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MILITARY SPECIFICATION

WATERTIGHTNESS OF AIRCRAFT, GENERAL SPECIFICATION FOR

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

1. SCOPE

1.1 Scope. This specification covers testing for watertightness and water control of aircraft for rainy weather and aircraft washing.

2. APPLICABLE DOCUMENTS

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

NAVY PUBLICATIONS

SD-24	General Specification for Design and Construction of Aircraft Weapon Systems. Volume I - Fixed Wing Aircraft Volume II - Rotary Wing Aircraft
NAVAIR 01-1A-509	Aircraft Weapons Systems Cleaning and Corrosion Control

(Copies of SD-24 General Specification are available from the Defense Printing Service, Bldg 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.
Copies of NAVAIR 01-1A-509 are available from the Aviation Supply Office, 5801 Tabor Road, Philadelphia, PA 19120.)

Beneficial comments, (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commanding Officer, Naval Air Warfare Center Aircraft Division Lakehurst, Systems Requirements Department, Code SR3, 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 15GP

* 2.2 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 Design and construction. Aircraft shall be designed and constructed in accordance with watertightness (see 6.4.3) requirements specified in SD-24 for Navy aircraft or the contract. These requirements are applicable for aircraft cleaning procedures and for all aircraft environmental conditions in stowed or flight configurations including rain, wind, humidity, driven rain, salt spray and mist.

* 3.1.1 Watertight areas. Areas containing equipment that may experience adverse effects from water intrusion (see 6.4.2) including corrosion, electrical discontinuity, or any other hazard related to aircraft safety or mission capability shall be designated watertight. The design of the aircraft shall ensure that these areas remain free from external water intrusion, migration of water from other areas and condensation.

* 3.1.2 Non-watertight areas. Areas where the presence of water will not adversely affect equipment performance shall be designated non-watertight. The design of the aircraft should be such that any water that enters non-watertight sections immediately flow to the aircraft exterior or designated drainage area.

* 4. QUALITY ASSURANCE PROVISIONS

* 4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, 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 this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

* 4.1.1 Responsibility for compliance. All items shall meet the requirements of section 3. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

* 4.2 Classification of inspections. The inspection requirements specified herein are classified as quality conformance inspections (see 4.4).

* 4.3 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with the test conditions in 4.5 and Table I.

* 4.4 Quality conformance inspections. Quality conformance inspections shall include the tests of 4.6 and inspections of 4.7.

TABLE I. Watertightness sampling plan.

Purpose of test	Type of test	Sampling	Remarks
Design acceptance	Ground (see 4.6.1)	Last full scale development (FSD) aircraft	If less than 3 FSD aircraft procured, test second pilot production aircraft
	Flight (see 4.6.3)	Same as above	Same as above
	Cleaning (see 4.6.4)	Third aircraft of each lot after FSD	
Quality conformance acceptance	Ground (see 4.6.1)	Second, fifth, tenth and every tenth aircraft thereafter in each production lot	

4.5 Test conditions. The aircraft shall be complete (prepared for final delivery including pylons), preflight inspected, configured for flight, and verified to be mission capable with all systems operating properly immediately prior to the tests specified herein. No ground covers, tape, or other protective or absorbing coverings (except pitot tube covers) shall be installed inside or outside of the aircraft during the tests of 4.6.1 and 4.6.2. Only pitot tube covers and other ground covers normally required for aircraft cleaning shall be utilized for the test of 4.6.4. All temperatures shall be at ambient. All watertight access closures (canopies, windows, doors, hatches) shall be fully opened and closed a minimum of five times immediately prior to the start of a test. All access doors and panels required to be opened during mission performance or for maintenance or inspection at frequencies of less than every 400 flight hours shall be opened and closed at least one time to break any paint seal prior to testing.

