 ± 5 Degrees F). At the end of the exposure period, the comparative weight loss will be determined.

4.6.5 Residue rinsibility. Six aluminum dishes containing no creases or crevices shall be cleaned in a solution of 21 g. chromic acid and 36 g. phosphoric acid per liter, rinsed, dried, and weighed. Ten ml of 25 percent by volume solution of the cleaning compound in standard hard water (See 4.6.10.1) shall be placed in three of the precleaned dishes and tested as follows: Dry for 7 1/2 hours in a circulating oven at 68 Degrees plus or minus 2 Degrees C with full draft.

Cool in desiccator overnight and weigh. Rinse with running distilled water for 1 minute. Brush with sash-type brush containing long-fiber bristles (2.5 cm diameter by 3.8 cm to 6.4 cm long) for 1 minute using distilled water. Rinse for 30 seconds with running distilled water. Dry in oven, cool, and reweigh. Check for compliance with 3.4.3. Standard hard water, prepared as described in 4.6.10.1, shall be tested as control for weight change comparison in the remaining three precleaned dishes, using the same procedure as above.

4.6.6 Heat stability - (Type II Only). A 141.75 gram sample of the well mixed concentrated cleaning compound shall be placed into each of two clean 254.9 ml (12 oz) clear glass bottles having approximate dimensions of 24 cm in height by 6.35 cm in diameter (9.5 in x 2.5 in). One bottle containing the concentrated cleaning compound shall be sealed with a screw type cap and stored in a dark place at standard conditions for 6 days (144 hrs) for reference purposes. Place into the second bottle of concentrated cleaning compound a strip of steel, 15.24 cm by 1.27 cm by 0.05 cm (6 in x 0.5 in x 0.02 in) conforming to MIL-S-7952. Clean the steel strip by abrasively polishing to remove surface scale and corrosion followed by immersion for one minute in reagent grade isopropyl alcohol followed by immersion for one minute in reagent grade xylene at standard conditions. Seal the bottle containing the concentrated cleaning compound and the cleaned steel strip with a screw type cover and shake thoroughly for 1 minute. Place the bottle in a bath maintained at 60 Degrees plus or minus 2 Degrees C (140 Degrees plus or minus 3 Degrees F) for 5 hours, then remove and allow to cool to ambient conditions for 19 hours. This heating/cooling cycle will be repeated 5 times. After completion of the test period, remove the test strip and inspect the portion of the strip which was immersed in the cleaning compound and the portion exposed to the vapors. Any corrosion, pitting or discoloration constitutes failure. The bottle is resealed and along with the control bottle, that has been maintained in the dark, is shaken thoroughly for 1 minute, then allowed to remain undisturbed for

MIL-C-87936A

1 hour at room temperature. The bottles are then examined. Any marked change in color, precipitation, layering or separation constitutes failure.

4.6.7 Cold stability. A 50 ml sample of the cleaning compound shall be poured into a suitable test tube and cooled to 0 Degrees C. This temperature shall be maintained for one hour. The compound shall be allowed to reach room temperature. After 5 (five) complete inversion cycles of the test tube, the compound shall be examined for homogeneity.

4.6.8 Flash point. The flash point of the concentrated compound (Both Types) shall be determined in accordance with ASTM D 93.

4.6.9 Emulsibility. **A. (Type I Only)** Ten ml. of a 25 percent by volume solution of the cleaning compound shall be placed in a 50-ml. glass-stoppered, graduated cylinder. Thirty ml. of dry cleaning solvent conforming to Type II of P-D-680 shall be added. An emulsion shall be formed by 10 inversions of the graduate followed by a vigorous 15-second shake. The 15 seconds of agitation shall be repeated after the emulsion has stood for 5 minutes. The resulting emulsion shall be allowed to stand for 6 hours. At the end of the 6-hour period, the emulsion shall be examined. There shall be no evidence of emulsion separation or free oil and no more than 2.0 ml of free water. **B. (Type II Only)** Place 5 ml. of the concentrated compound in a 50 ml graduated cylinder and add 45 ml of distilled water. The emulsion shall be formed by 10 inversions of the cylinder followed by vigorously hand shaking the cylinder for 15 seconds. The 15 second agitation shall be repeated a second time after 5 minutes has elapsed. The cylinder shall then be covered and allowed to stand undisturbed for 6 hours. At the end of the 6 hours, there shall be no evidence of emulsion separation or free oil and no more than 2.0 ml. of free water.

