MILITARY SPECIFICATION

BEARINGS; ROD END, PLAIN, AIRFRAME

This specification was approved on the above date by joint action of the Air Force and Navy Departments for use in the procurement of aeronautical supplies, and shall become effective upon publication of the Qualified Products List.

1. SCOPE AND CLASSIFICATION

1.1 This specification establishes the requirements for airframe plain rod end bearings.

2. APPLICABLE SPECIFICATIONS AND DRAWINGS

2.1 Specifications.- The following specifications, of the issue in effect on date of invitation for bids, shall form a part of this specification to the extent specified herein:

Federal

VV-K-211	Kerosene
QQ-M-151	Metals; General Specification for Inspection of
QQ-P-416	Plating; Cadmium (Electrodeposited)

Military

MIL-F-5572	Fuel; Aircraft Reciprocating Engine
JAN-P-139	Packaging and Packing for Overseas Shipment - Plywood, Container Grade

Air Force-Navy Aeronautical

AN-QQ-A-696	Anodic-Films; Corrosion-Protective (for) Aluminum Alloys
AN-G-25	Grease; Low Temperature Aircraft Lubricating (Low Volatility Type)
AN-O-8	Oil; Lubricating Aircraft Engine
AN-P-32	Plating; Zinc
AN-P-36	Preservation and Packaging of Bearings and Bearing Parts
AN-S-126	Screw-Threads; Standard, Aircraft
AN-S-684	Steel; Chrome-Molybdenum (4130) Bar and Rod
AN-S-771	Steel; Corrosion-Resisting (18Cr-8Ni), Bars and Rods

2.2 Drawings.- The following drawings, of the issue in effect on date of invitation for bids, shall form a part of this specification to the extent specified herein:

Air Force-Navy Aeronautical Standard Drawings

AN943	Bearing - Rod End, Internal Thread, Self-Aligning, Plain, Airframe
AN947	Bearing - Rod End, External Thread, Self-Aligning, Plain, Airframe
AN949	Bearing - Rod End, Hollow Shank, Self-Aligning, Plain, Airframe

(Copies of this publication and copies of applicable publications thereto required for Government procurement, and the Index of Military Aeronautical (AN or MIL) Standards may be obtained upon application to the Commanding General, Air Materiel Command, Wright-Patterson Air Force Base, Dayton, Ohio; or to the Commanding Officer, U. S. Naval Air Station, Johnsville, Pennsylvania. Military Specifications (aeronautical AN or MIL), ANA Bulletins, Qualified Products Lists, and ANA Drawings are available for purchase from the above agencies, acting as agents for the Superintendent of Documents. The price may be obtained from the Index of Military Aeronautical (AN or MIL) Standards or upon application to either of the above agencies, and payment shall be made by check or money order, payable to the Superintendent of Documents or the Treasurer of the United States.)

3. REQUIREMENTS

3.1 Materials.- The materials used shall be such that the finished bearings will meet all the requirements as specified herein.

3.2 Design and construction.- Bearings shall be of such design and construction as to meet the requirements specified herein and on the applicable AN Drawings. Except as otherwise specified, the details of the working parts shall be optional.

3.2.1 Loading slots.- Loading slots shall not be used in the construction of the bearings.

3.2.2 Grease grooves.- Grease grooves or other adequate means for storage and distribution of lubricant to the bearing surfaces shall be provided.

3.3 Dimensions and tolerances.- Dimensions and tolerances shall be as specified on the applicable AN drawings.

3.4 Finish.- Faces of inner and outer race members shall have a smooth finish which will not cut or score the fitting or clevis abutting this member. Bearings surfaces shall be free from tool marks or other imperfections which would result in unsatisfactory performance or life of the bearings.

3.5 Plating.- Except when fabricated of corrosion-resisting steel, all external steel surfaces including metal seals or shields, except the inner race bore, shall be cadmium-plated in accordance with Specification QQ-P-416, or chromium-plated in accordance with Specification AN-P-39, or zinc-plated in accordance with Specification AN-P-32 in such a manner as to meet the corrosion requirements specified herein.

3.6 Lubrication.- Bearings shall be thoroughly cleaned and dried and lubricated with grease conforming to Specification AN-G-25.

3.7 Identification of product.- Bearings shall be permanently and legibly marked with the manufacturer's name or trademark, and the complete AN number as noted on the detail drawings.

3.7.1 Use of AN or MIL designations.- AN or MIL designations shall not be applied to a product in correspondence or sales matter, until notification has been received from the Qualifying Service or the Aeronautical Standards Group that the product has been approved for aeronautical use.

