

MIL-R-81261A  
7 July 1970  

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SUPERSEDING  
MIL-R-81261(WP)  
18 May 1965

## MILITARY SPECIFICATION

### RAIN REPELLENT, GLASS WINDOW AND WINDSHIELD, FOR IN-FLIGHT APPLICATION

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

#### 1. SCOPE

1.1 This specification covers the requirement for a rain repellent formulation to be applied during flight in rain.

#### 2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on the date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

#### SPECIFICATIONS

##### Federal

P-P-560

Polish, Plastic

QQ-A-250/5

Aluminum Alloy Alclad 2024, Plate and Sheet

##### Military

MIL-T-5624

Turbine Fuel, Aviation Grades JP-4, JP-5

MIL-S-7124

Sealing Compound, Elastomeric, Accelerator Required, Aircraft Structure

MIL-L-19538

Lacquer, Acrylic-Nitrocellulose, Camouflage (for Aircraft Use)

FSC 6850

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Military (cont)

MIL-P-22750	Coating, Epoxy-Polyamide, Chemical and Solvent Resistant for Weapons Systems
MIL-P-81352	Lacquer: Acrylic (for Naval Weapons Systems)

STANDARDS

Federal

FED-STD-141	Paint, Varnish, Lacquer, and Related Materials, Methods of Inspection, Sampling and Testing
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Military

MIL-STD-105	Sampling Procedures and Tables For Inspection by Attributes
MIL-STD-290	Packaging, Packing and Marking of Petroleum and Related Products

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

3. REQUIREMENTS

3.1 Qualification - The rain repellent furnished under this specification shall be a product which is qualified for listing on the applicable qualified product list at the time set for opening of bids (see 6.3).

3.1.1 Service tests - The rain repellent shall perform as well as or better than the control formula product (see Table I) when both are tested on an airplane in flight under rain conditions.

3.2 No data is required by this specification (other than reports submitted for qualification testing) or by applicable documents in Section 2, unless specified in contract or order.

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3.3 Materials - The rain repellent shall consist of a polymeric material that will react in the presence of moisture to form a water repellent film on glass windshields.

3.3.1 Toxicity - When used for its intended purpose the rain repellent shall have no adverse effect on the health of personnel. Questions pertinent to this effect shall be referred by the procuring activity to the appropriate department medical service which will act as an advisor to the procuring agency.

3.4 Film properties

3.4.1 Appearance - The film formed when the rain repellent is applied to a glass windshield as specified in 4.4.2 shall be clear and transparent. There shall be no more than a five second delay between application and the formation of a clear film over the contacted surface.

3.4.2 Effectiveness and durability - When the rain repellent, is applied as specified in 4.4.2, water shall not form a continuous film, but shall be in the form of discrete droplets. The rain repellent film so applied to glass shall continue to be effective in this way for a minimum of five minutes when the film is exposed separately to the equivalent of one inch of rainfall at both 135±5 mph and 490±5 mph airspeed. In addition, the rain repellent shall perform as well as or better than control formula product (see Table I) similarly tested.

3.4.3 Adherence to soiled windshields - When a glass panel previously soiled with jet fuel has been coated with rain repellent in accordance with 4.4.3, the resultant rain repellent film shall be clear and adherent.

3.4.4 Reapplication - When the rain repellent is reapplied to a glass panel in accordance with 4.4.4, the resultant film shall be effective for five minutes minimum.

3.4.5 Application to dry surface - When the rain repellent is applied to a dry glass panel at a windspeed of 135±5 mph in accordance with 4.4.5, no impairment of vision shall result.

3.5 Effects on aircraft surfaces - The rain repellent, when tested in accordance with 4.4.6, shall show no deleterious effect on alclad aluminum alloy; aircraft lacquer surface; epoxy and acrylic coatings; and windshield pressure cabin sealing compound.

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3.6 Flammability - The rain repellent, when tested in bulk and as the applied film in accordance with 4.4.7, shall be non-flammable.

3.7 Storage stability - When the rain repellent is stored for 1 year in accordance with 4.4.8, there shall be no visible evidence of deterioration of container or contents. In addition the rain repellent after this storage shall meet all of the other Section 3 requirements of this specification except service testing.

3.8 Workmanship - The rain repellent shall be homogeneous and shall show no evidence of layering, precipitates, cloudiness or discoloration.

