INCH-POUND

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SUPERSEDING
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MILITARY SPECIFICATION

GENERATOR, TACHMOTER GEU-7/A, MINIATURE

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

1. SCOPE

1.1 Scope. This specification defines a miniature electric two-pole a-c tachometer generator, designated GEU-7/A.

2. APPLICABLE DOCUMENTS

2.1 Government Documents.

2.1.1 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).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Oklahoma City Air Logistics Center/MMEOR, Tinker AFB, OK 73145-5990 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 6620

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SPECIFICATIONS

FEDERAL

PPP-B-601	Box, Wood, Cleated Plywood
PPP-B-636	Box, Shipping, Fiberboard

MILITARY

MIL-P-116	Preservation, Methods Of
MIL-M-3171	Magnesium Alloy, Processes For Pretreatment And Prevention Of Corrosion On
MIL-C-5015	Connector, Electrical Circular Threaded, An Type, General Specifical For
MIL-C-5541	Chemical Conversion Coatings On Aluminum And Aluminum Alloys
MIL-S-7742	Screw Threads, Standard, Optimum Selected Series, General Specifications For
MIL-L-7808	Lubricating Oil, Aircraft Turbine Engine, Synthetic Base
MIL-A-8625	Anodic Coatings, For Aluminum And Aluminum Alloys
MIL-I-22596	Indicator, Tachometer, Electric, 0-120 Percent Rpm, 2-Inch Size
MIL-L-23699	Lubricating Oil, Aircraft Turbine Engines, Synthetic Base
MIL-I-25623	Indicator, Electrical Tachometer, Aircraft Turbo Speed, 0-110 percent RPM, 2 Inch Size Type MU-1
MIL-M-45202	Magnesium Alloy, Anodic Treatment Of
MIL-C-83488	Aluminum, Ion Vapor Deposited

STANDARDS

MILITARY

MIL-STD-100	Engineering Drawing Practices
MIL-STD-129	Marking For Shipment And Storage
MIL-STD-130	Identification Marking Of U.S. Military Property
MIL-STD-454	Standard General Requirements For Electronic Equipment
MIL-STD-810C	Environmental Test Methods
MIL-STD-838	Lubrication Of Military Equipment
MIL-STD-889	Dissimilar Metals
MIL-STD-970	Standards & Specifications, Order Of Preference For The Selection Of
MS9134	Gasket, Type X or XV Engine Accessory Drive
MS33540	Safety Wiring And Cotter Pinning, General Practices For
MS33678	Connector, Receptacle, Electric, Integral Mounting

AIR FORCE-NAVY AERONAUTICAL

AND20005	Drive - Type XV Engine Accessory

(Unless otherwise indicated, copies of federal and military specifications and standards handbooks are available from the Naval Publications and Forms Center, (ATTN: NPODS), 5801 Tabor Avenue, Philadelphia, PA 19120-5099).

2.2 Non-Government publications. The following document(s) form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are 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 D3951 Packaging, Commercial

(Application for copies should be addressed to ASTM, 1916 Race St, Philadelphia, PA 19103).

Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.

2.3 Order of precedence. In the event of a conflict between the text of this document and the reference cited herein (except for related associated detail specifications, specification sheets, or MS standards), 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 Qualification. The generators furnished under this specification shall be products which are qualified for listing on the applicable Qualified Products List at the time set for opening of bids (see 4.4 and 6.3).

3.2 Data. Unless otherwise specified in the contract or order (see 6.2), no data (other than reports and drawings accompanying qualification samples) are required by this specification or any of the documents referenced in Section 2.

3.3 Selection of standards and specifications. Standards and specifications for necessary commodities and services not specified herein shall be selected in accordance with MIL-STD-970.

3.4 Materials

3.4.1 Fungus-proof materials. Materials that are nutrients for fungi shall not be used where it is practical to avoid them. Where used and not hermetically sealed, they shall be treated with a fungicidal agent acceptable to the contracting activity. However, if they will be used in hermetically sealed enclosure, fungicidal treatment will not be necessary.

3.4.2 Nonmagnetic materials. Nonmagnetic materials shall be used for all parts, except where magnetic materials are essential.

3.4.3 Nonferrous materials. Nonferrous materials shall be used for all parts of the generator, except where ferrous materials are essential.

3.4.3.1 Recycled and reclaimed materials. Recycled and reclaimed materials shall be used to the maximum extent possible without jeopardizing the end use of the item.

3.4.4 Metals. Metals shall be of the corrosion-resistant type or suitably treated to resist corrosion due to fuels, salt fog, or atmospheric conditions likely to be met in storage or normal service.

3.4.5 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.

3.4.6 Magnesium alloy parts. Magnesium alloy parts shall be treated in accordance with MIL-M-3171 or MIL-M-45202.

3.4.7 Aluminum alloy parts. Where practicable, aluminum alloy parts shall be covered with an anodic film conforming to MIL-A-8625. Small holes, threads and case inserts need not be anodized. Aluminum alloys which do not anodize satisfactorily shall be coated with chemical film in accordance with MIL-C-5541.

3.4.8 Steel parts. Steel parts shall be coated with ion vapor deposited aluminum, where practicable, in accordance with MIL-C-83488, type I or II as applicable and of a class that is adequate to achieve the degree of protection required. Other protective coating, in lieu of MIL-C-83488, may be used if demonstrated to be satisfactory and approved by the contracting activity. Cadmium plating must be avoided when satisfactory alternative processes can be used.

3.4.9 Corrosive fumes. The materials, as installed in the generator and under the service conditions specified herein, shall not liberate deleterious fumes.

3.4.10 Protective treatment. When materials are used in the construction of the generator that are subject to deterioration when exposed to climatic and environmental conditions likely to occur during service usage, they shall be protected against such deterioration in a manner that will in no way prevent compliance with the performance requirements of this specification. The use of any protective coating that will crack, chip, or scale with age or extremes of climatic and environmental conditions shall be avoided.

