

INCH-POUND

MIL-DTL-45500E  
18 December 1996  
SUPERSEDING  
MIL-G-45500D  
30 July 1994

## DETAIL SPECIFICATION

GUN, AUTOMATIC, 20MM,  
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 the general requirements for multi-barrel, electrically fired, 20 millimeter (mm) automatic guns. Additional requirements for specific models of the 20mm automatic gun are on specification sheets which are included as a part of this specification.

## 2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, and 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all requirements documents cited in sections 3, 4, and 5 of this specification, whether or not they are listed.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document, should be addressed to: Commander, U.S. Army ARDEC, ATTN: AMSTA-AR-EDE-S, Picatinny Arsenal, New Jersey 07806-5000 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 1005

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2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks 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).

## SPECIFICATIONS

## DEPARTMENT OF DEFENSE

MIL-W-13855	Weapons: Small Arms and Aircraft Armament Subsystems, General Specification For
MIL-P-14232	Parts, Equipment and Tools for Army Materiel, Packaging Of

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from DODSSP - Customer Service, Standardization Documents Order Desk, 700 Robbins Avenue, Bldg. 4D, Philadelphia, PA 19111-5094.)

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

## DRAWINGS

F7273689	Gage, Flush Pin
C7797956	Gage, Boresight

Drawings applicable to the individual 20mm Automatic Gun will be as specified in the applicable specification sheets.

(Copies of other Government documents, drawings, and publications required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless

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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 NATIONAL STANDARDS INSTITUTE/  
AMERICAN SOCIETY FOR QUALITY CONTROL

ANSI/ASQC Z1.4            Sampling Procedures and Tables  
                                 for Inspection by Attributes

ANSI/ASQC A8402        Quality Management and Quality  
                                 Assurance Vocabulary

(Application for copies should be addressed to the American Society for Quality Control, 611 East Wisconsin Avenue, P.O. Box 3005, Milwaukee, Wisconsin 53201-1734)

2.4 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. (See contract provisions for additional precedence criteria).

### 3. REQUIREMENTS

3.1 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheet. In the event of any conflict between the requirements of this specification and the specification sheet, the latter shall govern.

3.2 First article. Requirements for submission of the first article shall be as specified in the contract (see 6.1). Unless otherwise specified (see 6.2), the first article (see 4.4) shall include the pilot pack (see 6.2).

3.3 Material, construction and design. Guns shall conform to the material, construction and design requirements specified herein, those specified in MIL-W-13855, and those specified on drawings referenced in applicable specification sheets.

3.3.1 Barrels. Finished barrels, or slave barrels (for guns procured without barrels), when assembled to the rotor and housing, and fitted with barrel clamps shall meet the targeting and accuracy requirements specified herein. The barrels shall

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assemble and disassemble from the rotor assembly without the use of tools.

3.3.1.1 New barrels. New barrels shall be free of cracks, seams, and mutilations. The bore and chamber shall be free of foreign matter, corrosion, pits, burrs, sharp edges, bulges and deformations. The chromium plating in the chamber and bore shall be free of nodules, anode burns, flaking and stripping. Scratches or marks in the chamber which meet the surface roughness requirements shall be permitted provided they do not cause marks on the case of a high pressure test cartridge fired in the chamber. New barrels shall be marked for proof firing and magnetic particle inspection in accordance with applicable drawings.

3.3.2 Barrel clamps. Unless the gun is procured without barrels the barrel clamps shall be fastened securely to the barrels as specified on the applicable drawing.

3.3.3 Breech bolt assemblies. The breech bolt assemblies shall be marked in accordance with the applicable drawings after being proof fired and magnetic particle inspected. The breech bolt assemblies shall move without binding on the trackways of the rotor. The roller, shaft, locking block, firing pin cam, and the firing pin shall be retained in the breech bolt body and shall move without binding. The firing cam pin insulator and the firing pin insulator assembly shall be retained in the breech bolt body. When the shaft assembly is depressed, the locking block shall move into the lock position and shall allow the firing pin cam to be fully depressed. When the firing pin cam is depressed, it shall move the firing pin forward. When the shaft assembly is raised, the locking block shall move to the unlocked position, the firing pin cam shall return to its original position, and the firing pin shall retract into the breech bolt body.