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection - Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements specified herein. Except as otherwise specified the supplier may use his own or any other facilities suitable for the performance of 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 where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

4.2 Compliance - Determination of compliance with provisions of this specification shall include the following:

	<u>SAMPLING DETAILS</u>
(a) Qualification inspection	4.3.1
(a.1) Service Tests	4.3.1.1
(b) Quality conformance (lot by lot) inspection	4.3.2

4.2.1 Qualification inspection - The qualification inspection performed by the qualification laboratory shall consist of a review for approval of the submitted manufacturer's report, and subjecting the qualification sample (4.3.1) to examination and testing for all requirements of this specification followed by field evaluation (service tests) of the sample specified in 4.3.1.1.

4.2.1.1 Service Tests - The service tests performed by a Naval establishment by the activity responsible for qualification shall consist of field evaluation of service test sample (4.3.1.1) under service condition, including conditions of

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of rain, on aircraft selected at random to determine suitability of the product for Military use. The control formula product specified in Table I shall be used as a criterion of effectiveness in these tests.

4.2.2 Quality conformance (lot by lot) inspection - The quality conformance inspection shall consist of examination of filled containers for conformance to the packaging, packing, and marking requirements, and examining and testing of the quality conformance samples (4.3.2) for all the requirements of this specification except storage stability and field evaluation.

#### 4.3 Sampling

4.3.1 Qualification samples - The qualification sample shall consist of 3 quarts of the rain repellent for which qualification is desired. At least one of the quart containers shall be oblong and shall conform to Type V, Class 4 of PPP-C-96. The sample shall be accompanied by a report from the manufacturer or a commercial laboratory. The report shall show the product inspection results for all requirements of this specification except storage stability and field evaluation, and shall refer specifically to the applicable paragraphs in the specification. The supplier shall show toxicological data required to evaluate the safety of the material for the proposed use. The samples and reports shall be forwarded to the Receiving Department, Aero Materials Department, Naval Air Development Center, Warminster, Pennsylvania 18974. The samples shall be plainly identified by securely attached durable tags or labels marked with the following information:

Sample for qualification inspection  
 RAIN REPELLENT, GLASS WINDOW AND WINDSHIELD,  
 FOR IN-FLIGHT APPLICATION  
 Name of manufacturer  
 Product code number  
 Date of manufacture  
 Submitted by (name) (date) for qualification  
 inspection in accordance with the requirements of  
 MIL-R-81261A under authorization of (reference  
 authorizing letter (see 6.3).

4.3.1.1 Pending completion of the storage stability tests, and after a product has met all other qualification requirements, the manufacturer shall furnish service test samples as requested and in accordance with instructions provided by the qualifying activity.

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#### 4.3.2 Quality conformance sampling and acceptability criteria -

Each case or large container shall be carefully identified by manufacturer's batch (or control lot) number. Individual samples shall not be mixed, shall be placed in separate airtight and watertight containers, which shall be nearly filled, covered and sealed to prevent atmospheric effects, and shall be labeled completely with information on the lot and batch number, date of sampling, contract number, and applicable specification.

4.3.2.1 Size of lot - For the purpose of sampling, a lot of rain repellent shall consist of a manufacturer's batch. If the material cannot be identified by batch, a lot shall consist of rain repellent offered for delivery at one time. A batch is defined as the end product of all raw materials mixed or blended in a single operation.

4.3.2.2 Sampling for tests - Sampling for tests shall be in accordance with Method 1031 of FED-STD-141. A lot shall be unacceptable if a sample fails to meet any of the test requirements.

4.3.2.3 Sample for examination of filled containers - A random sample of filled unit containers and a sample of shipping containers fully prepared for delivery shall be selected from each lot of rain repellent in accordance with MIL-STD-105 at inspection level I and acceptable quality level (AQL) =2.5 percent defective.

#### 4.4 Inspection methods

4.4.1 Visual examination - Visual examination shall verify conformance to requirements not specifically covered by tests.

#### 4.4.2 Effectiveness and durability

4.4.2.1 Panel preparation - Some well agitated glass cleaner conforming to P-P-560 shall be poured on a clean paper tissue which shall be used to rub a 3 by 3 inch panel of laminated safety glass until the cleaner wets the surface. The cleaner shall be allowed to dry, removed with a clean tissue and the glass washed with distilled water. Spots which resist wetting shall be recleaned. The glass shall be dried and polished using a clean tissue.