4.6 Watertightness test. The tests may be tailored and changed with procuring activity approval to meet special needs of different aircraft. The tests specified herein shall be performed as follows:

a. Ground watertightness test (see 4.6.1)
b. Additional ground watertightness test-rainsoak (see 4.6.2)
c. Flight watertightness test (see 4.6.3)
d. Aircraft cleaning watertightness test (see 4.6.4)

4.6.1 Ground watertightness test. The aircraft shall be parked with power off and subject to a water spray system of a uniform minimum intensity between 5 and 9 inches per hour for a minimum of 20 minutes. The spray system water rate shall be measured at the surface of the aircraft by U.S. Weather Service approved rain gages located at the nose, tail and wing root areas of the aircraft, or as designated by the procuring activity. The system shall spray uniformly downward over the entire aircraft and over the surfaces not shielded by the wings, at 45 degrees from vertical at aircraft side surface areas and horizontally at the nose section, tail section and surfaces shielded by the wings (see Figure 1). In order to ensure that the aircraft is tested in both stowed and flight configuration, the aircraft shall be tested with one wing folded and one wing spread if possible, or the test shall be conducted once with the aircraft in stowed configuration and once in flight configuration. After this test, the aircraft shall be inspected in accordance with 4.7 and a test report issued in accordance with 6.3.

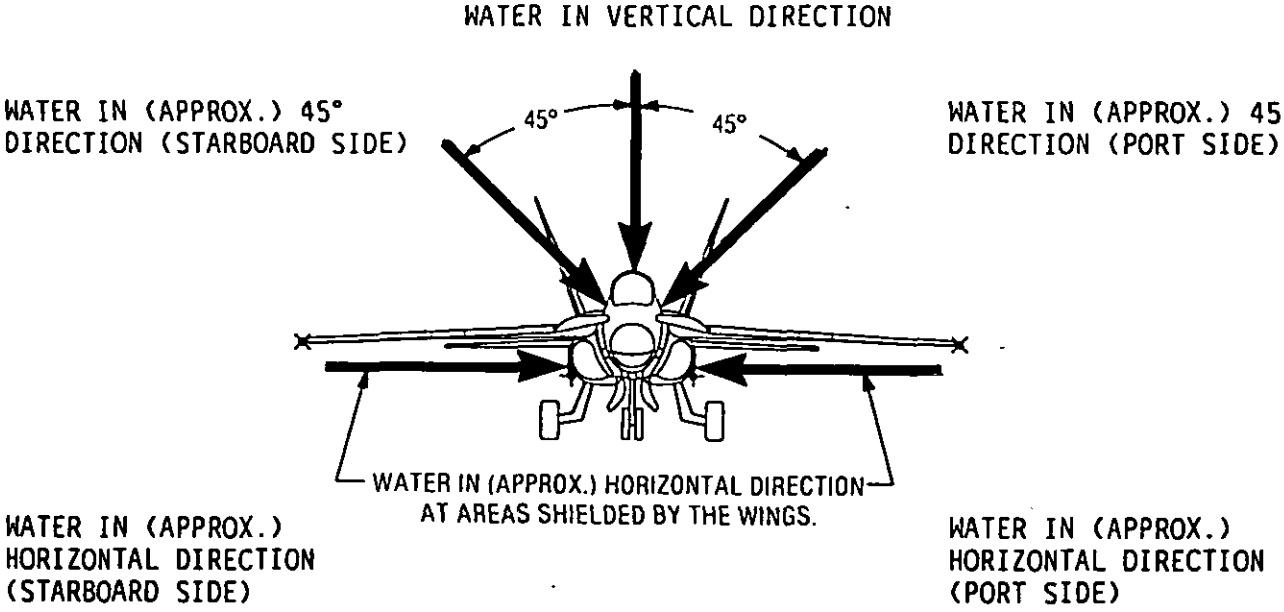

FIGURE 1. Ground watertightness test.