3.3.4 Cams, locking and unlocking. The locking cam and front and rear unlocking cams shall be positioned and securely fastened to the housing assembly in accordance with the applicable drawings.

3.3.5 Clearing sector assembly. The clearing sector assembly shall be retained on the housing assembly by the spring pin and shall function through its full range of travel without binding. When the clearing sector is manually moved into clearing position and the rotor is manually rotated in the direction of the arrow, the breech bolt assemblies shall enter the clearing track of the housing without sticking or binding. When the clearing sector assembly is released out of clearing position by its return spring and the rotor is rotated, the breech bolt assemblies shall enter the main cam of the housing without sticking or binding. This is applicable to all guns

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except the M197 and M197E1 gun, which does not have a clearing sector.

3.3.6 End plate. The end plate shall be positioned by dowel pins and retained on the housing by the coupling clamp. There shall be no relative movement of these parts.

3.3.7 Firing contact assembly. The firing contact assembly including conductors and insulators shall be securely fastened to the housing in accordance with the applicable drawing.

3.3.8 Guide bar. The guide bar shall be retained on the housing assembly by spring pins.

3.3.9 Housing assembly. The bolts securing the two housing halves shall be torqued as specified on the applicable drawings. The roller guide shall be securely fastened to the housing as specified on the applicable drawings and shall allow free movement after the rotor and bolts are installed. There shall be no interference with bolt assemblies cycling in clearing cam tracks.

3.3.10 Housing cover assembly. The housing cover assembly shall be retained on the housing assembly by the cover lock pins. The hinged housing cover shall move through its full range of travel when opened from either side. This requirement is not applicable to M197 and M197E1 Guns

3.3.11 Indexing pin assembly. The indexing pin assembly shall be assembled to the housing assembly and lock wired. The indexing pin shall move through its full range of travel without binding when manually depressed, and shall return and be held in the extended position by spring action after positioning the barrels.

3.3.12 Recoil adapters. The recoil adapters shall be fastened securely to the retainer assembly except for M61A1 and M61A2 guns which incorporate an Automatic gun recoil mechanism with integral mountings for the recoil spindle assemblies. The recoil adapters, or recoil mechanism shall provide controlled fore-aft deflection of the gun so as to reduce firing loads transmitted to the gun mounts. Spring rates and dampening of the recoil adapters spindles shall be as specified on applicable drawings. The spindle retainer shall be finger tightened to remove end play of the spindle assembly in the housing and lock wired. This requirement is not applicable to M197 and M197E1 Guns.

3.3.13 Bearing retainer assembly/automatic gun recoil mechanism. The bearing retainer assembly or automatic gun recoil

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mechanism (M61A1 and M61A2 guns) shall be securely fastened to the housing assembly as specified on the applicable drawing.

3.3.14 Rotor assembly. The rotor shall be proof tested and magnetic particle inspection marked and serial marked in accordance with the applicable drawings. The rotor gear, rotor assembly, rear well springs and plate, and the front and center bolt-tracks shall be fastened securely to the rotor body as specified on the applicable drawing. There shall be no relative movement of these parts. The rear bolt tracks shall assemble to the rotor body in accordance with the applicable drawing, and disassemble from the rotor body without the use of tools, except for a probe to depress the lock pin. The track lock pins shall move through their full range of travel without binding, and shall be returned to, and held in, the extended position by spring action to retain the rear bolt tracks in the locked position on the rotor body.

3.4 Performance characteristics.

3.4.1 Firing pin protrusion and continuity. With the rotor manually rotated until the firing pin cam is fully depressed and the firing pin protrudes through the bolt face, firing pin protrusion of each bolt assembly shall be .033 inches minimum. With the locking block in the unlocked position and firing cam pin fully depressed against block, the firing pin shall not protrude beyond the face of the bolt. With the locking block in the locked position (down 15° 30') and the cam pin depressed until the firing pin extends .028 to .030 inches, there shall be electrical continuity between the cam pin and the firing pin when 1.5 maximum voltage is applied. Testing shall be as specified in 4.5.3.2.

3.4.2 Head space. The head space in the assembled gun shall be not less than 3.467 inches nor more than 3.488 inches when measured to the 0.942 inch diameter datum on the first shoulder of the chamber. Testing shall be as specified in 4.5.3.2.