3.5 Design and construction

3.5.1 Generator. The generator shall be designed to operate at any speed up to 5,500 rpm in either direction of rotation and in any mounting position. The generator shall be suitable for mounting on a pad conforming to AND20005. The generator design shall be such that the output voltage will be three phase and will have a frequency of one cycle per revolution of the generator drive shaft. For calibration purposes, 4,200 rpm will be 100 percent rpm. The generator shall be designed to withstand a steady 20g vibratory load applied along any of the three principal mutually perpendicular axes when mounted on the pad specified herein. The generator shall be so constructed that no parts will work loose in service. It shall be built to withstand the strains, jars, vibrations, and other conditions incident to shipping, storage, installation, and service.

3.5.2 Explosion-proof. The generator shall not ignite any explosive mixtures that may surround it.

3.5.3 Reliability. The generator shall have a minimum mean-time-between-failures (MTBF) of 3,000 hours, demonstrated to a 90 percent (or greater) confidence factor.

3.5.4 Maintainability. The generator shall be so constructed that adjustment and repairs can be easily made.

a. It shall be possible to remove and replace the bearings without cutting or gouging any metal from the unit, bending any metal tab, and without using any special tools.

b. It shall be possible to remove and replace the flexible drive assembly without cutting any metal from the unit, bending any metal tab, and without using any special tools.

c. An air-stabilized magnet will not be required.

d. The capability to remove and replace the electrical connector will not be required.

e. The capability to remove and replace the stator windings will not be required.

3.5.5 Dimensions. The generator shall conform to figure 1. The drive and mounting details of the generator shall be suitable for mounting on the pad specified in 3.5.1. The 0.312-inch minimum radial clearance required behind the mounting flange holes shall extend behind the mounting flange holes for a minimum length of 0.8125 inch.

3.5.6 Oil leakage. The generator shall not be provided with an oil seal. The generator shall operate satisfactorily with oil leakage from the engine into the generator mounting flange at a rate not exceeding 5 cubic centimeters (cc) per hour. The oil shall conform to MIL-L-7808 or MIL-L-23699.

3.5.7 Drain holes. Four circular drain holes shall be provided as shown on figure 2. The drain hole diameter shall be not greater than 0.1000 inch or less than 0.0850 inch. The drain holes shall be 85° to 95° apart and shall be located not more than 0.625 inch from the face of the mounting flange. The drain holes must drain from the area between the front bearing and the mounting pad. Drain slots may be used instead of drain holes. If used, the drain slots shall be 0.125 to 0.1875 inch wide and 0.08 to 0.10 inch deep.

3.5.8 Vents. Means shall be provided to vent the generator other than through the bearings. If vent holes are used, not more than three holes shall be provided and the cross-sectional area of each hole shall not exceed 0.01 square inch.

3.5.9 Case. The external parts of the generator case shall be held together by positive mechanical means. The use of interference fits, glue, or sealant will not be relied upon as the sole means of holding the case together. Example: A snap ring opening into a groove would be satisfactory.

3.5.10 Shaft

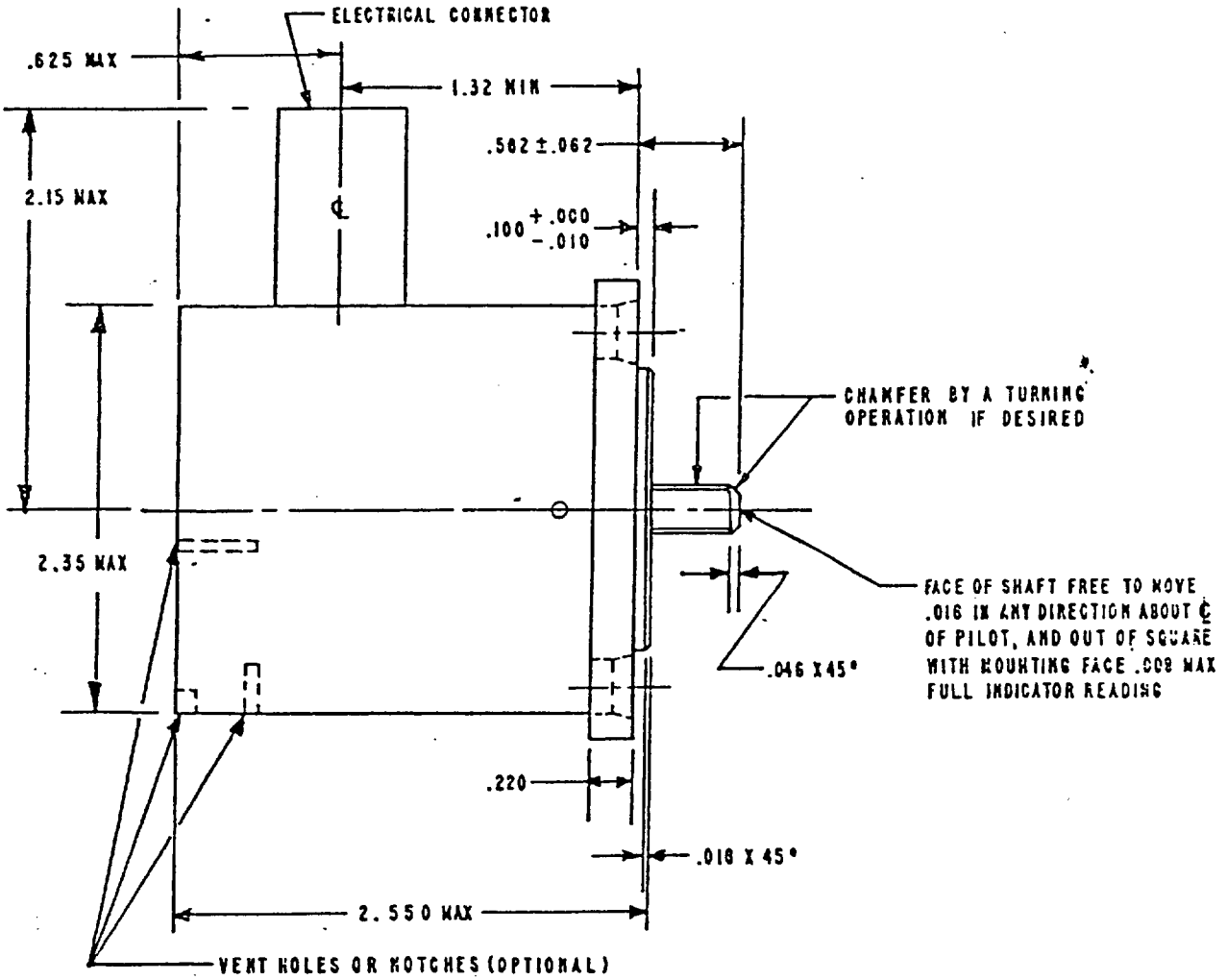
3.5.10.1 Hardness. The hardness of the drive end of the shaft shall be Rockwell C-30 to C-40.