3.8 Seals or boots.- If seals or boots are used, the material of the seals or boots shall be a composition which will work satisfactorily at conditions specified in paragraph 4.4.5. Seals shall be readily removable by service activities for inspection and relubrication and shall be of such construction that they may be replaced without undue difficulty. Seals or boots shall withstand temperatures of -55° to 121°C (-67° to 250°F) without embrittlement which will prevent retention of lubricant or sealing properties, and shall be compatible with grease conforming to Specification AN-G-25.

3.9 Physical properties.-

3.9.1 Radial strength.-

3.9.1.1 Nondeformation radial strength.- Bearings shall have a nondeformation radial strength of not less than the values specified in table I when tested as described in Section 4.

3.9.1.2 Ultimate radial strength.- Bearings shall have an ultimate radial strength of not less than the values specified in table I when tested as described in Section 4.

3.9.1.2.1 Permanent set.- The maximum permanent set after the application of the ultimate radial load shall not exceed the values specified in table I.

TABLE I
Radial and Axial Strengths

AN dash No.	Nominal bore size	Radial strength: Nondeformation load (lbs) (min)	Radial strength: Ultimate load (lbs) (min)	Radial strength: Permanent set (inch) (max)	Axial strength: Nondeformation load (lbs) (min)	Axial strength: Ultimate load (lbs) (min)	Axial strength: Permanent set (inch) (max)
-3	No. 10	650	1,300	0.002	460	920	0.002
-4	1/4	1,100	2,200	0.0025	760	1,520	0.0025
-5	5/16	2,100	4,200	0.003	1,480	2,960	0.003
-6	3/8	3,200	6,400	0.0035	2,240	4,430	0.0035
-8	1/2	4,500	9,000	0.005	3,160	6,320	0.005
-10	5/8	5,700	11,400	0.0055	4,000	8,000	0.0055

3.9.2 Axial strength.-

3.9.2.1 Nondeformation axial strength.- Bearings shall have a nondeformation axial strength of not less than the values specified in table I, when tested as described in Section 4.

3.9.2.2 Ultimate axial strength.- Bearings shall have an ultimate axial strength of not less than the values specified in table I, when tested as described in Section 4.

3.9.2.2.1 Permanent set.- The maximum permanent set after the application of the ultimate axial load shall not exceed the values specified in table I.

3.9.2.3 Compressive axial strength.- The hub inner race member of the bearings shall withstand the compressive axial load specified in table II without permanent deformation or binding of the bearing, when tested as described in Section 4.

TABLE II
Compressive Axial Load on Hub

AN dash No.	Applied load (pounds)
-3	1,250
-4	2,400
-5	3,800
-6	5,900
-8	10,000
-10	17,000

3.10 Internal play.- Radial and axial play, measured before and after the Nondeformation Radial and Axial Strength tests, shall not exceed the values specified in table III.

TABLE III
Radial and Axial Play

AN dash No.	Radial play inch (max)	Axial play inch (max)
-3	.0025	.006
-4	.0030	.007
-5	.0030	.008
-6	.0030	.009
-8	.0035	.011
-10	.0035	.012

3.11 Self-alignability.- Self-aligning bearings shall permit the angular movement specified on the applicable AN drawings.

3.12 Endurance.- Bearings shall withstand the Endurance test described in Section 4 without failure. The radial play of bearings following this test shall not exceed five times the values specified in table III. The axial play following this test shall not exceed twice the values specified in table III.

3.13 Corrosion resistance.- The bearing shall show no evidence of corrosion that may effect its serviceability when subjected to a 200 hour continuous Salt Spray Corrosion test as specified in Section 4.

3.14 Immersion.- Bearings containing rubber, plastic, and other nonmetallic materials, shall meet all the requirements specified herein, after being immersed in lubricating oil, kerosene, gasoline, and distilled water as described in Section 4 herein. All nonmetallic materials shall be compatible with grease conforming to Specification AN-G-25.

3.15 Lubricating fittings.- Lubricating fittings and lubrication reservoirs shall be provided to permit periodic lubrication without dismantling of the bearings.

3.16 Workmanship.- Workmanship shall be in accordance with high-grade aircraft bearing manufacturing practice.

4. SAMPLING, INSPECTION, AND TEST PROCEDURES

4.1 Classification of tests.- The inspection and testing of the bearings shall be classified as follows:

4.1.1 Qualification tests.- Qualification tests are those accomplished on samples submitted for qualification as satisfactory products.