3.4.3 High pressure resistance. Guns shall be capable of withstanding the firing of one round of Government standard 20mm, M54A1 high pressure test cartridge in each barrel. Parts shall be free of cracks, seams and other injurious defects after proof firing. Testing shall be as specified in 4.5.3.3

3.4.4 Functioning. Guns shall operate without malfunctions, except that one misfire shall be allowed in each 75/100 rounds fired and no parts becoming unserviceable. Guns shall meet the functioning requirements specified herein, and as specified in the applicable specification sheet. Unless other-

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wise specified herein, the steady state rate of fire shall be calculated using the last fifty percent of the burst excluding stopping time. Ammunition used for the function firing shall be Government Standard 20mm, M55A2 cartridges and 20mm, M51 series or PGU-39/B dummy cartridges. Testing shall be as specified in 4.5.3.3

3.4.4.1 Clearing. The gun shall be capable of being cleared when the clearing sector is manually pivoted into the main cam and the rotor assembly is manually turned by hand to load and clear a minimum of five rounds of Government Standard 20mm, M51 series or PGU-39/B dummy cartridges.

3.4.5 Targeting and accuracy. Using Government standard 20mm, M55A2 cartridges, the targeting and accuracy requirements shall be as specified in the applicable specification sheet. Testing shall be as specified in 4.5.3.3.

3.4.6 Endurance. Requirement for endurance testing shall be as specified in the contract (see 6.2). Guns shall be capable of withstanding the firing of 25,000 or 30,000 rounds, (as specified in the applicable specification sheet), of Government standard 20mm, M55A2 cartridges, with no misfires exceeding 0.5 percent of each series attributable to the gun, and not more than a total of three malfunctions for the entire test. In addition, the gun shall meet the performance requirements of Table I as specified in the applicable specification sheet. The schedule for maintenance and replacement parts during the endurance firing shall be in accordance with the applicable specification sheet. Testing shall be as specified in 4.5.3.4.

3.5 Deleted.

3.6 Interchangeability. Requirement for interchangeability testing shall be as specified in the contract (see 6.2). Unless otherwise specified on the drawings, all parts shall be interchangeable. Testing shall be as specified in 4.5.3.5.

3.7 Bolts, screws and fasteners. Bolts and screws shall be torqued, lock wired and secured to the requirements specified on applicable drawings. Threaded fasteners shall be torqued sufficiently to prevent relative movement between mating components.

3.8 Lubrication. Parts and assemblies shall be lubricated with material specified on the applicable drawings. The amount of lubrication used shall be such that the electrical contacts and circuits will not be affected.

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3.9 Marking. Guns and parts shall be clearly marked in accordance with the applicable drawings and MIL-W-13855. Each gun shall be identified by serial numbers assigned, or approved, by the procuring activity (see 6.2).

3.10 Workmanship. Workmanship shall be in accordance with MIL-W-13855.

#### 4. VERIFICATION.

4.1 General provisions. 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 Terms and definitions. Quality assurance terms and definitions used herein are in accordance with ANSI/ASQC A8402.

4.3 Classification of inspection. The inspection requirements specified herein are classified as follows:

- a. First article inspection (see 4.4).
- b. Conformance inspection (see 4.5).

4.4 First article inspection. The first article (initial production unit(s)) shall be submitted for inspection in accordance with the contract (see 6.2). The first article shall be representative of the production processes to be used during quantity production. The first article shall be subjected to the conformance inspection specified herein and in the applicable specification sheet, and such other inspections as necessary to determine that all requirements of the contract have been met.

#### 4.5 Conformance inspection.

4.5.1 Inspection lot. Unless otherwise specified (see 6.1) the formation, size, and presentation of inspection lots shall be in accordance with ANSI/ASQC Z1.4 and MIL-W-13855. Guns shall be assembled from component parts that have met all inspection requirements specified herein. Endurance test lot size shall be as specified in 4.5.3.4.1.

#### 4.5.2 Examination.



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4.5.2.1 Component parts and concurrent repair parts. Examination of component parts and concurrent repair parts shall be as specified in the contract (see 6.2). The contractor's examination of these parts shall be prior to assembly into the end item or acceptance as repair parts.