3.5.10.2 Strength. The drive shaft shall be provided with a shear section that will fail within the torque limits of 35 to 45 inch-pounds. Failure shall not occur until the shear section has yielded (twisted) through a minimum of 270°.

3.5.10.3 Support. The shaft shall be supported by at least two bearings, one at each end of the rotor.

3.5.10.4 Flexibility. The face of the shaft shall be free to move 0.016 inch in any direction about the centerline of the generator without rotating and without deflecting (bending) the shaft. The shaft rotational backlash about its longitudinal axis shall not exceed 6 angular degrees when the unit is new. The

SHAPE OF GENERATOR OPTIONAL PROVIDED
ALL DIMENSIONS ARE COMPLIED WITH.



DIMENSIONS IN INCHES.
UNLESS OTHERWISE SPECIFIED,
TOLERANCES:

DECIMALS 2PL ± .01
3PL ± .005

FIGURE 1. Generator side view.

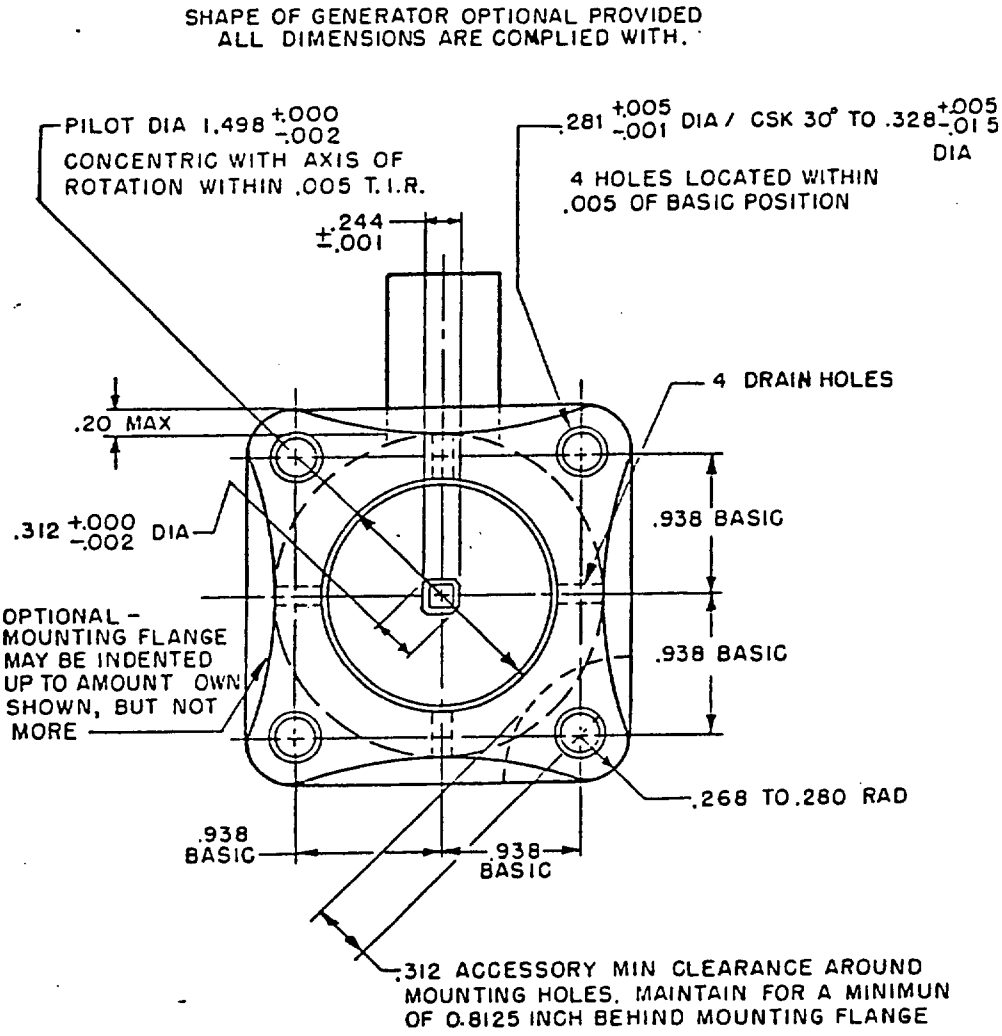


FIGURE 2. Generator end view.

rotational backlash may be measured on a disassembled unit. The free axial play shall not exceed 0.021 inch.

3.5.10.5 Shaft angle. When the generator is held with the axis horizontal and the shaft is lightly tapped downward once with the finger, the angle which the shaft makes with the centerline of the generator shall not exceed 10°. This requirement holds regardless of the rotational position of the shaft.

3.5.11 Bearings. Separable bearings or sleeve bearings shall not be used in the generator. The bearings used in the generator shall be shielded or sealed.

3.5.11.1 Mounting. The front bearing (closest to the mounting pad) shall be mounted on the shaft with an interference fit. When the bearings are mounted in aluminum or other nonferrous material, steel bearing mounting sleeves shall be used. The sleeves shall be made of the same series steel as the outer race of the bearing (except that the sleeve need not be a vacuum melt version of the steel). The sleeves shall be securely mounted in the generator case and, unless desired, need not be specially protected against the effects of corrosion as long as other specification requirements are complied with.

3.5.11.2 Alignment. Alignment of the bearings shall rely entirely upon the case components and shall be independent of the stator and the stator stacking factor.

