

MIL-G-85536(AS)
24 May 1984

MILITARY SPECIFICATION

GUN SYSTEM, 25-MM, AIRCRAFT A/A49E-10

This specification is approved for use by Naval Air Systems Command, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification establishes the requirements for the manufacture, test and acceptance of the 25-mm, Aircraft A/A49E-10 Gun System, referred to herein as the gun system.

2. APPLICABLE DOCUMENTS*

2.1 Government documents

2.1.1 Specifications, standards, and handbooks. Unless otherwise specified, the following specifications and standards of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation form a part of this specification to the extent specified herein,

SPECIFICATIONS

MILITARY

MIL-I-8500	Interchangeability and Replaceability of Component Parts for Aerospace Vehicles
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STANDARDS

MILITARY

MIL-STD-129	Marking for Shipment and Storage
MIL-STD-704	Aircraft Electric Power Characteristics
MIL-STD-45662	Calibration Systems Requirements

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commanding Officer, Naval Air Engineering Center, Engineering Specifications and Standards Department (ESSD), Code 93, Lakehurst, NJ 08733, by using the self addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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2. 1.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this specification to the extent specified herein.

DRAWINGS

Naval Air Systems Command (FSCM No 30003)

1395AS100	Gun System, 25-mm, Aircraft A/A49E-10
1395AS101	Gun Subsystem, 25-mm, Aircraft GAK-14/A49E-10)
1395AS102	Ammunition Handling Subsystem, 25-mm, Aircraft GFK-11/A49E-10
1395AS103	Gun Assembly, Automatic, 25-mm
1395AS104	Drive Unit, Pneumatic
1395AS105	Transfer Unit, Ammunition, 25-mm
1395AS107	Turnaround Unit, Ammunition, 25-mm
1395AS108	Conveyor, Ammunition, Crossover
1395AS110	Control Unit, Electronic
1395AS168	Universal Joint
1395AS232	Interface Unit
1395AS298	Recoil Mechanism, 25-mm Gun
1395AS399	Chute, Ammunition

(Copies of specifications, standards, drawings, and publications required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

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2.2 Other publications. The following document(s) form a part of this specification to the extent specified herein.

INDUSTRY DRAWINGS

General Electric Company (FSCM No 05606)

799E100

Stand, Assembly, Fire Test, AV-8B

(Application for copies should be addressed to the General Electric Company, Armament and Electrical Systems Department, Lakeside Avenue, Burlington, VT 05402a)

McDonnell Aircraft Company (FSCM No 76301)

75A732501

Integrated 25-mm Gun System, Installation

75A732506

Assembly - Structural, 25-mm Gun Pak

75A732707

Assembly - Structural, 25-mm Ammo Pak

(Application for copies should be addressed to the McDonnell Douglas Corporation, McDonnell Aircraft Company, P.O. Box 516, St. Louis, MO 63166.)

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

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3. REQUIREMENTS

3.1 Item description. The gun system shall be a double-ended percussion fired 25-millimeter (mm) automatic gun system intended for mounting on the AV-8B aircraft. The gun system shall consist of a gun pak mounted on the port side of the fuselage, an ammunition storage and handling pak mounted on the starboard side of the fuselage, and an ammunition crossover unit with chuting and conveyor to transfer ammunition from the ammunition pak to the gun transfer unit in the gun pak. The gun system shall be remotely fired by the pilot cockpit controls. The drive power for the gun system shall utilize aircraft engine bleed air.

3.1.1 Major component list. The major components of the gun system (see Drawing 1395AS100) shall be as specified in Table I. The installation hardware shall be as specified on Drawing 75A732501.

TABLE I. Major component list.

Component	Drawing
Gun Subsystem, 25-mm, Aircraft, GAK-14/A49E-10	1395AS101
Gun Assembly	1395AS103
Transfer Unit	1395AS105
Pneumatic Drive Unit	1395AS104
Recoil Mechanism	1395AS298
25-mm Gun Pak Assembly-Structural	75A732506
Ammunition Handling Subsystem, 25-mm, Aircraft, GFK-11/49E-10	1395AS102
Interface Unit	1395AS232
Turnaround Unit	1395AS107
Ammunition Conveyor	1395AS108
Electronic Control Unit	1395AS110
Ammunition Chute	1395AS399
25-mm Ammo Pak Assembly - Structural	75A732707

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3.1.2 Government-furnished property list. When specified in the contract or purchase order, the following Government-furnished property (GFP) will be supplied to the contractor for gun system testing:

- a. PGU-23/U TP Ammunition, Cartridge, 25-mm, Target Practice (TP)
- b. M794 Dummy Ammunition
- c. Other materials, as required, that the acquisition would be more expedient if the materials were furnished by the Government.