4.5.2.2 Guns. Visually and manually examine each gun to determine conformance with the following requirements. Each step in the examination shall include a visual examination for proper cleaning and presence of the specified protective coating and to determine the general quality, completeness of manufacture, assembly, clarity and legibility of markings and workmanship. The examination provisions shall be applied at the earliest practical point in manufacture at which it is feasible to inspect for acceptance without risk of change in the characteristic by subsequent operations. Reinspections of these characteristics on the completed product is not required provided assurance exists that the characteristic has not been changed, degraded or damaged by subsequent manufacturing, assembly or handling and that adequate inspection records are maintained. Guns failing to meet the requirements shall be rejected.

<u>Part or assembly</u>	<u>Reference paragraph</u>
Materials, construction and design	3.3
Barrels	3.3.1, 3.3.1.1
Barrel clamps	3.3.2
Breech bolt assemblies	3.3.3
Cams, locking and unlocking	3.3.4
Clearing sector assembly	3.3.5 (except M197 & M197E1)
End plate	3.3.6
Firing contact assembly	3.3.7
Guide bar	3.3.8
Housing assembly	3.3.9
Housing cover assembly	3.3.10 (except M197 & M197E1)
Indexing pin assembly	3.3.11
Recoil adapter	3.3.12
Bearing retainer assembly or Automatic gun recoil mechanism	3.3.13
Rotor assembly	3.3.14

4.5.2.2.1 Markings. All markings (see 3.9) required by final assembly drawings shall be visually examined for clarity and legibility. The identification plate shall be examined for compliance with the applicable drawings, secure assembly, and serial number.

4.5.2.2.2 Lubrication. The housing cam walls, rotor tracks rear surface of front locking wells, unlocking cams, gear

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teeth, and the bolt shaft assemblies shall be examined to assure that lubricant (see 3.8) has been applied as required by final assembly drawing.

4.5.2.2.3 Torque of housing bolts. The bolts holding the two housing halves together shall be manually examined for torque specified on the applicable drawing using a torque wrench (see 3.7).

4.5.2.3 Historical records. When specified (see 6.2), upon completion of all examinations and tests, the required data shall be recorded on DD Form 829, Historical Record for Aeronautical Equipment and DD form 829-1, Historical Record - Technical Instructions Compliance Record, and shall be examined to assure that all pertinent data has been entered. One each of the completed forms shall be provided with each gun assembly.

4.5.3 Testing.

4.5.3.1 Failure data. Unless otherwise specified herein, all tests shall be conducted on a complete gun. If test requirements cited herein are not met, acceptance of the gun shall be deferred and the contractor shall accomplish as applicable, the following actions:

a. Conduct a failure analysis study performing a dimensional physical and visual examination of the components which are suspected to be the cause of failure or malfunction.

b. Evaluate and correct the applicable production processes and procedures to prevent recurrence of the same defect(s) in future production.

c. Examine guns, partially assembled guns, and components (including components and subassemblies at in-process or final assembly) to insure that material containing the same defect is purged from the inventory and is not presented to the Government for acceptance.

d. Submit the results of the failure analysis and the corrective actions taken to the Government for review and approval prior to submitting a reconditioned lot or reconditioned gun for retest.

4.5.3.2 Firing pin protrusion and continuity and head space testing. Each gun shall be tested for firing pin protrusion and continuity (see 3.4.1) and head space (see 3.4.2) using the test methods specified in 4.6.1 and 4.6.2. Failure of any gun to pass these requirements shall be cause for rejection.

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4.5.3.3 High-pressure resistance, functioning, targeting and accuracy testing. Each gun shall be tested for high-pressure resistance (see 3.4.3), functioning (see 3.4.4), targeting and accuracy (see 3.4.5) using the test methods specified in 4.6.3, 4.6.4 and 4.6.5 respectively. Guns failing to meet these requirements shall be cause for rejection.

4.5.3.4 Endurance testing (see 6.2).

4.5.3.4.1 Lot size. The initial endurance test lot size shall consist of the initial month's production; subsequent endurance test lots shall consist of 100 guns. The initial test gun shall be taken from the first month's production. When five successive lots meet the requirements, the endurance test lot size shall be increased to 200 guns.

4.5.3.4.2 Procedure. One gun selected at random from each endurance lot shall be tested for endurance (see 3.4.6 and applicable specification sheet) using the test specified in 4.6.6. If the endurance test requirements are not met, the represented lot shall be rejected.

