

NOT MEASUREMENT  
SENSITIVE

MIL-PRF-29608(AS)  
19 September 1996  
SUPERSEDING  
See 6.6

## PERFORMANCE SPECIFICATION

### CLEANING AND CLEANING-LUBRICATING COMPOUNDS, ELECTRICAL CONTACT, LOW OZONE DEPLETION POTENTIAL (ODP)

This specification is approved for use by the Naval Air Systems Command, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

#### 1. SCOPE

1.1 Scope. This specification covers cleaning and cleaning-lubricant aerosol compounds that do not contain Class I Ozone Depleting Substances (ODSs). These products are suitable for use on electrical contacts, connectors, and switches.

1.2 Classification. The compounds are furnished in the following classes and types:

##### 1.2.1 Types.

Type I - Compounds having no deleterious effect on potting compounds, rubber materials, plastics, and insulation material (see 6.5).

Type II - Compounds having a slight deleterious effect on potting compounds, rubber materials, plastics, and insulation material (see 6.5).

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 self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 6850

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

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1.2.2 Classes.

Class C - Cleaning compound with no lubricant.

Class L - Cleaning compound containing 1 to 2 percent by weight of silicone lubricant.

## 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

## FEDERAL

QQ-A-250/5	-	Aluminum Alloy Alclad 2024, Plate and Sheet
VV-D-1078	-	Damping Fluid, Silicone Base (Dimethyl Polysiloxane)

## DEPARTMENT OF DEFENSE

MIL-C-81309	-	Corrosion Preventative Compounds, Water Displacing, Ultra-thin Film
MIL-H-83282	-	Hydraulic Fluid, Fire Resistant, Synthetic Hydrocarbon Base, Aircraft, Metric, NATO Code No. H-537

## STANDARDS

## FEDERAL

FED-STD-313	-	Material Safety Data, Transportation Data and Disposal Data for Hazardous Materials Furnished to Government Activities
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(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Standardization Document Order Desk, 700 Robbins Avenue, Bldg 4D, Philadelphia, PA 19111-5094.)

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 (CFR)

## OCCUPATIONAL SAFETY AND HEALTH STANDARDS

29 CFR 1910.1200 - Toxic and Hazardous Substances - Hazard Communications

## PROTECTION OF THE ENVIRONMENT

40 CFR 82 - Protection Of Stratospheric Ozone  
 40 CFR 261.24 - Characteristics of Hazardous Wastes - Toxicity  
 40 CFR 401 - Effluent Guidelines and Standards - General Provisions

## TRANSPORTATION

49 CFR 173 - Shippers-General Requirements for Shipments and Packagings

(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.)

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 shall be 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-D3065 - Flammability of Aerosol Products, Standard Test Method for (DoD Adopted)  
 ASTM-D5191 - Vapor Pressure of Petroleum Products, Standard Test Method for

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ASTM-F484 - Stress Crazing of Acrylic Plastics in Contact with Liquid or Semi-liquid Compounds, Standard Test Method for (DoD Adopted)

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

INSTITUTE FOR INTERCONNECTING AND PACKAGING ELECTRONIC CIRCUITS (IPC)

J-STD-004 - Requirements for Soldering Fluxes and Non-fluxed Solid Solders for Electronic Soldering Applications (DoD Adopted)

(Application for copies should be addressed to the Institute For Interconnecting And Packaging Electronic Circuits (IPC), 7380 N. Lincoln Avenue, Lincolnwood, IL 60646.)

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 First article. Unless otherwise specified (see 6.2), a sample shall be subjected to first article inspection in accordance with 4.2.

3.2 Material. The formulation is optional, however it shall be in conformance with the requirements of 3.2.1, 3.2.2, and 3.2.3. Control formulas used to verify the requirements of this specification are described in 6.5.

3.2.1 Solvent (vapor pressure). When tested as specified in 4.5.1, the vapor pressure of solvent mixture shall be not less than 30 millimeter (mm) Hg nor greater than 520 mm Hg at 20°C (68°F).