4.4.2.2 Test method - Tests shall be conducted by exposing a cleaned panel (see 4.4.2.1) to the equivalent of 1 inch of rainfall (at a rate of 200 ml/minute) at an airspeed of 135±5 mph and later at 490±5 mph. During the performance of the tests, the safety glass panel shall be held upright in a rigid aluminum frame. Air and water spray shall be directed at the glass at an angle

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of 45 degrees thru the nozzle shown in Figure 1. After 1 minute the rain repellent shall be sprayed from a position normal to the glass panel surface, making contact with the panel at the same point as the air and water spray. Sufficient rain repellent shall be applied to form rain repellent film. When the rain repellent is applied in conjunction with the equivalent of 1 inch of rainfall at airspeed of  $135 \pm 5$  mph, it shall be determined by observation whether water forms a continuous film or if water is present in the form of discrete droplets. These observations shall be continued for 5 minutes. This test shall be repeated, with the airspeed increased to  $490 \pm 5$  mph. The entire procedure shall be repeated, using the control formula product (Table I) instead of the rain repellent sample. Comparison shall be made between the performance in this test of the rain repellent sample and the performance of the control formula product (Table I) similarly tested. The rain repellent film shall be considered to be clear and transparent if the center portion of the target specified in 4.4.3.1 is distinguishable from the surrounding area for 5 minutes.

TABLE I

## Control Formula

Copolymer H <u>1/</u>	5 parts by volume
Arquad 2C-75 <u>2/</u>	0.05 parts by volume
Freon TF <u>3/</u>	94.95 parts by volume

1/ Copolymer H - A silicon-titanium copolymer prepared by hydrolyzing dimethyldiethoxysilane and reacting the hydrolyzate with tetrabutyltitanate. Available From Foster D. Snell, 29 W. 15th Street, New York, N.Y.

2/ A 75 percent solution of didodecyldimethyl ammonium chloride (dicoco dimethyl ammonium chloride) produced by Armour and Company 1335 W. 31st Street, Chicago, Illinois.

3/ Trichlorotrifluoroethane produced by E.I. DuPont DeNemours and Co., Wilmington 98, Del.

4.4.3 Adherence to soiled windshield

4.4.3.1 Target - The target shown in Figure 2 shall consist of a series of crossed black lines on a white background with 40 percent of the target being white. The target shall be placed 36 inches behind the panel.

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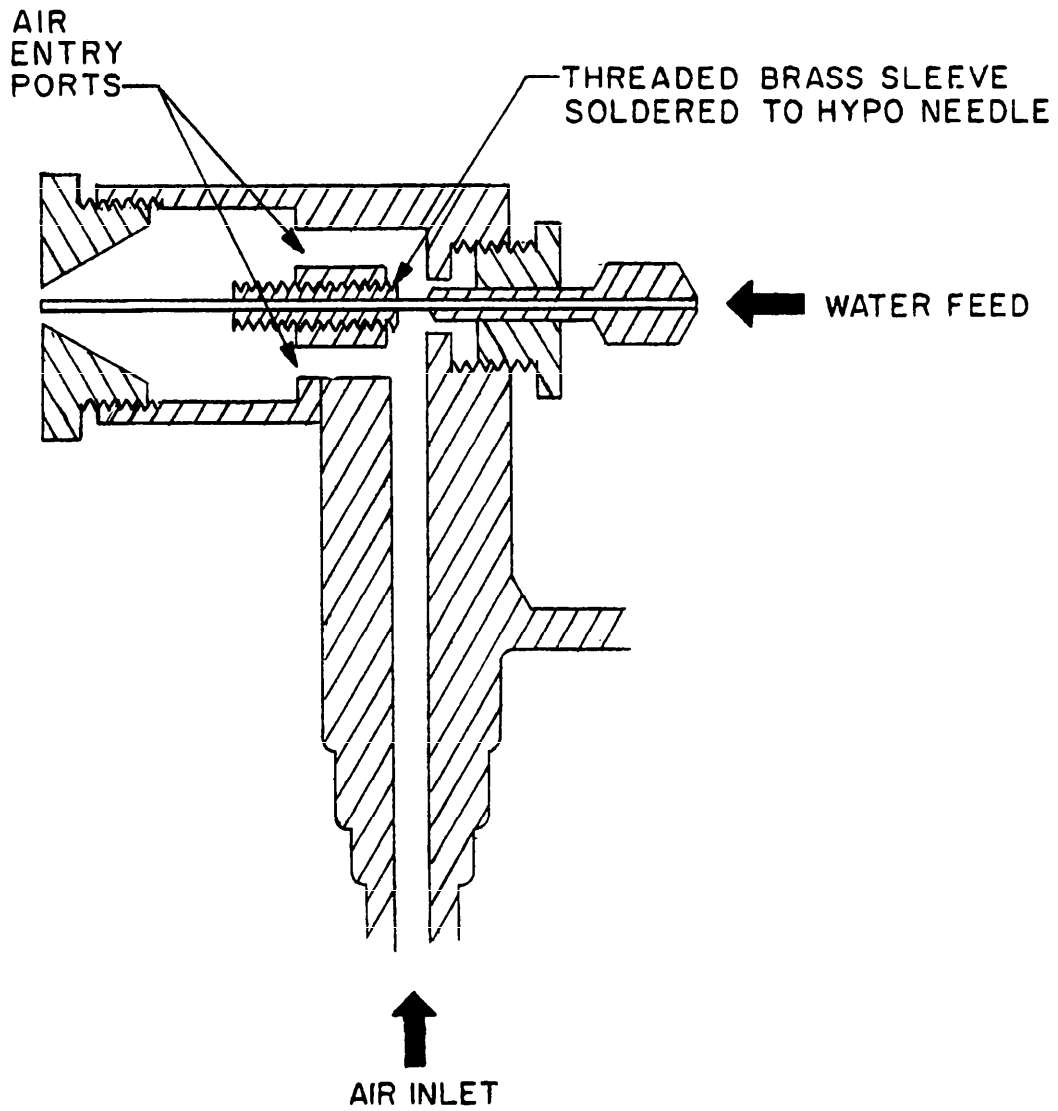