4.5.3.5 Interchangeability testing (see 6.2).

4.5.3.5.1 Intra-plant.

4.5.3.5.1.1 Guns. A sample of three guns, selected at random from the first ten guns of each month's production shall be tested for interchangeability (see 3.6 and applicable specification sheet) using the test method specified in 4.6.7.1.1. Guns taken for interchangeability testing shall have met all other inspection requirements specified herein and in the applicable specification sheet. The three guns shall be inspected for compliance with firing pin protrusion, head space, functioning, and targeting and accuracy requirements after interchange of parts using the test methods specified in 4.6.1, 4.6.2, 4.6.4 and 4.6.5 respectively. Failure of interchangeability shall be cause for rejection of the represented lot. Sample size and test methods shall be the same for retest.

4.5.3.5.1.2 Concurrent repair parts. At least two parts from each inspection lot shall be subjected to the test method specified in 4.6.7.1.2. Failure of any part to meet the requirements shall be cause for rejection of the represented lot. Parts subject to reconditioning and further test shall become a reconditioned lot and a sample of double the number of parts used in the original test shall be tested from each reconditioned lot using the test method specified in 4.6.7.1.2.

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4.5.3.5.2 Inter-plant. When guns with concurrent repair parts are manufactured by more than one contractor, each contractor shall forward monthly one gun and a sufficient quantity of repair parts for the inter-plant interchangeability test specified in 4.6.7.2 (see 6.2). The contractor shall be informed of test results, which indicate failure of the gun or parts to meet prescribed requirements.

4.5.3.6 Certification. Unless otherwise specified, the contractor shall furnish the Government representative with certified statements that each inspection lot of guns, parts and assemblies shall conform to applicable drawings, specifications of the materials and processes specified on the final assembly drawing and applicable specification sheet.

4.5.3.7 Component parts and concurrent repair parts testing. Raw material testing, part testing, and certification shall be as specified in the contract (see 6.2). This will include chemical analysis, physical tests of materials, tests of protective finishes, heat treatment, bonding, and function of parts as applicable. These tests shall be accomplished prior to assembly of parts into the end item.

4.5.4 Packaging examination and testing. Unless otherwise specified (see 6.2) the packaging examination and testing shall be in accordance with MIL-P-14232.

4.5.5 Inspection conditions.

4.5.5.1 Inspection equipment. Unless otherwise specified in the procurement documents (see 6.2), responsibilities for acquisition, maintenance and disposition of measuring and testing equipment prescribed on lists contained on the Index of Inspection Equipment Lists specified on the applicable specification sheet and for all other inspection equipment required by applicable specifications, shall be in accordance with commercial practices.

4.5.5.2 Ammunition feeding. The contractor shall be responsible for feeding and driving the gun using Government standard auxiliary equipment furnished on the contract (see 6.2) or government approved, contractor furnished equipment.

4.5.5.3 Mounts. Unless otherwise specified, all firing tests shall be accomplished with the gun affixed to a Government approved mount (see 6.2). The mount shall have a rigidity of approximately 50,000 pounds per inch deflection. The design of the mount shall be such that the two recoil adapters carry all the longitudinal load. The rear socket mounting of the end plate or drive unit shall provide the rear mounting surface for the gun

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on a plane perpendicular to the centerline of the gun, and allow freedom of movement in a longitudinal direction. Torsional deflection of the mount shall not affect targeting and accuracy.

4.5.5.4 Power supply and control equipment. The power supply and control equipment (see 6.2) shall be capable of allowed maximum torque and capable of controlling the steady state rate of fire within plus or minus one percent. In addition, a braking device shall be provided to stop the gun drive when power is removed. The drive used in the gun test shall be calibrated with adjustable power input versus torque output to assure that cyclic rate requirements are met or a calibrated torque transducer may be used to measure torque. Drives or torque transducer shall be recalibrated prior to each day's testing or as required. Instrumentation shall record the readings necessary to establish that performance requirements are met for each gun tested. Additional equipment shall be as specified on the applicable specification sheet.