3.2.2 Lubricant. The total amount of lubricant in Class L shall be 1 to 2 percent by weight. The lubricant shall be dimethyl polysiloxane fluid (silicone oil) conforming to VV-D-1078 with a viscosity of 100 to 500 centistokes (cs) at 25°C (77°F).

3.2.3 Propellant. The propellant shall have zero Ozone Depleting Potential (ODP) and shall be capable of delivering a uniform spray of usable product. A hydrofluorocarbon (HFC) may be used provided it conforms to Environmental Protection Agency (EPA) regulations for aircraft maintenance aerosol products current on the date of the invitation for bids or request for proposals.

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3.3 Safety.

3.3.1 Flame extension. When tested in accordance with 4.5.2, the flame extension from the aerosol container shall be not greater than 6 inches.

3.3.2 Toxicity. The Threshold Limit Value (TLV) for the total product shall be not less than 100 parts per million (ppm). In addition, the cleaning compound shall comply as follows:

- a. The compound shall be within the Toxicity Characteristic Leachate Potential (TCLP) limits when tested and listed in 40 CFR 261.24.
- b. The compound shall not contain any known or suspected human carcinogens as defined by the National Toxicology Program's Annual Report on Carcinogens.
- c. The compound shall not contain any toxic pollutants as defined in 40 CFR 401.
- d. The compound shall not contain any Class I Ozone Depleting Substances as defined in 40 CFR 82.

3.4 Appearance. When examined as specified in 4.5.3, the compound shall be homogeneous and free of suspended matter, sediment, grit, or other foreign material.

3.5 Dispenser.

3.5.1 Type. When visually examined in accordance with 4.5.4, the dispenser shall be of the aerosol type and shall have an on/off finger controlled pressure type dispensing device to produce the spray. When not in use, the dispensing device shall be protected against activation by a snug-fitting protective cap. This cap should provide a clearance of 1/8 inch (33 mm) over the dispensing device. A 5-inch (127-mm) hollow cylindrical plastic extension designed to fit into the dispensing device, for directing the spray into hard to reach places, shall be attached to the outside of the dispenser by tape, adhesive, or similar material.

3.5.2 Size. The size of the dispenser shall be capable of containing 5, 12, or 22 ounces (142, 340, or 625 grams) of the cleaning or cleaning-lubricating compound without exceeding 90 percent at 21°C (70°F) of the internal volume of the dispenser.

3.5.3 Leakage. When tested as specified in 4.5.5, the pressurized dispenser shall not leak or become distorted.

3.5.4 Net contents. The average net contents per dispenser shall be not less than the amount specified for the size dispenser when tested in accordance with 4.5.6.

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3.5.5 Precautionary markings. Each dispenser shall contain precautionary information, marked directly on the surface of the dispenser with marking material which is not affected by the cleaning compound. The warning shall be as follows:

CAUTION:                      Contents under pressure.  
                                      Do not puncture.  
                                      Use with adequate ventilation.  
                                      Keep away from direct sunlight, radiators,  
                                      hot water, and other heat.  
                                      Avoid prolonged or repeated breathing of  
                                      vapors or contact with skin.  
                                      Do not take internally.

3.6 Effect on plastics. After testing as specified in 4.5.7, class C cleaning compounds shall not cause crazing of type C acrylic (ASTM-F484) or polycarbonate, and class L compounds shall not cause crazing of polycarbonate.

3.7 Effect on elastomers. The cleaning compounds shall not cause cracking, softening or swelling to the selected elastomers after testing as specified in 4.5.8.

3.8 Cleaning efficiency. When tested in accordance with 4.5.9, the cleaning efficiency of the compounds shall be as specified in table I.

TABLE I. Minimum percent cleaning efficiency.

Soil	Class C	Class L
MIL-C-81309	N/A	35
MIL-H-83282	95	85
VV-D-1078	85	45
J-STD-004, Type R	N/A	80

3.9 Low temperature. After being treated with type I or II material and tested in accordance with 4.5.10, electrical contacts on parts shall function properly in environmental temperatures as low as -54°C (-65°F).