3.1.3 Input electrical power. The gun system shall maintain the performance specified herein when supplied with d-c electrical power in accordance with MIL-STD-704 (28 volts nominal). The current shall be not greater than 10 amperes (A).

3.1.4 Input pneumatic power. The gun system shall maintain the performance specified herein when supplied with air at the inlet to the regulator having the following air conditions:

- a. Pressure: 60 psig to 255 psig
- b. Temperature: 400°F to 700°F
- c. Flow rate: Not greater than 7.7 cubic feet per second

3.2 Characteristics.

3.2.1 Performance.

3.2.1.1 Dispersion and accuracy. When installed on the ground firing test stand, Drawing 799E100, the gun system shall place not less than 80 percent of all fired projectiles in a 178-mm (700-inch) diameter circle at a range of 25.4 meters (m) (1,000 inches) for dispersion. The center of impact shall fall within a 7-mil diameter circle the center of which is located 4.75 mils to the left and 4.75 mils down from the true boresight point of the gun (See 6.3.1).

3.2.1.2 Firing rates. The steady-state firing rate (see 6.3.6) shall be within the limits of 3,400 to 4,000 rounds per minute. The gun system shall fire not less than 45 rounds in 1.0 second after application of the trigger ON signal.

3.2.1.3 Clearing. The gun system shall automatically clear after each firing burst. The cleared gun shall have not less than one spent case between the gun sear point and a live round following firing of a burst.

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3.2.1.4 Burst firing schedule. The gun system shall be capable of firing any number of bursts of any length including a single burst fire-out without degrading performance. Unless otherwise specified herein, the gun system normal burst firing schedule shall consist of continuous bursts of at least one second, with five minutes of static ambient cooling between burst cycles until all the ammunition is fired.

3.2.1.5 Gun system signals. The gun system shall provide a rounds remaining signal and a gun unclear signal to appropriate cockpit indicators:

- a. Rounds count. A 22.0 to 29.0 Vdc, 500 mA maximum, 7 ms + 1 ms pulse shall be provided for each round fired. The rounds remaining signal shall be accurate to + 20 rounds per complement when fired in accordance with the schedule specified in 3.2.1.4.
- b. Gun not clear. A 22.0 to 29.0 Vdc, 500 mA maximum signal shall be provided when the gun is not clear.