4.6 Methods of inspection.

4.6.1 Firing pin protrusion and continuity test. Guns shall be tested using the inspection equipment in accordance with Drawing F7273689 or Government approved test equipment. The spring loaded plug shall be placed in the gun and fed into each barrel by manually rotating the gun until the barrel containing the plug is in the firing position with the breech bolt assembly locked. The low test voltage shall then be applied across the contact pin of the firing contact assembly and the gun housing. The minimum firing pin protrusion requirements and electrical continuity requirement has been met if electrical continuity is indicated on the test equipment.

4.6.2 Headspace test. Guns shall be tested using the inspection equipment specified on Drawing F7273689 or Government approved test equipment. The spring loaded plug shall be placed in the gun into each barrel by manually rotating the gun until the barrel containing the plug is in the firing position with the breech bolt assembly locked. The thickness gage shall then be inserted through the housing assembly to check the distance between the plug head and sleeve. The headspace is within the requirements if the minimum thickness end of the gage enters and the maximum thickness end of the gage does not enter between the plug head and sleeve.

4.6.3 High-pressure resistance test. Guns shall be tested by firing one high-pressure test cartridge in each barrel after the guns have been given the clearing test as specified in 4.6.4.1. This proof firing shall be accomplished with the gun held in a mount in accordance with 4.5.5.3. Barrels and bolts to

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be assembled into production guns shall be proof fired as part of the completed guns, inspected and proof marked in accordance with applicable drawings. Barrels and breech bolt assemblies to be used as repair parts shall be proof firing independently of production guns and inspected and proof marked in accordance with applicable drawings. After proof firing, the guns shall be examined for cracks, deformation or other evidence of damage. Cartridge cases shall be visually examined for bulges, splits, rings, and other defects caused by defective barrels. All parts, shall be reassembled to the guns from which they were removed and proof marked in accordance with the applicable drawings.

4.6.4 Functioning test. Unless otherwise specified, guns shall be tested held in mounts in accordance with 4.5.5.3 and using the power supply and control equipment specified in 4.5.5.4 and applicable specification sheet.

4.6.4.1 Clearing test. Guns shall be function checked for clearing action (see 3.4.4.1) using a 12 round belt of dummy cartridges prior to the high-pressure resistance test (4.6.3). The clearing action shall be checked by manually rotating the gun to load five rounds in the gun, manually moving the clearing cam sector assembly into clearing position, and clear the remainder of the belt by manually rotating the gun. During clearing, the clearing cam sector assembly shall be fully depressed to prevent damage to the bolt shaft assemblies.

4.6.4.2 Function firing test. Guns shall be tested for function firing using one six round belt for warm-up and to test for proper functioning. A 75 or 100 round belt shall be fired to test for acceleration, stopping time, cyclic rate of fire, torque, targeting and accuracy, and functioning to determine compliance with requirements of 3.4.5, 3.4.4, and Table I of the applicable specification sheet. At the completion of firing, the gun shall be checked to assure that all breech bolt assemblies are in the cleared position.

4.6.4.3 Function firing test procedure. The function firing test procedure shall be as specified on the applicable specification sheet.

4.6.5 Targeting and accuracy test.

4.6.5.1 Procedure. Guns shall be tested with the gun held in a mount in accordance with 4.5.5.3 and using a boresight in accordance with Drawing C7797956, or Government approved test equipment. The barrels shall be boresighted by inserting the boresight in the muzzle end of the barrel when the gun is in each of the three or six indexed positions. The boresight point of the gun is then determined by the geometrical center of three

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boresight points. The boresight shall then be removed and a 75 or 100 round belt of target practice cartridges fired from the gun. The target shall be checked to determine whether the targeting and accuracy requirements have been met.

4.6.5.2 Range. Guns may be fired at a range of 1,000 to 3,000 inches provided that suitable correlations, approved by the contracting officer, are made. In addition, if the contractor's range facilities permit, this test shall be fired as part of the functioning test (see 4.6.4).

4.6.6 Endurance test.

4.6.6.1 Mount. Unless otherwise specified, guns shall be tested with the gun held in a Government approved mount in accordance with 4.5.5.3.

4.6.6.2 Firing. All guns shall be fired in a series of approximately 1000 rounds using five (5) burst of  $200 \pm 10$  rounds each; except the M197 and M197E1 guns shall be fired in a series of approximately 500 rounds using five (5) bursts of  $100 \pm 5$  rounds each. The performance requirements of Table I, (as specified on the applicable specification sheet), shall be measured and recorded for the last burst using instrumentation in accordance with 4.5.5.4 and the applicable specification sheet.