4.6.10 Hard-water stability (Type I Only):

4.6.10.1 Preparation of stock solution. A 20-grain (as CaCO_3) hard-water stock solution shall be prepared by dissolving 0.40 plus or minus 0.005 grams of reagent grade Calcium Acetate, $\text{Ca}(\text{C}_2\text{H}_3\text{O}_2)_2 \cdot 2\text{H}_2\text{O}$ and 0.28 plus or minus 0.005 grams of reagent grade Magnesium Sulfate, $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$, in 1 liter of boiled distilled water.

4.6.10.2 Procedure. Using a 5 ml volumetric pipet, transfer 5 ml of a 25 percent by volume solution of cleaning compound into each of 3 clean 50 ml volumetric flasks. Add hard-water stock solution to each of 3 flasks to make 50 ml. Each solution shall be well mixed and allowed to stand undisturbed for 24 hours at 25 degrees plus or minus 1 degrees C. Each solution shall then be visually examined for precipitation. Agitate each solution by inverting the flask five times. The turbidity shall be measured with a Hellige turbidimeter or equivalent non-photometric instrument and calibrated as ppm silica.

4.6.11 Hydrogen embrittlement. The hydrogen embrittlement properties of the cleaning compound shall be determined in accordance with ASTM F 519 using Type 1a, Treatment B AISI 4340 steel specimens.

4.6.12 Total immersion corrosion. The total immersion corrosion effects of the cleaning compound on the new, unused metals and metal alloys listed in 3.6.2 and Table II shall be determined in accordance with ASTM F 483-77.

4.6.13 Low embrittling cadmium plate corrosion. The cleaning compound shall be evaluated for corrosion on low-embrittling cadmium plate in accordance with ARP

MIL-C-87936A

1511.

4.6.14 Effects on unpainted metal surfaces. The cleaning compound shall be evaluated for effects on unpainted metal surfaces to the requirements of ASTM F 485.

4.6.15 Effect on painted surfaces. Prepare a 25 percent solution of cleaning compound with distilled water. Test both the 25 percent solution and concentrate in accordance with ASTM F 502 except that the panels used for testing shall be coated with the paint systems listed in Table IV. For all paint systems tested, a separate panel will be required for both 25 percent solution and concentrate. For Type I compound, conduct the test on all paint systems listed in Table IV. For Type II compound, conduct the test only on the polyurethane (P) paint system.

4.6.16 Stress crazing of stretched (Type C) acrylic plastics. The cleaning compound shall be evaluated for stress crazing of stretch (Type C) acrylic plastics in accordance with ASTM F 484 except that only the 10 percent solution by volume of the cleaning compound in distilled water shall be tested.

4.6.17 Long term storage stability. The cleaning compound shall be prepared and stored for long term storage stability in accordance with ASTM F 503 using two (2) 3.8 liter (one-gallon) cans conforming to PPP-P-704. This test will be conducted by the Air Force.

4.6.18 Solvent content. The organic solvent content of Type II cleaning compound shall be determined in accordance with ASTM D 460-84 procedures 91 through 95.

4.7 Toxicity and waste disposal characteristics. The supplier shall furnish the toxicological data or formulations required (See 3.3) to evaluate the safety of the material proposed for use. The supplier shall also furnish certification (from the surfactant manufacturer) of the percent activity and percent biodegradability of the surfactants. The data are to be forwarded to San Antonio Air Logistics Center, Attention SFTT, Kelly AFB, Texas 78241-5000.

4.8 Filler Materials. The contractor shall furnish certification that the cleaning compound contains only the materials allowed and does not contain any filler materials disallowed per paragraph 3.2.

4.9 Infrared spectrograms graph. Infrared spectrograms of the non-volatile matter shall be prepared by the Government approved qualification laboratory (See 3.10). The detailed method of sample preparation of the spectra shall be provided with each graph to the qualifying activity from the approved qualification laboratory.

MIL-C-87936A

TABLE IV. Test Panel Finishes

Primer Coatings

Panel Set	Primer Material	Dry Film Thickness Per Coat/ mm(Inches)	No. of Coats	Drying Time Between Coats	Min Drying Time Before Topcoating
L	MIL-C-8514, Coating Compound Metal Pre-treatment Resin-Acid (First Coat)	0.0051-0.0102 (0.0002-0.0004)	1	---	---
	MIL-P-7962 Lacquer Primer (Second Coat)	0.0076-0.0127 (0.0003-0.0005)	1	---	24 hours
EP	MIL-P-23377 Primer, Coating Epoxy-Polyamide, Chemical and Solvent Resistant	0.0178-0.0229 (0.0007-0.0009)	1	---	24 hours

