

MIL-I-8599B(AV)
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Superseding
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MILITARY SPECIFICATION

INSTALLATION OF RECIPROCATING ENGINE
INDUCTION AIR FILTERS, DESIGN REQUIREMENTS FOR

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

1. SCOPE

1.1 This specification covers the design for installation of reciprocating engine induction air filters in aircraft.

2. APPLICABLE DOCUMENTS

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

SPECIFICATIONS

MILITARY

MIL-F-7194	Filters, Engine Induction Air.
MIL-D-1000	Drawings, Engineering and Associated List.

STANDARDS

FEDERAL

FED-STD-151	Metals: Test Methods
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MILITARY

MIL-STD-143	Specifications and Standards, Order of Precedence for the Selection of.
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FSC 2945

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MIL-STD-889

Dissimilar Metals.

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

3. REQUIREMENTS

3.1 Installation design. The general design, as specified herein for the installation of engine induction air filters, shall have approval of the procuring activity prior to installation on a new model aircraft (see 6.3). Engine induction air filters employed in aircraft installations shall be in accordance with Specification MIL-F-7194. The induction air filter installation shall be designed so that the engine and aircraft operation is not affected by the installation of the filter or by its absence.

3.1.1 Filter location. The air filter shall be located where it is accessible for servicing by removal of a minimum amount of cowling, cowling supports, or fairing, and where it will not be affected by the flow of engine exhaust gases. The filter shall not be installed downstream of the induction air heater where it can be subjected to heated induction air, unless it is designed to perform satisfactorily under this condition and withstand the maximum heat to which it may be subjected. It shall be possible to remove and reinstall the air filter in fighter aircraft within 5 minutes, and in all other aircraft within 15 minutes. The filtered air system shall be designed so that it will have no critical effect on carburetor metering.

3.1.2 Effective filter area. The filter area inside the filter frame shall be sufficient to prevent filter front face air velocity from exceeding filter-rated maximum velocity at the airflow required by the engine to obtain the maximum takeoff power stated in the specification for the engine.

3.1.3 Filtered air intakes. The air for the filter system may be taken from within the cowling or any part of the aircraft structure, provided allowable carburetor air intake temperatures are not exceeded when the outside air temperature is approximately 37^o C. (100^o F.). Nonramming filtered air intakes shall, whenever possible, be located above the horizontal centerline of the engine, and shall consist of a scoop or louvers, not facing forward, such that the air turns 90^o or more before it enters the filtered air intake. The filter installation shall, whenever possible, take advantage of momentum cleaning of the air.

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3.1.4 Air ducts. The air ducts used in connection with the installation of air filters shall be designed to prevent possible failure due to backfires, vibrations, or flexing of the aircraft structure and engine mount. Backfire doors shall not be used. Where a collection of fuel from a flooding carburetor is unavoidable, a drainline shall be provided to drain all free fuel to the open air, clear of all parts of the aircraft, particularly the exhaust outlets. All joints between carburetors and air intake ducts shall be fueltight. In the event of backfire, flames shall discharge into the open air or into spaces free of flammable materials or explosive mixture, and shall not damage the air intake duct or other parts or the engine installation. Means shall be provided to prevent the accumulation of dust in the aircraft duct system.

3.1.5 Controls. A single control, one for each engine installation, shall be provided in the aircraft flight station to operate all devices used in connection with the air filter to control the flow of air through the filter.

3.1.6 Ramming intake. Aircraft equipped with engines requiring full throttle to obtain takeoff power at sea level standard conditions shall be equipped with a ramming filtered air inlet. If a hinged-type filter is used, icing shall not prevent removal of the filter from the air stream. If the filter is fixed in the main air duct, a separate source of unfiltered air shall be provided. Filtered air or alternate unfiltered air shall not be drawn through inlets used for carburetor preheat or anti-icing.

3.1.7 Nonramming intakes. Nonramming intakes may be used in installations not requiring ramming intakes. All filters shall be capable of being bypassed in flight, and filtered air shall not be drawn through inlets used for carburetor preheat or anti-icing.

3.2 Materials. Materials and processes used shall be of high quality, suitable for the purpose, and shall conform to applicable Government specifications. Materials conforming to contractor's specifications may be used, provided the specifications are approved by the procuring activity and contain provision for adequate tests. The use of contractor's specifications shall not constitute waiver of Government inspection.

3.3 Construction.

3.3.1 Metals. Metals shall be of the corrosion-resistant type or suitably treated to resist corrosion due to fuels, salt spray, or atmospheric conditions likely to be met in storage or normal service. The use of any protective coating that will crack or scale with age or extremes of climatic and environmental conditions shall be avoided. Metals shall be inspected in accordance with FED-STD-151.