4.6.6.3 Procedures.

4.6.6.3.1 Cooling. After each burst the gun shall be allowed to cool for approximately 35 seconds. After each five burst series the gun shall be cooled to within 25°F of room temperature (using cooling aids other than water).

4.6.6.3.2 Cleaning and lubrication. Cleaning and lubrication procedures will be implemented in accordance with the appropriate operational level Technical Manual (see 6.3) during the endurance test. At the end of each day's firing, the gun shall be cleaned and protected against corrosion.

4.6.6.3.3 Barrels. Barrels may be alternated with a spare set of barrels to expedite cooling. To preclude barrel rupture, additional barrel sets may be utilized, as needed, to limit erosion of any barrel in a set to 0.035 inch maximum.

4.6.6.3.4 Measurements and maintenance. After each 15,000 rounds fired the gun shall be disassembled as necessary for maintenance and to replace parts in accordance with the appropriate gun technical manual. Parts removed from the gun during inspection shall be replaced in original positions from which they are removed. Headspace, and firing pin protrusion, and (M197 and M197E1 guns

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only) recoil spring assembly preload, shall be measured and recorded at the start of the test, after each 15,000 rounds fired, and at the end of the test.

4.6.6.4 Parts replacement. No alteration or replacement of parts except as scheduled shall be made unless the parts are broken or worn to the extent that they cause malfunctions or impair or jeopardize the safe operation of the gun. A complete record shall be kept for each endurance test, showing all gun maintenance procedures, each malfunction, and all parts replaced, including the number of the gun rounds at which they occurred.

4.6.6.5 Disposition. Endurance tested guns and parts shall be disposed of as specified in the contract (see 6.2).

4.6.7 Interchangeability test.

4.6.7.1 Intra-plant.

4.6.7.1.1 Guns. Guns shall be tested by disassembly and reassembly of parts, using parts from a prearranged system. Interchangeability of parts shall be accomplished by dividing the parts of each gun into three groups of non-mating parts, and distributing the groups into three different trays until each tray contains parts for a complete gun. Groups of parts with the same part number are to be exchanged between guns as a set. Groups I, II and III of non-mating parts shall be as specified on the applicable specification sheet. Groups of parts from the first gun shall be taken in order and placed in trays 1 through 3; groups of parts from the second gun shall be taken in order and placed in trays 2, 3, and 1; groups of parts from the third gun shall be taken in order and placed in trays 3, 1, and 2. Common hardware such as screws, spring pins, etc., shall be placed in the same tray as their mating or associate part. New laminated shims may be used for reassembly of guns during the interchangeability test. Any common hardware or other expendable items, rendered unserviceable by disassembly shall be replaced without penalty to the interchangeability test. The guns shall be reassembled using only those parts which are in the same tray.

4.6.7.1.2 Concurrent repair parts. When required by contract (see 6.2), concurrent repair parts shall be tested for interchangeability by disassembling two guns previously tested in 4.6.7.1.1 and reassembling, using the concurrent repair parts. This test shall be performed independently of the interchangeability test required in 4.6.7.1.1 using accepted guns taken from current production.

4.6.7.2 Inter-plant.



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4.6.7.2.1 Guns. Guns subjected to the inter-plant interchangeability test shall be given a preliminary firing test of 12 cartridges, 20mm, Target Practice, M55A2 to assure proper operation before parts are interchanged. Parts shall be disassembled from the guns and identified as to manufacture. Disassembled parts shall be mixed and guns reassembled by random selection of parts. After assembly, the guns shall be tested for functioning, targeting and accuracy requirements using the tests specified in 4.6.4 and 4.6.5. Before guns are returned to the contractors, the original parts shall be reassembled to their respective weapons and given a functioning test using a belt of 50 cartridges, 20mm, Dummy, M51 series.

4.6.7.2.2 Repair parts. When required by contract (see 6.2), concurrently manufactured repair parts submitted for tests shall be assembled in the guns previously tested in 4.6.7.1.1 Guns shall be assembled using different combinations of parts to insure parts are interchangeable. After assembly, the guns shall be tested for functioning, targeting and accuracy requirements specified in 4.6.4 and 4.6.5.