4.6.2. Additional ground watertightness test - rainsoak. When specified by the procuring activity, the aircraft shall also be subjected to a ground-rainsoak test (see 6.2) consisting of vertical rain spray at 1 to 2 inches per hour for 4 to 8 hours (see Figure 2). After this test the aircraft shall be inspected in accordance with 4.7 and a report issued in accordance with 6.3.

4.6.3 Flight watertightness test. The aircraft shall be flown in a heavy rain as defined by the U.S. Weather Service (at least 0.30 inches accumulation per hour) for a minimum of 15 minutes or as specified by the procuring activity. During the test all compartments accessible in flight, such as cockpits and cabins, shall be inspected for leaks around canopies, windshields, escape hatches, cockpit ventilators and other inspection or access doors. Following the flight the aircraft shall be inspected in accordance with 4.7 and a report issued in accordance with 6.3.

* 4.6.4 Aircraft cleaning watertightness test. The aircraft shall be cleaned in accordance with the applicable weapon system cleaning manual (NAVAIR 01-1A-509 for Navy aircraft). After completion of the cleaning procedures, the aircraft shall be inspected in accordance with paragraph 4.7 and a test report issued in accordance with 6.3.

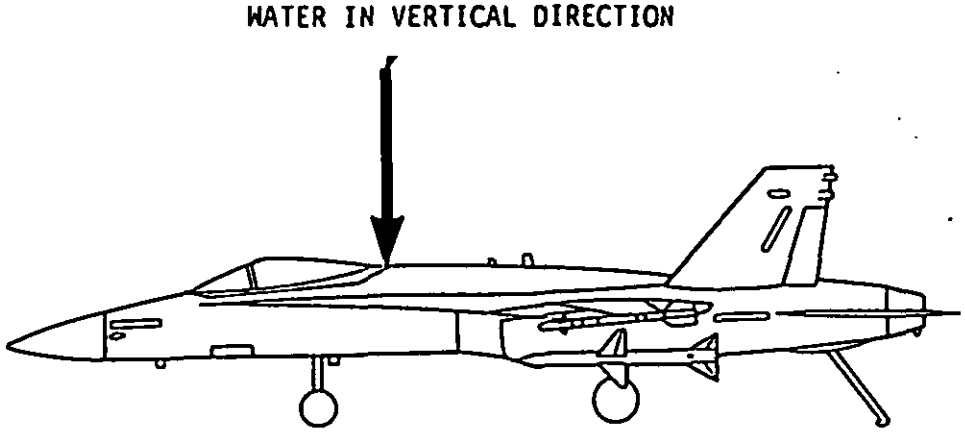

FIGURE 2. Rainsoak simulation

4.7 Post test inspections.

4.7.1 Operational test and inspections. Immediately following the completion of the spray testing, the aircraft shall be preflight checked, engines started and post start checked to confirm all systems are operationally capable for flight and mission performance. Any system malfunctions shall be immediately investigated to determine if the problem is associated with water intrusion or improper water control (see 6.4.1). Defects shall be as defined in Table II. The aircraft shall be exposed to ambient temperature during this test, and the aircraft shall not be dried in any manner unless required for trouble shooting purposes during investigations of system malfunctions. When ambient icing conditions exist, related problems shall also be investigated and documented in the test report (see 6.3).

* 4.7.2 Inspection for watertightness areas. Areas classified as watertight in accordance with 3.1.1 shall be thoroughly inspected for any water intrusion, water migration from other areas and condensation.

* 4.7.2.1 Defects for watertight areas. Any amount of water found in watertight areas during inspection constitutes a defect. Watertight area defects shall be identified as to the source of the water intrusion and the nature of the defect as a design or workmanship problem. Defects identification information shall be included in the test report.

* 4.7.3. Inspection for non-watertight areas. Areas classified as non-watertight in accordance with paragraph 3.1.2, shall be thoroughly inspected for any water accumulation.