3.2.1.6 Torque.

3.2.1.6.1 Breakaway torque. The gun system breakaway torque (less ammunition) shall be not greater than 85 inch-pounds.

3.2.1.6.2 Running torque. The average system running torque shall be not greater than the limits specified in Figure 1.

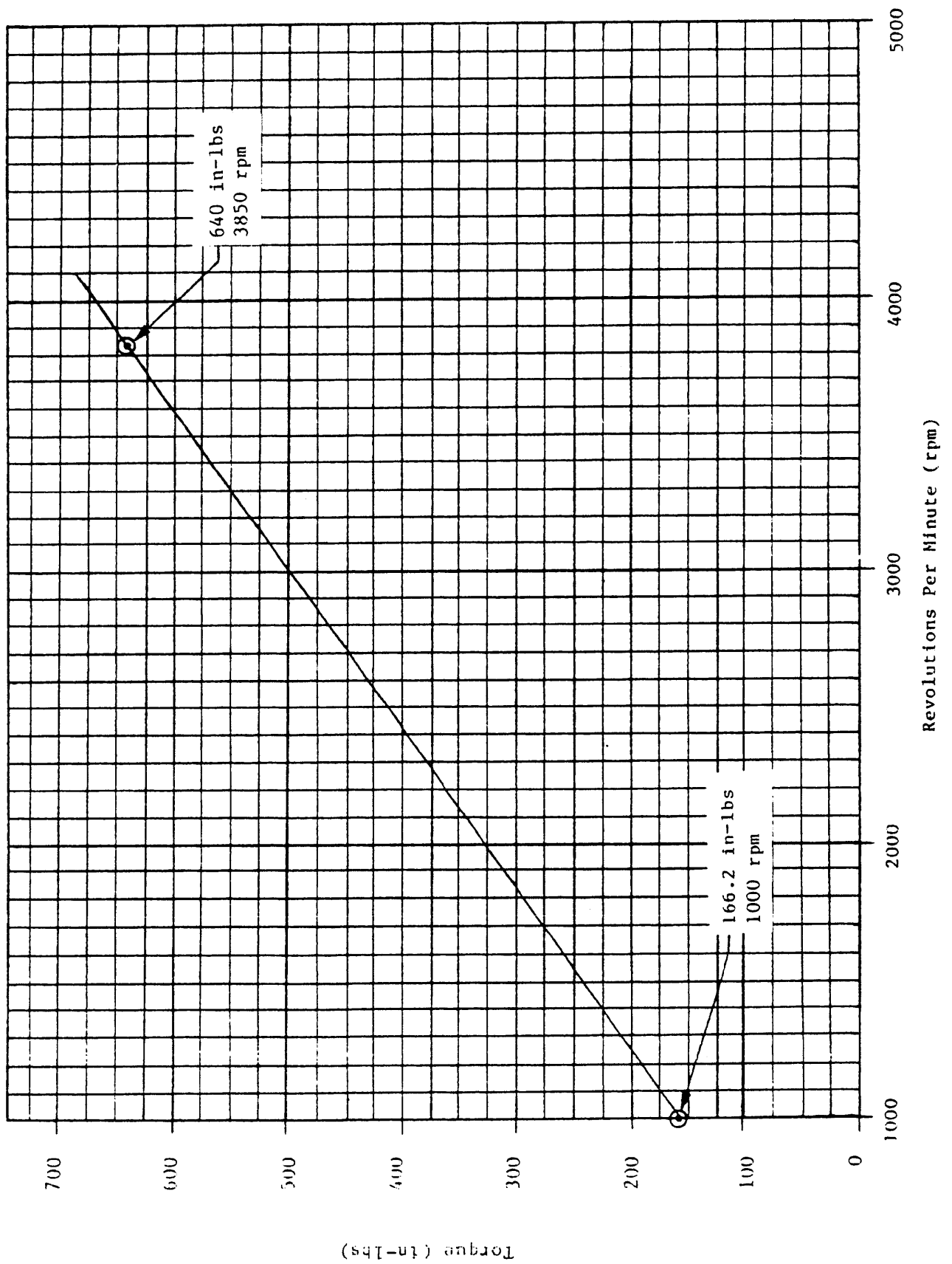
3.2.2 Weight. The gun system weight in the configuration defined by Drawing 1395AS100, less ammunition, shall be not greater than the weights specified in Table II.

TABLE II. Gun system weight.

Component	Drawing	Weight
Gun System (less ammunition)	1395AS100	950.0
25-mm Gun Pak Structure Assembly	75A732506	188.0
25-mm Ammo Pak Structure Assembly	75A732707	117.0

3.2.3 Reliability. When installed on the ground firing test stand, the gun system shall have a minimum reliability, at a confidence level of 90 percent, of 0.98 probability of firing a one-second burst of ammunition at any given firing sequence within the limitations specified herein without a stoppage (see 6.3.5).

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3.2.4 Durability. The gun system shall perform within the limitations specified herein with a scheduled parts replacement at intervals of 18,000 fired rounds. Scheduled maintenance shall be performed as specified in a procuring activity approved maintenance manual (see 6.2.2).

3.3 Design and construction. The gun system shall have the following design and construction characteristics.

3.3.1 Production drawings. The gun system shall be fabricated and assembled in accordance with the drawings, parts lists, and other documents listed on Drawing 1395AS100.

3.3.2 Standards of manufacture. The gun system shall be manufactured in accordance with the standards of this specification and the standards specified on the drawings listed in Table I.

3.3.3 Interchangeability. The components of the gun system shall be completely interchangeable without field adjustment. All parts having the same part numbers shall be completely interchangeable, in accordance with MIL-I-8500. The gun and ammunition Paks, Drawings 75A732506. and 75A732707, shall be interchangeable as assemblies with the aircraft interface.

3.4 First article. When specified, a sample shall be subjected to first article inspection (see 4.3 and 6.5).

3.4.1 First article sample. When specified in the contract or purchase order, the contractor shall furnish a first article sample of one gun system for first article inspection and approval (see 6.2.1c). The first article shall be manufactured using the same methods, materials, processes and procedures proposed for production. Any production prior to approval of the first article shall be at the risk of the contractor.