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3.3.1.1 Dissimilar Metals. Unless suitably protected against electrolytic corrosion, dissimilar metals shall not be used in intimate contact with each other. Dissimilar metals are defined in MIL-STD-889.

3.3.2 Fasteners. Fasteners to hold the air filter in place shall be of the rapid-acting, positive-locking type, and the number required shall be a minimum. If lugs, brackets, or handgrips welded to the filter frame are required, they shall be considered a part of the air filter panel assembly and shall be incorporated on the air filter panel.

3.3.3 Sealing. The air filter installation shall provide for a tight dust seal around the edges of the filter, around the edges of any ram-air shutoff valves, and across any joints in the system. The portion of the induction system between the filter and the engine, including branches to the ram-air shutoff valve, if used, shall be subjected to the leakage test specified (see 4.2.4) to evaluate the effectiveness of the seals. In a supercharged installation, only the portion of the induction system between the filter and the supercharger inlet shall be tested since the portion from the supercharger to the engine is subject to separate leakage test requirements.

3.3.4 Standards and Specifications. Standards and specifications for commodities and services not specified herein, shall be selected in accordance with MIL-STD-143.

3.3.4.1 Standard Parts. AN and MS standard parts shall be used where they suit the purpose. Commercial parts, such as fasteners, connectors and cotter keys may be used, provided they can be replaced by AN and MS standard parts without alteration or degradation of function. The parts list shall reference the applicable AN and MS standard parts as acceptable replacements for the commercial parts.

3.3.5 Interchangeability of parts. Components shall be interchangeable (without requiring modification for replacement) with similar components furnished under the same contract or order.

3.4 Technical Data. Drawings and data showing general design of installation, and operation of the filter system for the type aircraft specified (see 6.3 and 6.4), shall be prepared as required for intended use category A, Form 2 of Specification MIL-D-1000 and submitted to the contracting officer for approval.

3.5 Workmanship. All parts used in the installation of the engine induction air filters shall be of optimum reliability, and the method of the installation itself shall enable the equipment to function to its full capacity under the conditions to which it may be subjected.

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 as specified herein. Except as otherwise specified in the contract or order, the supplier 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 where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Tests. Tests required herein for the testing of the installation of engine induction air filters are classified as inspection tests.

4.2.1 Examination of product. Each engine induction air filter installation shall be examined to determine conformance with this specification with respect to design, construction, material, and workmanship.

4.2.2 Operation. The engine induction air filter installation shall be checked during both ground and flight acceptance tests of the aircraft in which installed. This test shall include operation of controls, and effect on engine performance both with and without the filter installed in the air-induction system.

4.2.3 Manifold pressure loss. The loss in manifold pressure at takeoff power, with a clean engine induction air filter and its ducting in operation, shall not exceed 4 percent in the case of a ramming filter installation, and 5 percent for a nonramming filter installation, of the takeoff manifold pressure obtained with unfiltered direct air. This test shall be conducted with the aircraft on the ground.

4.2.4 Seal leakage. If the portion of the induction system between the filter and the aircraft engine, including branches to the ram-air shut-off valve, is used, the area shall be subjected to the leakage test. This portion of the induction system shall be set up with a flexible seal over the downstream face of the filter and with a plate over the engine or supercharged end. If the filter bypass valves are used, they shall be placed in the filtered-air position. The filter unit shall be braced and secured in a manner to withstand a pressure of 5 pounds per square inch (psi), inside the duct, without being damaged or displaced from the position it assumes in normal operation. A positive pressure

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of 5 psi shall be applied to the duct system. The minimum time allowed for the pressure to fall from 5 to 0 psi shall be computed from the formula:

$$t = 1390 \frac{V}{HP}$$

HP

Where:

t = time in seconds

V = internal volume in cubic feet of duct
to which pressure is applied

HP = military rated shaft horsepower of engine.

4.2.5 Materials. It is not mandatory that all materials be tested in conformance with the referenced specifications in each individual case. However, the Government inspector will require these referenced tests whenever, in his judgment, they are necessary to ascertain that the quality of the materials used conforms to the referenced specifications.

5. PREPARATION FOR DELIVERY
(Not applicable.)

6. NOTES

6.1 Intended use. The installation covered in this specification is intended to accommodate reciprocating engine induction air filters covered by Specification MIL-F-7194.

6.2 Supplementary data. This specification should be referenced in section 2 of the detail specification document prepared for the designated aircraft.

6.3 Ordering data. Procurement documents should specify the following:

6.3.1 Procurement requirements.

- (a) Title, number, and date of this specification.
- (b) Aircraft designated for this installation, and approval of drawings required before installation (see 3.1 and 3.4).

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6.4 Contract data requirements. Data specified in paragraph 3.4, as generated by this document, shall not be delivered to the procuring activity unless specified on the Contract Data Requirements List (DD1423).

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