3.5.11.3 Loading. Due to differential expansion of the generator components, provisions shall be made to compensate for differential expansion of the components in the axial direction to prevent damaging thrust loading of the bearings.

3.5.12 Stator lock. A positive means shall be provided to prevent the stator from rotating or moving relative to the case. Use of interference fits, glue, or sealant, while permissible as a secondary means of locking the stator, shall not be considered positive means.

3.5.13 Electrical connector. The generator shall be provided with an MS33678-12S-3P two-pin electrical connector conforming to MIL-C-5015, except that the connector shall be protected against corrosion and high temperatures. Electrical connection of the wire to the connector terminal shall not be relied upon as the sole means of supporting the wires from the stator to the connector. Within 0.500 inch from the ends of the connector terminals, the wires shall be supported by any suitable means. The support need not be rigidly fastened to the generator case. The electrical shell shall be electrically grounded to the frame of the generator. The threaded portion of the electrical connector shall be located within 0.375 inch from the rear of the generator.

3.5.13.1 Connector strength. The connector mounting shall be sufficiently rigid to withstand a force of 17 foot-pounds bending moment applied in any direction perpendicular to the longitudinal axis of the connector without damage.

3.5.14 Electrical connections. The three leads from the generator windings shall be designated B, A, and C (conforming to phases 1, 2, and 3). The B and A leads shall be connected to the B and A pins of the electrical connectors in such a manner that when the generator drive shaft is rotated in a counterclockwise director (looking into the end of the shaft), the sequence of the generator output phase rotation shall be B, A, and C. The C-lead shall be grounded to the frame of the generator.

3.6 Performance. The generator shall be capable of satisfactory performance when subjected to the following conditions and tested as specified in Section 4.

a. Temperature: Temperatures ranging from -65° to +230°C.

b. Vibration: Vibration of 20g's from 5 to 2000 Hz.

c. Humidity: Relative humidity up to 100 percent.

d. Fungus: Fungus growth as encountered in tropical climates.

e. Salt fog: Exposure to simulated salt sea atmosphere for 50 hours.

f. Oil soak: Immersion in oil at temperatures ranging from -45° to +177°C.

g. Altitude: Altitudes up to 80,000 feet.

h. Operation: 2,200 hours of operation.

3.6.1 Dielectric strength. When a potential of 500V rms is applied between any electrical pin contact and any metal part of the generator case (before grounding of the C lead), there shall be no insulation breakdown.

3.6.2 Voltage output. When the generator is operated at a drive shaft speed of 4,200 rpm with a load consisting of three 40-ohm Y-connected resistances, the three terminal voltages shall be 21 $\pm$0.5V when measured at the generator terminals. When the generator is similarly operated at a shaft speed of 1,000 rpm with a load of three 20-ohm Y-connected resistances, none of the three terminal voltages shall be less than 3.5V

3.7 Part numbering of interchangeable parts. All parts having the same manufacturer's part number shall be functionally and dimensionally interchangeable. the drawing number requirements of MIL-STD-100 shall govern the manufacturer's part numbers and changes thereto.

3.8 Screw threads. Screw threads shall conform to MIL-S-7742. All screws used in the construction of the generator shall be secured by use of safety wiring in accordance with MS33540.

3.9 Lubrication. Lubrication shall be accomplished in accordance with MIL-STD-838. The qualifying activity shall be informed of the bearing lubricant used. The flexible joint shall be lubricated.

3.10 Weight. The weight of the complete generator shall not exceed 1.2 pounds.

3.11 Marking

3.11.1 Identification of product. Equipment, assemblies, and parts shall be marked for identification in accordance with MIL-STD-130.

3.11.2 Shell marking. The marking, FOR USE WITH PERCENT RPM INDICATORS ONLY, shall be marked in yellow on opposite sides of the shell in letters at least 0.093 inch high.

3.11.3 Installation diagram. An external wiring diagram shall be applied on the case by etching, stamping, plate or other permanent method approved by the contracting agency.

3.12 Workmanship. The generator, including all parts and accessories, shall be fabricated and finished in a workmanlike manner in accordance with MIL-STD-454 requirement 9. Particular attention shall be given to freedom from blemishes, defects, burrs, and sharp edges; accuracy of dimensions and marking of parts and assemblies; thoroughness of soldering, painting, and wiring; and alignment of parts and tightness of assembly screws and bolts.

3.12.1 Cleaning. The generator shall be thoroughly cleaned, and loose, spattered, or excess solder, metal chips, and other foreign material removed during and after final assembly.

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 all requirements of sections 3 and 5. 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 follows:

a. Qualification inspection (4.4)

b. Quality conformance inspection (4.5).

4.3 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with the test conditions specified in this specification.

4.3.1 Atmospheric conditions. Unless otherwise specified, all tests shall be made at atmospheric pressure (approximately 29.92 inches Hg) and at room temperature (18.3°C to 29.4°C). When tests are made with atmospheric pressure or temperature differing materially from the above values, proper allowance shall be made for the difference from the specified condition.

4.3.2 Voltages. All voltages specified herein are root mean square (rms) values. Voltmeters used to measure voltage shall be free from frequency errors. If the voltmeter draws appreciable current, the specified loads shall be so adjusted that the combined voltmeter and loads will form a balanced load equivalent to the specified load. The voltmeter shall have an accuracy of 1 percent or better and meter errors shall not be included in the errors attributable to the generator.

4.3.3 Test indicator. Whenever a tachometer indicator is specified for conducting tests, a single magnetic-drag type electric tachometer indicator in accordance with MIL-I-22596 or MIL-I-25623 or as specified by the contracting activity shall be used.

4.3.4 Order of testing. Unless otherwise specified, tests shall be conducted in the order listed under 4.6.

4.3.5 Mounting test samples. Whenever a test generator is mounted on a drive pad, an asbestos gasket conforming to MS9134 shall be used between the generator and the drive pad. This requirement does not apply if the generator is being operated in conducting the voltage test.

4.3.6 Test average. Each data point shall be included in the test report. Unless otherwise specified, test results shall not be averaged.