4.1.2 Inspection tests.- Inspection tests are those accomplished on samples of products manufactured and submitted for acceptance under contract.

4.2.1 Sampling instructions.- Samples upon which Qualification tests are to be conducted shall conform to the applicable AN drawings. At least 20 samples of each AN part number upon which qualification is desired shall be submitted. Drawings containing complete dimensions, construction, materials, heat treatment, if any, and date of latest revision shall be furnished for each AN part number submitted for testing. Samples shall be forwarded to the U. S. Naval Air Experimental Station, Naval Air Material Center, Naval Base, Philadelphia 12, Pennsylvania, and shall be plainly identified by securely attached durable tags marked with the following information:

Samples for Qualification Test
BEARINGS; ROD END, PLAIN, AIRFRAME
Specification MIL-B-5629
AN Part No.
Name of Manufacturer
Manufacturer's Part No.
Submitted by (name) (date) for Qualification test in accordance with the requirements of Specification MIL-B-5629 under authorization (reference authorizing letter)

4.2.2 Tests.- Qualification tests shall consist of all the tests of this specification as described in paragraph 4.4.

4.3 Inspection tests.- The contractor shall furnish all samples and shall be responsible for accomplishing the tests specified herein. When inspection is conducted at the contractor's plant, all inspection and testing shall be under the supervision of the Government Inspector. Contractors not having laboratory testing facilities satisfactory to the Government shall engage the services of a commercial testing laboratory acceptable to the Inspector. Upon request, the contractor shall furnish test reports, showing quantitative results for all tests required by this specification, and signed by an authorized representative of the contractor or laboratory, as applicable. Acceptance or approval of material during course of manufacture shall in no case be construed as a guaranty of the acceptance of the finished product.

4.3.1 Sampling.- Random samples shall be selected for the respective Inspection tests in accordance with tables IV and V.

4.3.1.1 Lot.- AN inspection lot shall consist of bearings of the same AN part number made of the same material and submitted for inspection at the same time and place.

TABLE IV
Sampling for: Examination of Product

Lot size	Sample size	Maximum allowable number of defectives
Under 5	All	0
5-50	5	0
51-125	10	1
126-300	20	1
301-500	30	2
501-800	40	2
801-1300	55	3
1301-3200	75	3
3201-8000	115	5

TABLE V
Sampling for: Radial and Axial Play; Radial and Axial Strength (Nondeformation Load Only)

Lot size	Sample size	Acceptance number	Rejection number
Under 200	3	0	1
200-1000	6	0	1
1000-2000	9	1	2

4.3.2. Tests.- The Inspection tests of the bearings shall consist of the following tests as described in paragraph 4.4.

Examination of Product
Radial and Axial Play
Radial and Axial Strength (Nondeformation Load Only)

In addition, bearings may be subjected to any other tests specified herein which the Inspectionconsiders necessary to determine conformance with the requirements of this specification.

4.4 Test methods.-

4.4.1 Examination of Product.- The sample selected for this test shall be carefully examined to determine conformance with all requirements of this specification for which no test methods are specified herein. In addition, each sample bearing shall be inspected by manual rotation and if there is catching or binding, the bearing shall be classed as defective.

4.4.2 Radial Strength tests.-

4.4.2.1 Nondeformation Radial Strength.- Bearings shall be mounted in a rigid support as shown in figure 1, and rotated by hand to determine smoothness of operation before testing. The nondeformation radial load specified in table I shall be applied for 1 minute. The loading shall then be removed and the bearing shall be inspected for evidence of failure. In inspection by manual rotation before and after the radial load test, the bearing shall be subjected to a 5-1/2-pound radial load. If the smoothness of operation of the bearing has been lessened perceptibly, it shall be considered to have failed.

4.4.2.2 Ultimate Radial Strength.- The ultimate radial load specified in table I shall applied to the bearing for 1 minute. After removal of the load, the bearing shall be examined. Bearings not capable of being turned by hand, or having parts broken or cracked shall be considered to have failed.

4.4.3 Axial Strength tests.-

4.4.3.1 Nondeformation Axial Strength.- Bearings shall be subjected to the nondeformation axial load specified in table I, applied for 1 minute as indicated in figure 2. The load shall then be removed and inspected for evidence of failure. The bearing shall then be turned over and the test repeated. In inspecting by manual rotation before and after axial load test, the bearing shall be subjected to a 5-1/2-pound axial load. If the smoothness of operation of the bearing is lessened perceptibly, the bearing shall be considered to have failed.