3.10 Storage stability. After storage as specified in 4.5.11, the cleaning compounds shall not have deteriorated and shall meet the requirements for appearance (3.4), leakage (3.5.3) and net contents (3.5.4).

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## 4. VERIFICATION

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

- a. First article inspection (see 4.2)
- b. Conformance inspection (see 4.3)

4.2 First article inspection. The first article inspection shall consist of the tests specified in table II. First time suppliers to this specification shall perform the first article inspections specified herein (see 6.3).

4.2.1 First article samples. When first article inspection is required, the first article sample shall consist of four filled dispensers of the type and class specified in the contract or purchase order. The aerosol cleaner, cleaner/lubricant shall be packaged as specified in 49 CFR 173 for delivery to the testing laboratory. The samples shall be identified by securely attached tags or labels marked with the following information:

Sample for first article inspection  
Cleaning and Cleaning-Lubricating Compound, Electrical Contact,  
Low Ozone Depletion Potential (ODP)  
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Type  
Class  
Manufacturer  
Manufacturer's product identification  
Batch or lot number  
Date of manufacture

4.2.1.1 Manufacturer's data. Along with the first article sample, the manufacturer may be requested to shall furnish two copies of his first article inspection report. The report, when requested, shall show conformance to this specification and shall include:

- a. The certifications required in table II.
- b. A Material Safety Data Sheet (MSDS) prepared in accordance with FED-STD-313 and 29 CFR 1910.1200.

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TABLE II. First article inspections.

Characteristic	Requirement	Test paragraph/method
Solvent (vapor pressure)	3.2.1	4.5.1
Lubricant <u>1/</u>	3.2.2	----
Propellant <u>1/</u>	3.2.3	----
Flame extension	3.3.1	4.5.2
Toxicity <u>1/</u>	3.3.2	-----
Appearance	3.4	4.5.3
Dispenser	3.5	4.5.4
Leakage	3.5.3	4.5.5
Net contents	3.5.4	4.5.6
Effect on plastics	3.6	4.5.7
Effect on elastomers	3.7	4.5.8
Cleaning efficiency	3.8	4.5.9
Low temperature	3.9	4.5.10
Storage	3.10	4.5.11

1/ The manufacturer shall certify the product conforms to the requirement.

#### 4.3 Conformance inspection.

4.3.1 Lot formation. A lot shall consist of all the cleaning compound or cleaning lubricant produced by one supplier, at one plant, from the same materials, under essentially the same manufacturing conditions and offered for inspection at one time.

4.3.2 Sampling for conformance inspection. Sampling shall be as specified in table III.

4.3.3 Inspection procedures. The samples selected in 4.3.2 shall be subjected to the inspections in table IV. There shall be no defects.



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TABLE III. Sampling plan.

Lot size	Number of unit samples selected
1 to 50	2
51 to 500	3
501 to 35000	5
over 35000	8

TABLE IV. Conformance inspections.

Examination	Paragraph	
	Requirement	Test
Dispenser, type and size	3.5.1 and 3.5.2	4.5.4
Leakage	3.5.3	4.5.5
Net contents	3.5.4	4.5.6

4.4 Inspection conditions. Unless otherwise specified in the test method or paragraph, all tests shall be conducted at  $21^{\circ} \pm 3^{\circ}\text{C}$  ( $70^{\circ} \pm 5^{\circ}\text{F}$ ) and  $50 \pm 10$  percent relative humidity.

#### 4.5 Test methods.

4.5.1 Solvent vapor pressure. The solvent vapor pressure shall be determined in accordance with ASTM-D5191 at a test temperature of  $20^{\circ}\text{C}$  ( $68^{\circ}\text{F}$ ) and shall conform to 3.2.1.

4.5.2 Flame extension. Flame extension testing of the aerosol shall be performed in accordance with ASTM-D3065. The flame extension shall conform to the requirements of 3.3.1.

4.5.3 Appearance. A visual examination shall be made of the product after spraying throughout the first article inspection to determine conformance to 3.4.