* 4.7.3.1. Defects for non-watertight areas. Any water accumulation found during inspection in non-watertight areas constitutes a defect. Non-watertight area defects shall be identified with the nature of the defect as a design or workmanship problem. Defects identification information shall be included in the test report.

* 4.8 Classification of defects. Table II lists watertight/non-watertight defects.

TABLE II. Classification of defects.

Classification	Defects
	Water Intrusion
1 (Critical)	- Design defect
101 (Major)	- Fabrication defect; Quality Control
	Water Accumulation
102	- Improper flow path
103	- Improper drainage design
201 (Minor)	- Clogged drains
2 (Critical)	Improper Sealing or Access Closure

5. PACKAGING

This section is not applicable to this specification.

6. NOTES

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

* 6.1 Intended use. Procedures for testing aircraft described herein are intended to ensure watertightness and proper drainage when the aircraft is exposed to natural humid and rainy environments or washing procedures.

6.2 Acquisition requirements. Acquisition documents must specify the following:

a. Titles, number, and date of the specification.

b. Test(s) required (see 4.6).

c. Type inspection(s) required (see 4.7).

d. Sampling plan indicating quantity, frequency and sequence of sample aircraft (see Table I).

e. Applicable specific aircraft design specifications.

f. Tailoring as required, to fit the specific need of the structure or equipment of the aircraft.

* 6.3 Data requirements. The following Data Item Descriptions (DID's) must be listed, as applicable, on the Contract Data Requirements List (DD Form 1423) when this specification is applied on a contract, in order to obtain the data, except where DOD FAR Supplement 27.475-1 exempts the requirement for a DD Form 1423.

Reference Paragraph	DID Number	DID Title	Suggested Tailoring
4.7	DI-NDTI-80809A	Test reports	Whenever possible use the contractor's test report format

The above DID's were those cleared as of the date of this specification. The current issue of DOD 5010.12-L, Acquisition Management Systems and Data Requirements Control List (AMSDL), must be researched to ensure that only current, cleared DID's are cited on the DD Form 1423.

6.4 Definitions. Definitions listed herein pertain only to those items peculiar to this specification.

6.4.1 Water control. Water control is the control of the flow paths of rain or wash water or solvents which enter the aircraft non-watertight interior spaces to prevent degradation of the aircraft or its systems operational performance and design service life. All water flow paths should lead to a low point area equipped with drainage facilities to ensure complete overboard discharge by natural gravity flow.

6.4.2 Water intrusion. Water intrusion is the entrance of water within a compartment or zone specified to be watertight.

6.4.3 Watertightness. Watertightness is the absolute prevention of water or water-solvent solution entry into a compartment or zone specified to be watertight when it is properly closed and secured for flight. Watertightness applies while the aircraft is either at rest, taxiing, or in-flight.

* 6.5 Subject term (Key word) listing.

Environmentally Secure, Compartment, Cockpit
Rain Test, Airplane
Rainsoak, Airplane
Water Control, Airplanes & Helicopters
Water Intrusion, Airplanes & Helicopters

* 6.6. Changes from previous issue. The margins of this specification are marked with asterisks to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

Custodians:
Army - AV
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Preparing activity:
Navy - AS

(Project No. 15GP-0097)

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.
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I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-W-6729	2. DOCUMENT DATE (YYMMDD) March 08, 1993

3. DOCUMENT TITLE
WATERTIGHTNESS OF AIRCRAFT, GENERAL SPECIFICATION FOR

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 (2) AUTOVON (If applicable)	7. DATE SUBMITTED (YYMMDD)

8. PREPARING ACTIVITY

a. NAME COMMANDING OFFICER, NAVAL AIR WARFARE CENTER AIRCRAFT DIVISION LAKEHURST SYSTEMS REQUIREMENTS DEPARTMENT	b. TELEPHONE (Include Area Code) (1) Commercial: (908) 323-7488 (2) AUTOVON: 624-7488
c. ADDRESS (Include Zip Code) CODE SR3 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 AUTOVON 289-2340