4.3.7 Standard load. The standard load shall consist of three 40-ohm Y-connected resistances.

4.4 Qualification inspection

4.4.1 Test samples. The test samples shall consist of nine generators plus parts for the fungus test as specified in 4.6.16, the shaft failure test as specified in 4.6.24, and a small sample of lubricant(s) as specified in 4.6.12. Three samples shall be subjected to all the tests except reliability and the other six samples shall be subjected to the reliability test only. The three generators subjected to all the tests except reliability and one of the samples subjected to reliability only shall be forwarded to the qualifying activity (see 6.3) along with the qualification test report. Two of these samples will be returned to the contractor.

4.4.2 Qualification inspections. The qualification inspections consist of all the tests specified under 4.6.

4.5 Quality conformance inspection. The quality conformance inspection shall consist of:

a. Individual tests.

b. Sampling tests.

4.5.1 Individual tests. Each generator shall be subjected to the following tests as described under 4.6:

a. Examination of product. (4.6.1)

b. Continuity and resistance. (4.6.2)

c. Phase rotation. (4.6.3)

d. Voltage. (4.6.4)

e. Dielectric strength. (4.6.5)

4.5.2 Sampling tests

4.5.2.1 Sampling plan A. One generator shall be selected at random from each 100

or less produced on the contract or order and subjected to the following tests as described under 4.6:

a. Individual tests. (4.5.a)

b. Low temperature operation. (4.6.6)

c. Vibration. (4.6.7)

d. High temperature operation. (4.6.10)

e. Voltage. (4.6.4)

4.5.2.2 Sampling plan B. Unless otherwise specified, 10 generators shall be selected from the first 30 produced on the contract or order. Six generators shall be subjected to the reliability test only and three generators shall be subjected to all the tests listed below except reliability. The last generator shall supply parts for the fungus test. This test program shall be initiated within two working days after the first 30 generators are available for selection of samples.

a. Sampling plan A tests. (4.5.2.1)

b. Operation. (4.6.8)

c. Oil soak. (4.6.9)

d. Altitude-high temperature. (4.6.11)

e. Overspeed and reverse operation. (4.6.13)

f. Short circuit. (4.6.14)

g. Humidity. (4.6.15)

h. Fungus. (4.6.16)

i. Salt fog. (4.6.17)

j. Reliability. (4.6.22)

4.5.2.3 Rejection and retest. When one item selected from a production run fails to meet the specification, generators still on hand or produced later shall not be accepted until the extent and cause of failure are determined. After corrections have been made, all necessary tests shall be repeated.

4.5.2.3.1 Individual tests may continue. For operational reasons, individual tests may be continued pending the investigation of a sampling test failure, but final acceptance of generators on hand or produced later shall not be made until it is determined that items meet all the requirements of the specification.

4.5.2.3.2 Defects in items already accepted. The investigation of a test failure could indicate that defects may exist in generators already accepted. If so, the contractor shall fully advise the qualifying activity of all defects likely to be found and methods of correcting them.

4.6 Test methods

4.6.1 Examination of product. The generator shall be inspected to determine compliance with the requirements specified herein with respect to materials, workmanship, marking, dimensions, and other requirements not covered by tests.

4.6.2 Continuity and resistance. The stator windings of the generator shall be checked for continuity between electrical connector pins A and B, and between pins A and B and the generator frame. There shall be no evidence of discontinuity. The resistance between the pins or between a pin and the case shall be less than 50 ohms. The three measurements shall be within 2 ohms or each other.

4.6.3 Phase rotation. The generator shall be properly connected to the test indicator. The wiring shall be so arranged that generator terminals marked A and B will be connected to test indicator terminals marked A and B respectively. The C terminal of the indicator shall be grounded to the electrical connector shell. The test indicator shall indicate positive when the generator drive shaft is rotated in a counterclockwise direction (looking at the drive end of the shaft).

4.6.4 Voltage. Unless otherwise specified, the temperatures of the generator for the following test shall be 18°C minimum and 30°C maximum initial temperature, for test A.

4.6.4.1 Test A. The generator shall be operated at a drive-shaft speed of 4,200 ±5 rpm while connected to a load consisting of three 40-ohm Y-connected resistances. Unless otherwise specified, the voltages shall be 21 ±0.5V when measured across the generator terminals. All three voltages shall be measured.

4.6.5 Dielectric strength. Prior to grounding the C-lead, a potential of 500V rms commercial frequency shall be applied between the individual electrical pins and metal parts of the generator case, including the receptacle shell, for a period of 5 seconds. There shall be no breakdown of insulation. Leakage currents in excess of 0.002 amp shall be considered insulation breakdown.

a. If desired for the purpose of facilitating the dielectric strength test, the C-lead may be brought out of the generator case and routed back into the case through the same hole. The C-lead shall remain grounded to the case in exactly the same manner as in actual use. The C-lead may then be broken and reconnected as desired.

4.6.6 Low temperature operation. The generator shall be placed in a chamber, the temperature of which shall be controllable, and the circulating air reduced to a temperature of -65° ±5°C and held at this temperature for the duration of the test. Before the test is started, the generator shall be kept in the chamber for not less than 44 hours after the specified temperature is reached. The generator shaft shall not be turned during this time. At the end of 44 hours and while still at -65°C, the shaft shall be rotated at a speed of 25 ±5 rpm for 15 ±1 minutes. The chamber temperature shall then be raised to -45° ±5°C and held at this temperature for the duration of the test. After a minimum of 20 hours at -45° ±5°C, during which the shaft shall not be turned, the breakaway torque shall not exceed 8 inch-pounds. The generator shaft shall then be rotated at a speed of 25 ± rpm. Within 1 minute after starting the rotation, the torque required to turn the shaft shall be measured and shall not exceed 1.5 inch-pounds. No damage to the generator shall result from this test. The amount of torque required to turn the shaft shall be reported.