4.5.4 Examination of dispenser. The dispenser shall be visually examined to determine conformance to 3.5.

4.5.5 Leakage. Using a filled pressurized dispenser, the solvent shall be sprayed five times for three seconds with a two-second pause between sprays. The dispenser shall then be submerged completely in water maintained at  $54^{\circ} \pm 1^{\circ}\text{C}$  ( $130^{\circ} \pm 2^{\circ}\text{F}$ ) for five minutes. The emission of bubbles

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shall indicate leakage. At the end of the five minutes, the dispenser shall be removed from the water and examined for conformance to 3.5.3.

4.5.6 Net contents. The net weight of the dispenser shall be determined by the difference between the gross weight and the tare weight. Results shall be in conformance with 3.5.4.

4.5.7 Effect on plastics. The crazing effect of the product on plastics shall be determined as specified in ASTM-F484 with the following exceptions:

a. Acrylic specimens (type C in ASTM-F484): Type C acrylic specimens shall be stressed to 4500 psi outer-fiber stress. A cotton swatch on the stress point shall be saturated with the test material initially, then every 30 minutes for 8 hours. Test results shall conform to 3.6.

b. Polycarbonate specimens: The specimen shall be the same dimensions as acrylic specimens specified in ASTM-F484. Each specimen shall be loaded to 1000 psi outer-fiber stress. A cotton swatch on the stress point shall be saturated with the test material initially, then every 15 minutes for 2 hours. Test results shall conform to 3.6.

4.5.8 Effect on elastomers. Three elastomeric specimens shall be used. The product shall be sprayed on each specimen until the surface is completely wet. The specimens shall be re-wet after 4 and 8 hours and then be permitted to stand for a total of 24 hours. At this time the specimens shall be examined for conformance to 3.7.

#### 4.5.9 Cleaning efficiency.

4.5.9.1 Specimen preparation. Twelve panels, 2 by 5 by 0.020 inch, cut from aluminum alloy 2024 conforming to QQ-A-250/5 shall be solvent-wiped, weighed ( $W_1$ ), and soiled with the following:

- a. MIL-C-81309 (corrosion preventative)
- b. MIL-H-83282 (hydraulic fluid)
- c. VV-D-1078 (silicone damping fluid)
- d. J-STD-004, Type R (rosin soldering flux)

Five drops of a test soil shall be applied to each of three panels with an eyedropper and spread with acid brush. Repeat this procedure for the remaining test soils. Panels coated with MIL-C-81309 shall be baked at  $105^\circ \pm 1^\circ\text{C}$  ( $221^\circ \pm 2^\circ\text{F}$ ) for 1 hour. Panels coated with soldering flux in accordance with J-STD-004 shall be dried at room temperature for 1 hour. Panels coated with fluids in accordance with MIL-H-83282 and VV-D-1078 shall be tested wet. The weight of the soiled panels shall be recorded as  $W_2$ .

4.5.9.2 Procedure. Soiled panels shall be placed approximately  $45^\circ$  from horizontal. The compound under test shall be sprayed for 5 seconds across each panel and allowed to evaporate for 10 minutes. The bottom edge and reverse of the panel shall be wiped to remove displaced soil.

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Record each final weight ( $W_3$ ). Cleaning efficiency shall be determined as follows with the average results of each soil reported. Results shall conform to 3.8.

$$\% \text{ Cleaning efficiency} = \frac{W_2 - W_3}{W_2 - W_1} \times 100$$

4.5.10 Low temperature. Low temperature requirements shall be demonstrated by observing the operation of an in-service electrical part after the part has been cleaned. Conformance to 3.9 shall be noted.

4.5.11 Storage stability. One aerosol dispenser filled with product shall be stored for 12 months at ambient laboratory temperature and humidity. After the storage period, the sample shall be tested for conformance to 3.10.

## 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 material 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 contact cleaner (Class C) or cleaner-lubricant (Class L) is to be used for the cleaning or cleaning and lubrication of electrical contacts. Type I products contain a mild cleaning agent which will effectively remove light oils and particulates. This type should not significantly affect materials, however, it is slightly more aggressive than CFC-113 based products, and may affect some materials in extreme cases of exposure. Type II products are more effective cleaners for semi-solid soils, but care should be exercised when using this type on synthetic materials, such as acrylics, as this type is slightly more aggressive than Type 1 and may affect some of these materials. Class L products of either type contain electronics grade silicone lubricant, which is effective in reducing contact wear and extends the life of switches.