3.5 Workmanship. Workmanship and finish shall be in accordance with the highest grade practice used in manufacturing military weapons. Finished items and parts shall not exhibit poor material and processing such as seams, laps, laminations, cracks, visible steps, sharp edges, nicks, scratches, burrs, deformations, and missing operations which may affect serviceability, functioning, operation, or safety. Fins and other extraneous metal shall be removed from cast or forged parts. When doubt exists concerning acceptability of the contractor's workmanship, the questionable physical item will be submitted to the responsible technical agency for decision.

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4. QUALITY ASSURANCE PROVISIONS

4.1 General. This section establishes the methods used to verify that the gun system as a fabricated and assembled unit, complies with the requirements of this specification.

4.1.1 Responsibility for inspections. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements 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 procuring activity. The procuring activity 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.

4.1.2 Failure criteria. If a failure (see 6.3.4) occurs during the tests of 4.2.2, 4.2.3, and 4.3 specified herein, the following action shall be taken by the contractor:

- a. A failure report shall be prepared (see 6.2.2)
- b. A failure investigation shall be performed
- c. The cause of failure shall be determined
- d. Corrective action shall be recommended.

4.1.3 Test conditions and equipment. All firing tests shall be performed with the gun system affixed to the test stand conforming to Drawing 799E100. The contractor shall furnish the applicable measuring devices and instrumentation to measure and record test data. Calibration of the test equipment shall be in accordance with MIL-STD-45662. The contractor shall provide all necessary supplies and services except GFP to accomplish the testing specified herein. Unless otherwise specified in the contract or purchase order, all gun system test firing shall be with PGU-23/U ammunition (see 3.1.2). Unless otherwise specified herein, all tests shall be performed under environmental conditions existing at the test site.

4.1.4 Test plan. When specified in the contract or purchase order, a contractor proposed test plan and test procedures shall specify methods to be used for acceptance of the gun system (see 6.2.1b). Test plan and procedures shall be subjected to review and acceptance by the procuring activity (see 6.2.2).

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

- a. First article inspection (see 4.3)
- b. Quality conformance inspection (see 4.2)

4.1.6 First article inspection report. After completion of the first article inspection, the contractor shall prepare and make available a test report for procuring activity acceptance (see 6.2.2).

4.2 Quality conformance inspection. Each production gun system shall be subjected to the quality conformance inspection in Table 111.

TABLE III. Quality conformance inspection.

Examination or test	Requirement paragraph	Examination or test	First article	Quality conformance
Major component list	3.1.1	4.2.1(a)	x	x
Input electrical power	3.1.3	4.2.3.1	x	x
Input pneumatic power	3.1.4	4.2.3.2	x	x
Dispersion and accuracy	3.2.1.1	4.2.3.3	x	x
Firing rates	3.2.1.2	4.2.3.4	x	x
Clearing	3.2.1.3	4.2.3.5	x	x
Burst firing schedule	3.2.1.4	4.2.3	x	x
Gun system signals	3.2.1.5	4.2.3.6	x	x
Breakaway torque	3.2.1.6.1	4.2.3.7.1	x	x
Running torque	3.2.1.6.2	4.2.3.7.2	x	x
Weight	3.2.2	4.2.2	x	x
Reliability	3.2.3	4.3.2	x	
Durability	3.2.4	4.3.1	x	
Production drawings	3.3.1	4.2.1(b)	x	x
Standards of manufacture	3.3.2	4.2.1(b)	x	x
Interchangeability	3.3*3	4.4	x	x
Workmanship	3.5	4.2.1(c)	x	x
Packaging	5	4.5	x	x

4.2.1 Visual examination. Each production gun system shall be visually examined to assure:

- a. The major components identified in 3.1.1 were previously accepted and were not damaged during assembly.
- b. The system is assembled in accordance with the drawings, parts lists and other documents listed on Drawing 1395AS100 as specified in 3.3.1 and 3.3.2.
- c. Workmanship is in accordance with the requirements of 3.5.

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4.2.2 Weight. Each gun system shall be weighed to assure conformance to 3.2.2.