FIGURE 1. AIR-WATER SPRAY NOZZLE FOR VISIBILITY COMPARATOR



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4.4.3.2 Method - A safety glass panel, cleaned in accordance with 4.4.2.1 and soiled with a mist coat of jet fuel conforming to MIL-T-5624, shall be subjected to the test specified in 4.4.2.2 for a clean panel. The rain repellent film will be considered to have been clear and adherent if the impinging water does not form a continuous film for 5 minutes, and if the center portion of the target specified in 4.4.3.1 is distinguishable from the surrounding area for 5 minutes.

4.4.4 Reapplication - A panel which has been subjected to effectiveness and durability test (4.4.2) and air-dried shall be tested once more in accordance with procedure specified in 4.4.2.2.

4.4.5 Application to dry surface - A safety glass panel cleaned in accordance with 4.4.2.1 shall be subjected to the test specified in 4.4.2.2 except that the water spray shall be omitted and the test shall be conducted only at an airspeed of  $135 \pm 5$  mph. Observation shall be for 5 minutes and shall be confined to observing the pattern on the target (see Figure 2). Comparison shall be made of the clarity of the target before and after rain repellent has been applied.

4.4.6 Effects on aircraft surfaces - One half of a 3 by 6 inch alclad aluminum panel conforming to QQ-A-250/5 shall be coated with lacquer conforming to MIL-L-19538, with the other half panel remaining uncoated. A 1/2 inch wide bead of glazing compound conforming to MIL-S-7124 shall be placed down the center of the panel, so that it extends 1/4 inch over the lacquered surface, the remainder being in contact with the uncoated aluminum. Additional panels shall be similarly coated with epoxy coating conforming to MIL-P-22750 and with acrylic lacquer conforming to MIL-P-81352. The rain repellent shall then be sprayed to form a continuous film over the entire surface of each panel. The spraying shall be repeated three times at 15 minute intervals. At the end of this period, the glazing and paint shall be examined for softening. The panel shall be air dried for 24 hours and reexamined for deleterious effects, such as corrosion on metal, distortion of glazing compound or paint or, any other noticeable change.

4.4.7 Flammability - The rain repellent shall be sprayed to form a continuous film on an alclad aluminum panel conforming to QQ-A-250/5. The flame from a Bunsen burner shall be applied to the side of the panel containing the rain repellent film and to the surface of a 250 ml beaker filled with rain repellent. The rain repellent film shall be considered to be nonflammable if no flaming is observed while the flame is in contact with the film or liquid or after the flame has been removed.