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6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of this specification.
- b. Type and class of compound (see 1.2).
- c. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.2.1)
- d. Whether first article inspection is required (see 3.1).
- e. Packaging requirements (see 5.1).

6.3 First time suppliers. First time suppliers who have not previously supplied cleaning compounds to MIL-PRF-29608 and want to have their product tested may do so at their own expense. Manufacturers are urged to have their products that they propose to offer to the Federal Government tested so that they may be eligible to be awarded contracts or purchase orders for the products covered by this specification. It is recommended that inquiries pertaining to the testing of products be addressed to the Naval Air Warfare Center Aircraft Division, Mail Stop 3, Bldg 2188, Code 4.3.4.1, 48066 Shaw Road, Patuxent River, MD 20670-5304.

6.4 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 FED-STD-313.

6.5 Control formulas. The following control formulas were used as the basis to generate the requirements for this specification:

<u>Type I, class C:</u>	Dichlorofluoroethane	47%
	C5-C7 Perfluorocarbon	47%
	Carbon dioxide	6%
<u>Type I, class L:</u>	Dichlorofluoroethane	47%
	C5-C7 Perfluorocarbon	47%
	100-500 cs Silicone Oil	1%
	Carbon dioxide	5%
<u>Type II, class C:</u>	Dichlorofluoroethane	53%
	Ethanol	7%
	Tetrafluoroethane	40%

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<u>Type II, class L:</u>	Dichlorofluoroethane	52%
	Ethanol	7%
	100-500 cs Silicone Oil	1%
	Tetrafluoroethane	40%

6.6 Supersession data. This specification supersedes MIL-C-81964(AS), MIL-C-83360(AS) and MIL-C-85447 as follows:

MIL-PRF-29608(AS)	REPLACES		
	MIL-C-81964(AS)	MIL-C-83360(AS)	MIL-C-85447(AS)
Type I, Class C	All types	Type III	Composition A & B Types I and II
Type I, Class L	--	Types I and IV	--
Type II, Class C	--	--	--
Type II, Class L	--	Type II	--

6.7 Subject term (key word) listing.

Aerosol  
 Hydrochlorofluorocarbon  
 Hydrofluorocarbon  
 Ozone Depleting Substance  
 Silicone  
 Solvent  
 Toxicity

## CONCLUDING MATERIAL

Preparing Activity  
 Navy - AS  
 (Project 6850-N863)

# 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.
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-29608(AS)

2. DOCUMENT DATE (YYMMDD)

960919

3. DOCUMENT TITLE

**CLEANING AND CLEANING-LUBRICATING COMPOUNDS, ELECTRICAL CONTACT,  
LOW OZONE DEPLETION POTENTIAL**

4. NATURE OF CHANGE *(Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)*

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME *(Last, First, Middle Initial)*

b. ORGANIZATION

c. ADDRESS *(Include Zip Code)*

**d. TELEPHONE**  
*(Include Area Code)*  
**(1) Commercial:**

**7. DATE SUBMITTED**  
**(YYMMDD)**

**(2) DSN:**  
*(If Applicable)*

8. PREPARING ACTIVITY

**a. NAME**  
**COMMANDER**  
**NAVAL AIR WARFARE CENTER**  
**AIRCRAFT DIVISION**

**b. TELEPHONE NUMBER *(Include Area Code)***  
**(1) Commercial (908) 323-1281** **(2) DSN 624-1281**

**c. ADDRESS *(Include Zip Code)***  
**CODE 414100B120-3**  
**HIGHWAY 547**  
**LAKEHURST, NJ 08733-5100**

**IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:**  
**Defense Quality and Standardization Office, 5203 Leesburg Pike,**  
**Suite 1403, Falls Church, VA 22041-3466**  
**Telephone (703) 756-2340 DSN 289-2340**

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