## 5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or purchase order (see 6.2). When actual packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

## 6. NOTES

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

6.1 Intended use. The 20mm automatic gun is intended for use on fixed and rotary wing aircraft and for use on ground to air anti-aircraft weapon systems.

6.2 Acquisition requirements. Acquisition documents should specify the following:

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

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- b. Lists of drawings and specifications pertinent to the gun, showing applicable revision dates (see 2.1 and 3.1).
- c. Examination criteria for components (see 4.5.2.1 and 4.5.3.7).
- d. Index to lists of inspection gages and parts which are pertinent to the gun, showing applicable revision dates.
- e. Historical records, when required (see 4.5.2.3).
- f. Disposition of endurance tested guns and parts (see 4.6.6.5).
- g. Shipping instructions for first article, and pilot pack if different (see 3.2).
- h. Packaging examination and testing, if different (see 4.5.4).
- i. Requirements for pilot pack; preservation, packaging, packing, and marking; and repair parts will be as specified in the contract and in applicable specification sheets.
- j. List of acceptance inspection equipment to be furnished to the contractor (see 4.5.5.1) and responsibilities for other Government property to be furnished the contractor.
- k. Responsibilities for furnishing ammunition, links, feeders and drives or other equipment (see 4.5.5.2, 4.5.5.3 and 4.5.5.4).
- l. Shipping instructions for guns and parts when an interplant interchangeability test is required (see 4.5.3.5.2).
- m. Blocks of serial numbers (see 3.9).
- n. Disposition of Government furnished property.
- o. Inspection lots, if different (see 4.5.1).
- p. Requirement for, or waiver of, first article inspection (see 3.2 and 4.4).
- q. Requirement for, or waiver of, endurance testing (see 3.4.6 and 4.5.3.4).
- r. Requirement for, or waiver of, interchangeability testing (see 3.6 and 4.5.3.5).

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s. DD Form 1423 to include data item for submission of reports of examination and testing (e.g. function firing, targeting and accuracy, endurance and interchangeability, etc.)

t. Unless otherwise specified (see 6.2 k), the contract should specify the application of ANSI/NCSL Z540.1, and MIL-I-45607.

u. When warranted, the contract should specify the application of ANSI/ASQC 9001 or ANSI/ASQC 9002, as appropriate.

6.3 Technical Manuals. Military technical manuals are listed for the purpose of providing appropriate maintenance and parts replacement schedules for the weapons. Information contained in the latest versions of these manuals should be used for servicing the weapons during and after endurance testing.

T.O 11W1-12-4-32	Intermediate Maintenance Instructions, M61A1 and M61 20mm Automatic Guns
NAVAIR 11-95M197-1	Maintenance Instructions with Illustrated Parts Breakdown Organizational and Depot Levels M197 20mm Automatic Gun

6.4 Subject term (key word) listing.

multi-barrel  
Gatling  
air defense  
aircraft armament

6.5 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:

Army - AR  
Navy - NW  
Air Force - 84

Preparing activity:

Army - AR  
(Project: 1005-0844)

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## 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.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced documents(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-DTL-45500E	2. DOCUMENT DATE (YYMMDD) 18 December 1996
3. DOCUMENT TITLE  Gun, Automatic, 20MM, General Specification for		
4. NATURE OF CHANGE ( <i>Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.</i> )		
5. REASON FOR RECOMMENDATION		
6. SUBMITTER		
a. NAME ( <i>Last, First, Middle Initial</i> )	b. ORGANIZATION	
c. ADDRESS ( <i>Include Zip Code</i> )	d. TELEPHONE ( <i>Include Area Code</i> ) (1) Commercial (2) AUTOVON ( <i>if applicable</i> )	7. DATE SUBMITTED  (YYMMDD)
8. PREPARING ACTIVITY		
a. NAME  U. S. Army ARDEC	b. TELEPHONE ( <i>Include Area Code</i> ) (1) Commercial: <b>(201) 724-6671 DSN 880-6671</b>	
c. ADDRESS ( <i>Include Zip Code</i> )  ATTN: AMSTA-AR-EDE-S, B-12 Picatinny Arsenal, NJ 07806-5000	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 DSN 289-2340	