4.6.7 Vibration. Prior to vibration, the output voltage of the test sample shall be determined in accordance with 4.6.4, test A. The vibration test shall be conducted in accordance with MIL-STD-810, Method 514.2, procedure I, part 1 of table 514.2-II, and curve L of figure 514.2-2. While operating, the generator shall be vibrated for 3 hours in each axis. The generator shall be connected to the standard load and operated at 4,200 +500 -0 rpm. The terminal voltage shall again be determined in accordance with 4.6.4, test A, and shall be recorded. The generator, not operating, shall then be subjected to 177°C for a minimum of 1 hour. The generator shall be removed from the oven and immediately vibrated (not operating) for 15 minutes. During the 15 minutes, the vibration frequency spectrum shall be scanned at least once but not more than twice. The terminal voltages shall then be determined in accordance with 4.6.4, test A, and shall be recorded. The above procedure shall be repeated and the voltage determined and recorded as specified. At the completion of this test, no terminal voltage shall be less than 20.0V when tested as specified in 4.6.4, test A. The generator shall then be subjected to the test specified in 4.6.5.

4.6.8 Operation. The generator shall be connected to a Y-connected load of three 20-ohm resistances and, while in an ambient temperature of 177° +10° -0°C, operated at a drive-shaft speed of 4,200 +100 -0 rpm for a period of 500 +20 -0 hours. The ambient temperature shall then be lowered to room temperature (18.3° to 29.4°C) and the generator operated for an additional 500 +20 -0 hours. After the generator has cooled, the terminal voltages shall be checked and recorded as specified in 4.6.4, test A, except the tolerance shall be 21 $\pm$1V.

4.6.9 Oil soak. The generator shall be immersed in oil conforming to MIL-L-7808 or MIL-L-23699 and operated for 24 hours with the oil temperature held at 177° +10 -10°C. The temperature of the oil shall then be lowered to -45° $\pm$5°C and the generator operated for a minimum of 30 minutes. No damage or malfunction of the generator shall result from this test. CAUTION: Adequate ventilation shall be provided during this test. If an oven or similar enclosure is used, it is suggested that it either be flooded with a gas that will not support combustion or be provided with ventilation.

4.6.10 High temperature operation. The generator shall be subjected to an ambient temperature of 177° +10 -0°C for a minimum of 3 hours. While at 177°C, the test specified in the 4.6.4, test A, shall be conducted. No terminal voltage shall be less than 17V. The ambient temperature shall then be raised from 177° to 230° +10 -0°C for a minimum period of 4 hours during which time the generator shall be operated at 4,200 $\pm$100 rpm but shall not be connected to an electrical load. After the generator has cooled, the terminal voltages shall be measured and recorded in 4.6.4, test A, except that the tolerance shall be 21 $\pm$2V. The generator shall then be subjected to the test specified in 4.6.5.

4.6.11 Altitude-high temperature. The generator shall be connected to the standard load and operated at 4,200 $\pm$100 rpm while a chamber maintained at 149° $\pm$5°C and at an absolute pressure of 0.82 inch Hg (80,000 feet) or less for a period of 20 hours. There shall be no damage to the generator as a result of this test.

4.6.12 Grease test (qualification only). A small sample of grease(s), not less than 4cc, shall be divided and one-half of the sample placed in the chamber and subjected to the test specified in 4.6.11 along with the generators. At the end of the test, the two samples shall be compared for changes in texture, viscosity, and color. The results of this test shall be reported in detail to the qualifying activity. A difference in the samples may indicate that the lubricant will not perform satisfactorily in service.

4.6.13 Overspeed and reverse operation. The generator shall be connected to the standard load and operated at 4,200 ±10 rpm. The terminal voltages shall be measured. the generator shall be operated with the specified load at 5,000 rpm for 5 minutes, and in the reverse direction with the specified at 4,200 rpm for 1 minute. After the generator has been allowed to cool to room temperature, it shall be operated with the specified load at 4,200 rpm in the normal direction and the terminal voltages measured. The decrease in the terminal voltages shall be recorded. The terminal voltages shall be measured and recorded in accordance with 4.6.4, test A, except that the tolerance shall be 21 ±2V.

4.6.14 Short circuit. The generator shall be connected to the standard load and operated at 4,200 ±5 rpm. The three terminal voltages shall be determined. The generator shall then be short-circuited five times, for a period of 1 second each time, across all three of the generator terminals. After the generator has been allowed to cool to room temperature, the three terminal voltages shall again be determined with the generator operating at the above speed and with the standard load connected across the terminals. After the generator has cooled, the terminal voltages shall be measured and recorded as specified in 4.6.4, test A, except that the voltage shall be 21.5 to 19V.

4.6.15 Humidity. The generator shall be mounted with the shaft in a horizontal position and tested as specified in MIL-STD-810, Method 507.1, procedure I. The external connections to the generator shall be made in such a manner as to simulate installed conditions. Within 2 hours after removal from the humidity chamber, the generator shall be subjected to the test specified in 4.6.5.

4.6.16 Fungus. The components of one generator and a grease sample shall be subjected to a fungus resistance test in accordance with MIL-STD-810, Method 508.1, procedure I. Evidence of fungus growth shall be cause for rejection.

4.6.17 Salt fog. The generator shall be subjected to a salt fog test in accordance with MIL-STD-810, Method 509.1 for a period of 50 hours. The external connections to the generator shall be made in such a manner to simulate installed conditions. At the end of the 50-hour period, the generator shall be subjected to the tests specified in 4.6.1, 4.6.2, and 4.6.5.

4.6.18 Cumulative voltage error. The test specified in 4.6.4, test A, shall be conducted on all test units and the voltages reported to the qualifying activity. Any voltage less than 19.0V shall be cause for rejection.

4.6.19 Shaft angle. Each of the four flats of the shaft shall be turned up and examined as specified in 3.5.10.5. The amount of shaft drop shall be reported in the test report.

4.6.20 Weight. The generator shall be weighed. The weight of the generator shall not exceed 1.2 pounds.

4.6.21 Rockwell hardness. Rockwell hardness of the drive end of the shaft shall be measured and shall be from C-30 to C-40.

4.6.22 Reliability demonstration. The six generators shall be subjected to a reliability test to demonstrate a required minimum MTBF of 3,000 hours at a confidence level of 90 percent. The total test time, number of failures permitted, and accept, continue-test, reject criteria shall be in accordance with figure 3.