4.4.3.2 Ultimate Axial Strength.- The bearing shall be subjected to the ultimate axial load specified in table I, applied for 1 minute, as indicated in figure 2. The bearing shall then be turned over and the test repeated. Bearings not capable of being turned by hand after the test, or having parts broken or cracked shall be considered to have failed.

4.4.3.3 Compressive Axial Strength.- Bearing shall be subjected to the axial load specified in table II, applied as indicated in figure 3. The load shall be applied to the hub (inner race member) for 1 minute. The bearing shall be rejected if it binds when rotated by hand, during or after the removal of the specified load.

4.4.4 Internal Play tests.-

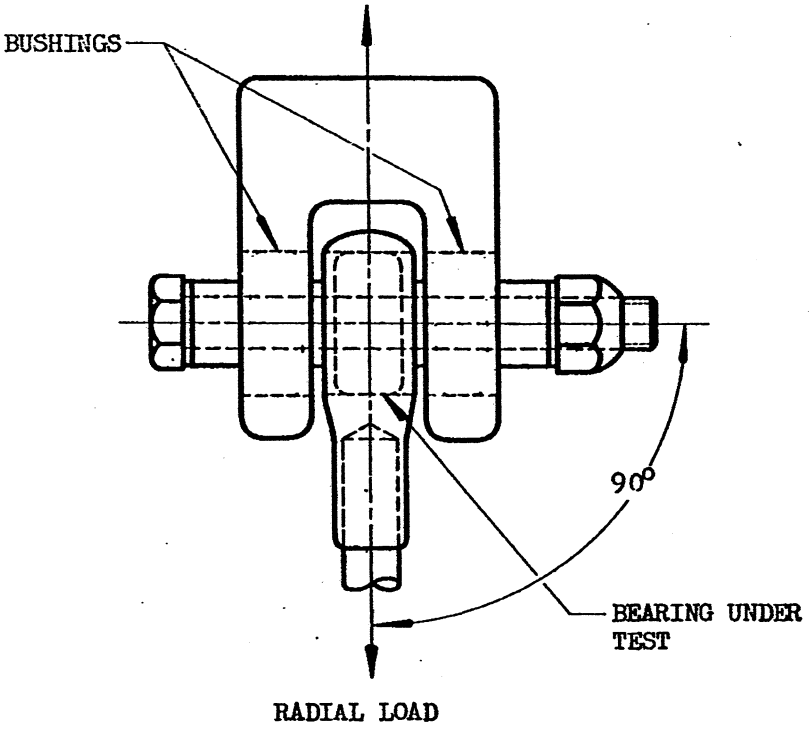

FIGURE 1. Radial Strength Test Set-up

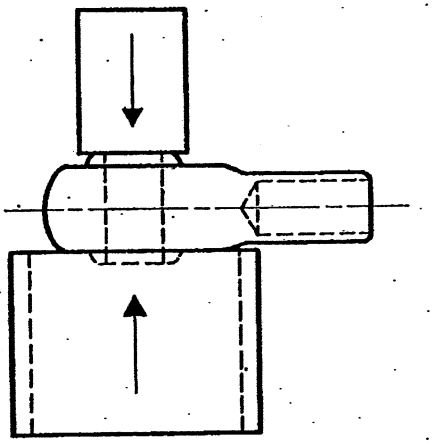

FIGURE 2. Axial Strength Test Set-up

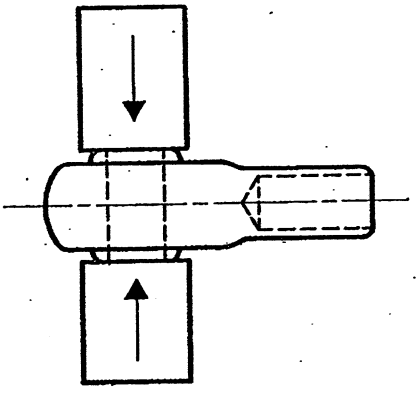

FIGURE 3. Compressive Strength Test Set-up

4.4.4.1 Radial Play.- All sample bearings shall be tested, at room temperature, for radial play. The radial play shall be measured by means of a dial indicator with the bearing subjected to a 5-1/2-pound radial load applied alternately in opposite directions.

4.4.4.2 Axial Play.- All sample bearings shall be tested, at room temperature, for axial play. The axial displacement shall be measured by means of a dial indicator with the bearing subjected to a 5-1/2-pound axial load applied alternately in opposite directions.