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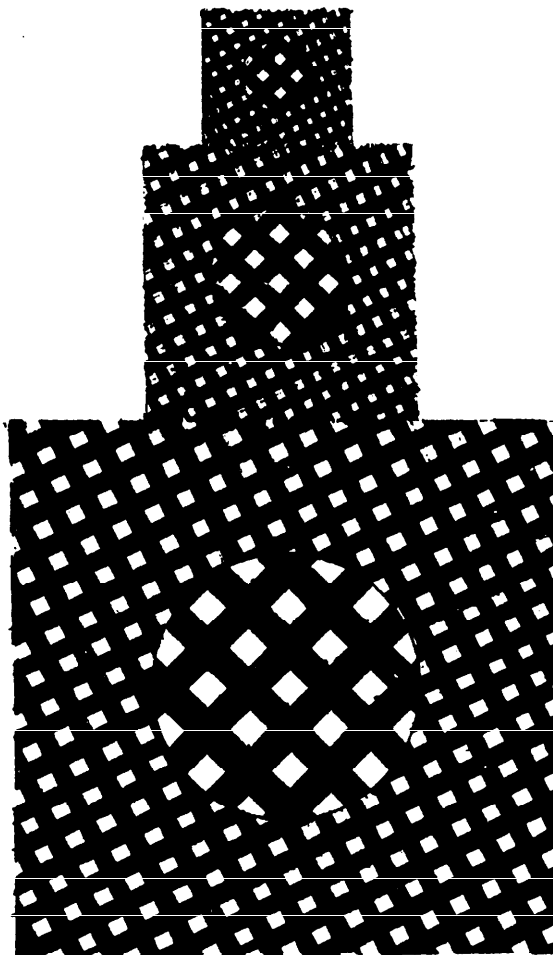


FIGURE 2. TARGET

4.4.8 Storage stability - An unopened oblong 1 quart container (conforming to Type V, Class 4 of PPP-C-96) of the rain repellent shall be stored for 1 year at  $100\pm 5^{\circ}\text{F}$  ( $38\pm 3^{\circ}\text{C}$ ). The container shall then be examined for evidence of corrosion, and the contents shall be examined for any visible changes. The rain repellent which has been stored shall be examined for any visible changes. The rain repellent which has been stored shall be compared to the control formula product in its ability to meet all the other requirements of Section 3 of this specification except service tests.

4.4.9 Examination of filled containers - Each sample filled container selected in accordance with 4.3.2.3 shall be examined for defects of container and closure, for evidence of leakage, and for unsatisfactory markings. Each sample container shall be weighed to determine the amount of contents. If the number of defective containers in any sample exceeds the sample acceptance number, the lot shall be rejected.

## 5. PREPARATION FOR DELIVERY

5.1 Packaging, packing and marking - Packaging, packing, and marking shall be in accordance with MIL-STD-290 (see 6.2).

## 6. NOTES

6.1 Intended use - This rain repellent is intended for application during flight to assure good visibility under rainy conditions especially during low level flying or landing operations. It shall have no deleterious effects on aircraft materials, particularly aluminum alloys, aircraft finishes and windshield pressure cabin sealing compounds.

6.2 Ordering data - Procurement documents should specify the following:

- (a) Title, and number of this specification
- (b) Quantity desired
- (c) Type and capacity of containers in which rain repellent is to be furnished
- (d) Applicable levels of packaging, if other than as specified in 5.1.

6.3 Qualification - With respect to products requiring qualification, awards will be made only for such products as have, prior to the time set for opening of bids, been inspected and approved for inclusion in the applicable Qualified Products List whether or not such products have actually been so listed

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by that date. The attention of suppliers is called to this requirement, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government, inspected for qualification, in order that they might be eligible to be awarded contracts or orders for the products covered by this specification. The activity responsible for the qualified products list is the Naval Air Systems Command, Department of the Navy; however, information pertaining to qualification of products may be obtained from the Director, Aeronautical Materials Department, Naval Air Development Center, Warminster, Pennsylvania 18974.

6.3.1 Material furnished under contract shall be identical with rain repellent samples which have been submitted by the manufacturer and have been inspected and approved for inclusion in the Qualified Products List. In the event that material furnished under contract is found to deviate from the composition of the approved product or that the product fails to perform satisfactorily in service, approval of such material will be subject to immediate withdrawal from the Qualified Products List.

6.4 The formulation of the repellent is not restricted; however, one formulation of ingredients that has proven to be acceptable is:

Copolymer H	5 parts by volume
Arquad 2C - 75	0.05 parts by volume
Freon TF	94.95 parts by volume

Custodians

Army - AV

Navy - AS

Review Activities

Army - AV

Navy - AS

Preparing Activity

Navy - AS

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