4.6.22.1 Reliability. The test equipment and fixtures shall include provisions for temperature cycling and continuous operation of the generator. The generators shall be subjected to the individual tests specified in 4.5.1. Each generator shall then be mounted on a drive pad conforming to AND20005. A shim shall be placed between any two adjacent studs, and all bolts tightened so that the generator is cocked on the drive pad by 0.008 inch when measured at the two studs where the shim was placed. Each generator shall then be connected to a Y-connected load of three 20-ohm resistances operated at a drive-shaft speed of 4,000 to 4,400 rpm under the following ambient conditions. The transition from 25° to 130°C and from 130° to 177°C shall be achieved in not more than 3 hours. The generators shall be operated continuously while the oven is heating, but shall not be operated during the 6-hour cooling period. The oven temperature shall be checked and recorded at least once during each 66 hours of testing.

a. 96 to 98 hours at 25° ±5°C.

b. 144 to 148 hours at 130° ±5°C.

c. 192 to 196 hours at 177° ±5°C.

d. 6 hours minimum shutdown and cooling with oven open.

This cycle shall be repeated until the test is terminated. Only the hours that the generator actually operates shall be counted. This test may be interrupted at any point for maintenance or repair of test stand equipment.

4.6.22.2 Performance check. The performance of the equipment (voltage output) shall be checked at least once during each 66 hours of operation.

4.6.22.3 Failure criteria. Failure of any generator to maintain at least 19V across each lead when connected to three 40-ohm Y-connected resistances when operated at 4,000 to 4,200 rpm shall be cause for rejection. The generator may be at any temperature above 25°C when the output is measured for the performance check.

4.6.22.4 Preventive maintenance. No preventive maintenance or lubrication shall be performed on the generators.

4.6.22.5 Accept-reject criteria. The accept-reject criteria is shown on figure 3 of this specification. For an accept decision with no failures, the generators must have operated satisfactorily for a minimum total of 13,200 hours (2,200 hours per generator). For an accept decision with no failures, each generator shall have operated within 50 hours of its share of the total time. If a unit fails, it shall be replaced with a new unit. The test shall then be run long enough to achieve the total additional operating hours required (15,600 for one failure). The hours up to the last satisfactory performance check on the failed unit may be included in the operating time.

4.6.22.6 Reporting of reliability test results. The log of the reliability test shall be included in the test report.

4.6.23 Internal examination. One generator which was subjected to the reliability test and one generator which was subjected to the other qualification tests shall be disassembled and examined internally for evidence of excessive wear, corrosion, or gross deterioration. The findings shall be reported to the qualifying activity as part of the test report. The disassembled generators shall be forwarded to the qualifying activity.

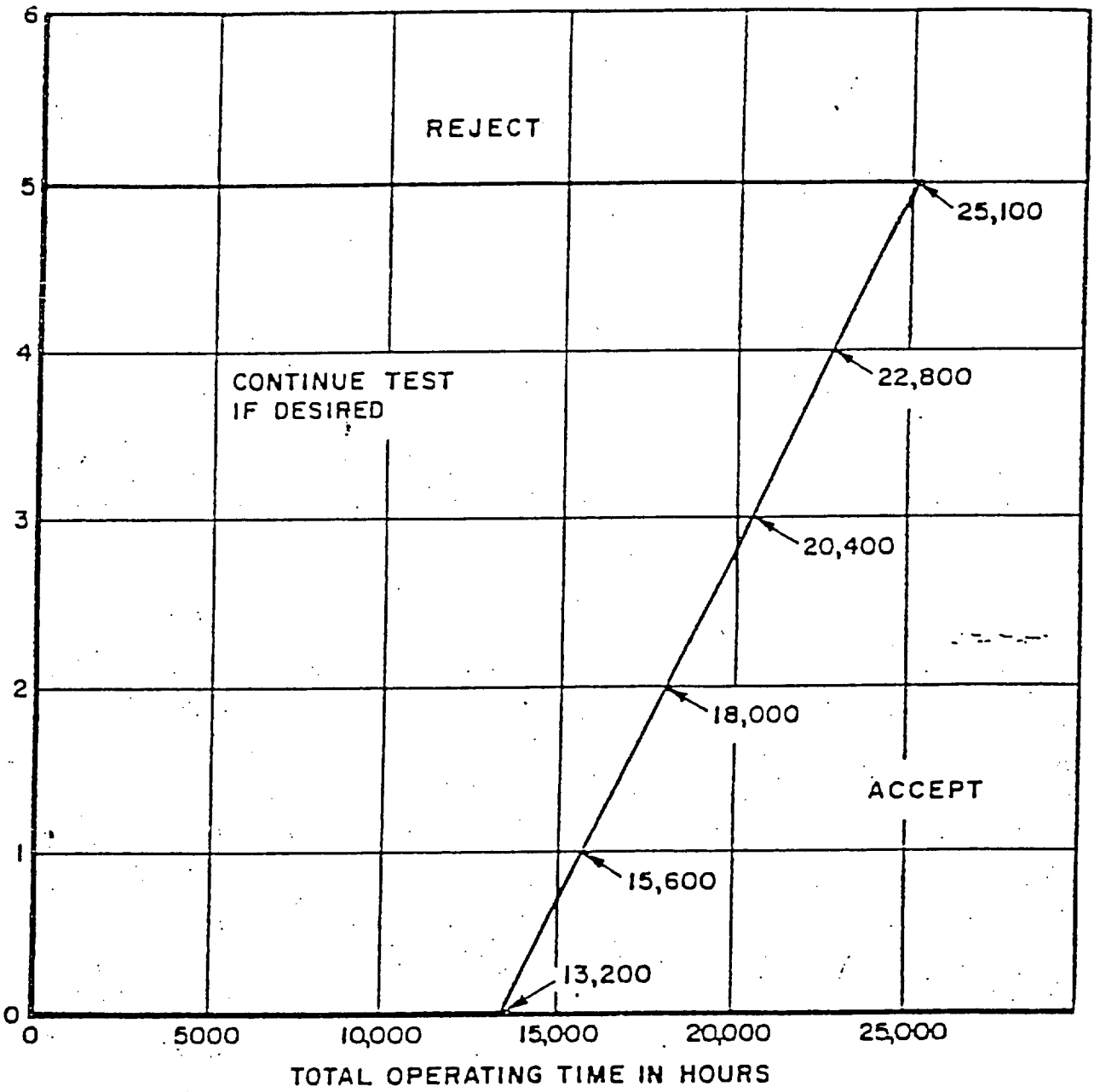


FIGURE 3. Accept, continue test, reject criteria.