Topcoats

Panel Set	Topcoat Material	Dry Film Thickness Per Coat/ mm (Inches)	No of Coats	Drying Time Between Coats	Dry Film Thickness mm (Inches)	Drying Time Before Testing/ Days
L	MIL-L-19538 Lacquer, Acrylic Nitro-cellulose (Camouflage)	0.0102-0.0127 (0.0004-0.0005)	2	1 hr	0.0203-0.0254 (0.0008-0.0010)	7
E	MIL-C-22750 Coating, Epoxy Topcoat	0.0102-0.0127 (0.0004-0.0005)	2	1 hr	0.0203-0.0254 (0.008-0.0010)	7
P	MIL-C-83286 Polyurethane	0.0203-0.0305 (0.0008-0.0012)	2	1 hr	0.0457-0.0610 (0.0018-0.0024)	7

MIL-C-87936A

5. PACKAGING

5.1 Packing. Packing shall be Level A, or Industrial for required net fill, as specified.

5.1.1 Level A. The cleaning compound shall be furnished in 18.9 liter (5 gallon) containers conforming to PPP-P-704, Type I, Class 4, or in 208 liter (55 gallon) drums conforming to PPP-D-729, Type I.

5.1.2 Industrial. The cleaning compound shall be packed in accordance with ASTM D 3951. Containers shall be in accordance with Uniform Freight Classification rules or regulations of other carriers applicable to the mode of transportation.

5.1.3 Compatibility of materials. The container, closure, lining, or sealing compound shall not interact physically or chemically with the contents so as to corrode, be altered, or to alter the strength, quality or purity of the contents.

5.2 Palletization. When specified, the cleaning compound, shall be palletized in accordance with Load Type III or MIL-STD-147 except that for overseas shipment the overall height of the load shall not exceed 109.2 cm (43 inches.)

5.3 Marking. Containers shall be marked in accordance with MIL-STD-129. This shipment marking nomenclature shall be:

CLEANING COMPOUND, AIRCRAFT EXTERIOR SURFACES, TYPE _
(I OR II) MIL-C-87936A

5.4 Material Safety Data Sheet. Contractor shall comply with the requirements of FED-STD-313.

6. NOTES

6.1 Intended use. The two types of cleaning compound covered by this specification are intended to be used for cleaning exterior aircraft surfaces. (See 1.1). Type I should be used unless otherwise specified. Type II should be used only on polyurethane coatings as it attacks acrylic nitrocellulose coatings. For Naval activities only, cleaning compounds covered by this specification should not be used on Naval aircraft where cleaners could possibly contact polyimide-insulated air frame wiring. (Test as specified in MIL-C-43616.)

6.2 Ordering data. Procurement documents should specify the following:

- a. Title, number and date of this specification.
- b. Type I or Type II.
- c. Size containers required.
- d. QPL reference or test number.
- e. Level of packing required.

MIL-C-87936A

f. Palletization, when applicable.

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are at the time set for opening of bids, qualified for inclusion in the applicable Qualified Products List whether or not such products have actually been so listed by that date. The attention of the contractors is called to this requirement, and contractors are urged to arrange to have their 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 orders for the products covered by this specification. The activity responsible for the Qualified Products List is San Antonio Air Logistics Center, Attention SFTT, Kelly AFB Texas 78241-5000; and information pertaining to qualification of products may be obtained from that activity (See 4.3.1).

6.4 Additional Information Recent changes in EPA Regulations regarding methyl blue active substances (MBAS) may require future restrictions on the use of certain surfactants and/or imposing a specification test for MBAS based on the dilution ratio that may be encountered at wastetreating facilities.

CUSTODIANS:

Army-GL
Navy-AS
Air Force-68

PREPARING ACTIVITY:

Air Force-68

REVIEW ACTIVITIES:

Army-AV
DLA-GS

PROJECT NO. 6850-0784

INSTRUCTIONS: In a continuing effort to make our standardization documents better, the DoD provides this form for use in submitting comments and suggestions for improvements. All users of military standardization documents are invited to provide suggestions. This form may be detached, folded along the lines indicated, taped along the loose edge (**DO NOT STAPLE**), and mailed. In block 5, be as specific as possible about particular problem areas such as wording which required interpretation, was too rigid, restrictive, loose, ambiguous, or was incompatible, and give proposed wording changes which would alleviate the problems. Enter in block 6 any remarks not related to a specific paragraph of the document. If block 7 is filled out, an acknowledgement will be mailed to you within 30 days to let you know that your comments were received and are being considered.

NOTE: This form may not be used to request copies of documents, nor to request waivers, deviations, or clarification of specification 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.

(Fold along this line)

(Fold along this line)

DEPARTMENT OF THE AIR FORCE



NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE \$300

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 73236 WASHINGTON D. C.

POSTAGE WILL BE PAID BY THE DEPARTMENT OF THE AIR FORCE

SA-ALC/SFRM
Kelly AFB, TX 79241