4.4.5 Endurance test.- A shaft through the bearing to be tested shall be rotated back and forth through an angle of 90 degrees at a frequency of 14-1/4 cycles per minute. The test apparatus shall be mounted on a vibration machine operated at a frequency of 3600 cycles per minute at an amplitude of 1/16 inch. Each sample shall be tested for 25 hours under 1/3 the nondeformation radial load given in table I. The bearing shall then be tested for radial and axial play, for evidence of failure.

4.4.6 Corrosion Resistance test.- Tests shall be conducted in accordance with Specification QQ-M-151. Superficial tarnish which can be removed with a damp cloth shall not be cause for rejection.

4.4.7 Immersion test.- Samples shall be immersed at room temperature for 2 hours in each of the following: lubricating oil, Grade 1120, conforming to Specification AN-O-8; kerosene, conforming to Specification VV-K-211; gasoline, conforming to Specification MIL-F-5572, Grade 100/130; grease, conforming to Specification AN-G-25, and distilled water, and subjected to all the tests noted herein.

4.5 Rejection and retest.- If a sample fails any of the tests according to tables IV and V, that is, if more than the allowable number of defectives is found in any one test, the lot shall be rejected or else screened for the test in which it failed.

5. PREPARATION FOR DELIVERY

5.1 Application.- The packaging, packing, and marking requirements specified herein apply only to direct purchases by or direct shipments to the Government.

5.2 Packaging and packing.- Unless otherwise specified, the preservation, packaging packing, and marking shall be in accordance with the current issue of Specification AN-P-36 except that plywood, when used, shall conform to Specification JAN-P-139, Type A or B Condition I.

5.3 Marking and labeling.-

5.3.1 Packages.- Each interior package shall be durably and legibly marked with the following information in such a manner that the markings will not become damaged when the packages are opened:

BEARINGS; ROD END, PLAIN, AIRFRAME
Specification MIL-F-5629
AN Part No._____
Stock No._____(USAF or Navy, as applicable)
Manufacturer's Name or Trademark
Manufacturer's Part No. (when applicable)
Quantity contained
Name of Contractor (if not the same as manufacturer's)
Contract or Order No.

5.3.2 Shipping containers.- Each shipping container shall be marked as specified above and in accordance with the requirements applicable to the individual Services as specified in Specification AN-P-36.

6. NOTES

6.1 Intended use.- Plain bearings are not intended for use in primary control systems and other critical applications. They are intended for locations where moderate friction and bearing play at low rotational speeds are not objectionable, where wear is not excessive, and where bearings are not subjected to excessive vibratory shocks or alternating loads.

6.1.1 Closures.- Where climatic conditions conducive to corrosion exist, and where the bearing is subjected to the ingress of dust, salt spray, or other extraneous material, bearings with seals or boots incorporated should be used.

6.3 Superseded documents.- This specification superseded the current issue of U.S. Air Force Specification 25543 for Air Force and Navy aeronautical use.

6.3 Ordering data.- Requisitions, contracts, and orders shall specify the AN part number of the bearing desired, quantity to be furnished, and whether overseas packing is desired (see Section 5).

6.4 Provisions for Qualification tests.- The right is reserved to reject any bids on the product if it has not been subjected to the required tests and found satisfactory. The attention of manufacturers is called to this provision and they are urged to request authorization for tests of the product which they propose to offer to the Air Force or Navy under this specification. Requests for authorization of tests and for information as to the test fees involved should be addressed to the Bureau of Aeronautics, Navy Department, Washington 25, D. C., the Qualifying Service, with a copy to the other Service. It is to be understood that the manufacturer shall pay all transportation charges to and from the point where tests are made. In the case of failure of the sample or samples submitted, consideration will be given to the request of the manufacturer for additional tests only after it has been clearly shown that changes have been made in the product which the Government considers sufficient to warrant additional tests.

6.4.1 It is to be understood that the product supplied under contract shall be identical in every respect to the sample tested and found satisfactory except for changes previously approved by the Bureau of Aeronautics or U. S. Air Force. Any unapproved changes from the qualification sample shall constitute cause for rejection.

6.5 Definitions.-

6.5.1 Loading slot.- Any slot cut or change in the contour of the outer race surface to facilitate insertion of the inner race member shall be considered a loading slot.

6.5.2 Inner race member or hub.- That portion of the bearing which is fastened rigidly to the central shaft or bolt.

6.5.3 Outer race member or casing.- That portion of the bearing which is fastened to the rod.

Custodian:
Navy - BuAer

Other interest
Air Force