4.6.24 Shaft failure. The shaft of the disassembled generator which was subjected to the qualification inspections and two shear sections identical to the production item shall be made to fail. The torque required to fail each shear section shall be recorded and shall be from 35 to 45 inch-pounds. The shear section shall have yielded (twisted) through a minimum of 270°.

4.6.25 Connector strength. A force of 17 foot-pounds shall be applied in any direction perpendicular to the longitude axis of the connector. There shall be no damage to the connector as a result of this test.

4.7 Inspection and test. Inspection and test of methods of preservation and packaging shall be accomplished in accordance with Section 4 of MIL-P-116 to insure compliance with Section 5 of this specification.

5. PACKAGING

5.1 Preservation. Preservation shall be Level A, C, or Industrial as specified.

5.1.1 Level A.

5.1.1.1 Cleaning. Units shall be dried in accordance with process C-1 of MIL-P-116.

5.1.1.2 Drying. Units shall be dried in accordance with process D-4 of MIL-P-116.

5.1.1.3 Preservation application. Not applicable.

5.1.1.4 Unit packaging. Unless otherwise specified by the contracting activity, each generator, tachometer GEU-7/A, miniature, shall be packaged in quantity unit packs of one each in accordance with method 1A8 of MIL-P-116. Each unit shall be overboxed in PPP-B-636 carton. Carton shall be large enough to allow for application of sufficient cushioning material between container and bag, of a type, density, thickness to insure shock transmission does not exceed peak values of G's established for the generator when completed packs are subjected to the rough handling drop tests of MIL-P-116.

5.1.2 Level C. Units shall be clean, dry and individually packaged in a manner that will afford adequate protection against corrosion, deterioration, and physical damage during shipment from supply source to the first receiving activity.

5.1.3 Industrial. The industrial preservation of generator, tachometer shall be in accordance with ASTM D3951.

5.2 Packing. Packing shall be level A, B, C, or Industrial as specified by contracting activity.

5.2.1 Level A. Units packaged as specified in 5.1.1 shall be packed in shipping containers conforming to PPP-B-601, style A or B, Class overseas, unless otherwise specified by the contracting activity. In so far as practical, exterior shipping container shall be of uniform shape, size, and of minimum tare and cube, consistent with the protection required.

5.2.2 Level B. Units packaged as specified in 5.1.1 shall be packed in shipping containers conforming to PPP-B-636. Other requirements as specified in 5.2.1 above are applicable.

5.2.3 Level C. Packing shall be applied which affords adequate protection during domestic shipment from the supply source to the first receiving activity for immediate use. This level shall conform to applicable carrier rules and regulations.

5.2.4 Industrial. The generator, tachometer shall be packed in accordance with ASTM D3951.

5.3 Marking. In addition to any special marking required by the contract or order, each unit package and shipping container shall be marked in accordance with MIL-STD-129.

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 GEU-7/A miniature tachometer generator covered by this specification is intended for use on turboprop and turbojet engines to generate electrical signals for transmission to the indicating instruments.

6.2 Acquisition requirements. Acquisition documents must specify the following:

a. Title, number, and date of this specification.

b. Data requirements (see 3.2).

c. When sampling plan B tests will not be conducted (see 4.5.2.2).

d. Levels of packaging and packing required and reinspection date markings. (See Section 5).

e. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1).

6.3 Qualification. With respect to products requiring qualification, awards will be made only for such products which are, at the time set for opening of bids, qualified for inclusion in the applicable Qualified Products List whether or not such products have actually been so listed by that date. The attention of the 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 tested for qualification in order that they may 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 Oklahoma City Air Logistics Center/MMEOR, Tinker AFB AFB OK 73145-5990.

a. If the generator is modified in any way after having passed the qualification tests, the qualifying activity will be notified and modified product will be subjected to, and must pass, all or part of the qualification tests as specified by the qualifying activity.

6.3.1 Qualification purposes. For qualification purposes, the following information will be furnished to the qualifying activity:

a. Size, material, type of bearing, manufacturer's bearing part number and name.

b. Type of bearing lubrication and source.

c. Drawings in sufficient detail to show internal construction.

6.4 Subject term (key word) listing.

Generator
Miniature
Tachometer
Turboprop and turbojet engines
3,000 hrs reliability
5,500 rpm (100% = 4,200 rpm)

6.5 Certain provisions of this document are subject to international standardization agreement ASCC AIR STD 10/36C and STANAG 3691. When amendment, revision, or cancellation of this document is proposed which will modify the international agreement concerned, the preparing activity takes appropriate action through standardization channels including the Departmental Standardization Offices (DepSo) to change the agreement or make other appropriate accommodations.

6.6 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodians:

AIR FORCE -99
Navy -AS
Army -AV

Preparing Activity

AIR FORCE -71

Project Number:
6620-0473

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions – Reverse Side)

1. DOCUMENT NUMBER	2. DOCUMENT TITLE
MIL-G-26611D	

3a. NAME OF SUBMITTING ORGANIZATION	4. TYPE OF ORGANIZATION *(Mark one)*
	☐ VENDOR
	☐ USER
b. ADDRESS *(Street, City, State, ZIP Code)*	☐ MANUFACTURER
	☐ OTHER *(Specify)*: _____

5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

6. REMARKS

7a. NAME OF SUBMITTER *(Last, First, MI)* – Optional	b. WORK TELEPHONE NUMBER *(Include Area Code)* – Optional
c. MAILING ADDRESS *(Street, City, State, ZIP Code)* – Optional	8. DATE OF SUBMISSION *(YYMMDD)*

DD FORM 82 MAR 1426

PREVIOUS EDITION IS OBSOLETE.