4.2.3 Performance. Each gun system shall be mounted as specified in 4.1.3 and loaded with 125 rounds of PGU-23/U TP ammunition and 175 rounds of M794 dummy ammunition. Two continuous bursts of at least one second duration shall be fired (see 3.2.1.4). One burst shall be fired at the low pressure limit (60 + 10 psig) and one burst at the high pressure limit (255 -25 psig). The inlet air temperature shall be not less than 360°F. Data shall be recorded during the two bursts to verify the following requirements specified in 4.2.3.1 through 4.2.3.6.

4.2.3.1 Input electrical power. The input electrical power specified in 3.1.3 shall be measured and recorded. The current shall be not greater than 10A.

4.2.3.2 Input pneumatic power. The input pneumatic power specified in 3.1.4 shall be measured and recorded. The airflow shall be not greater than 7.7 cubic feet per second.

4.2.3.3 Dispersion and accuracy. The dispersion and accuracy requirements of 3.2.1.1 shall be verified by firing two one-second bursts of TP ammunition on a target that is 25.4 meters from the muzzle. A separate target shall be taken for each burst.

4.2.3.4 Firing rate. The firing rate requirements of 3.2.1.2 shall be verified during firing. The average steady-state firing rate shall be measured and recorded during the last 30 rounds fired in each burst. The requirement for firing 45 rounds in the first second shall be verified and recorded from trigger-on to the end of the first second of each burst. The first second is measured from trigger actuation.

4.2.3.5 Clearing. The clearing requirement of 3.2.1.3 shall be verified during all firing tests. Visual inspection shall be utilized to determine if the clearing cycle is functioning as specified.

4.2.3.6 Gun system signals. The gun system signal requirements of 3.2.1.5 shall be verified as follows:

- a. The 7 ms + 1 ms pulse shall be recorded during each burst. The indicated rounds remaining in the system shall be within + 20 rounds of the actual remaining rounds in the system.
- b. The gun-not-clear signal shall be recorded.

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4.2.3.7 Torque.

4.2.3.7.1 Breakaway torque. The breakaway torque shall be measured with a torque wrench manually applied to the gun at the auxiliary drive shaft in the forward firing direction. The torque shall be measured and recorded in each of the five timed gun positions to verify the requirements of 3.2.1.6.1.

4.2.3.7.2 Running torque. The running torque requirement of 3.2.1.6.2 shall be measured on the drive shaft (Drawing 1395AS168) and recorded during the firing of the last 30 rounds in each burst.

4.2.4 Final examination. After completion of all testing and prior to preservation and packaging, each gun system shall have a visual examination for cleanliness, completeness of manufacture and workmanship.

4.3 First article inspection. Prior to subjecting the first article sample to first article inspection, the sample shall successfully complete the quality conformance inspection of 4.2 (see Table III). The first article shall consist of one unit.

4.3.1 Durability test. The durability requirement of 3.2.4 shall be verified by subjecting a gun system to an 18,000 round fire test. Only scheduled maintenance shall be performed during the test. The test shall be as follows:

- a. During the firing of each complement of ammunition (300 rounds) at least one target shall be used to verify accuracy and dispersion.
- b. Each burst shall be not less than one second except for the fire-out burst.
- c. Performance data shall be monitored and recorded for each burst.
- d. Inlet air pressure shall be varied from burst to burst within each complement.
- e. Not less than three 300-round complements shall be fired in continuous bursts.
- f. The 18,000 rounds accumulated shall include the rounds fired during the quality conformance inspection of 4.2.

4.3.2 Reliability. The reliability requirement of 3.2.3 shall be verified by analysis of the data obtained in the durability test.

4.4 Interchangeability. The requirements of 3.3.4 shall be considered verified by the normal random selection of components and parts that occurs during the assembly process. Selective assembly shall not be allowed except for the components of the gun pak and the ammunition pak.

4.5 Packaging. The requirements of Section S shall be verified by inspection.

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5. PACKAGING

5.1 Preservation, packaging, and packing. Unless otherwise specified in the contract or purchase order (see 6.2.1d), the gun system shall be preserved in a manner to provide protection from damage during transit to the first receiving activity.

5.2 Marking. The exterior of the shipping container shall be marked in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use. The gun system is intended to provide 25-mm fire power when installed on the AV-8B aircraft.

6.2 Ordering data.

6.2.1 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification
- b. Test plan and test procedure requirements, if required (see 4.1.4)
- c. First article sample requirements (see 3.4)
- d. Preservation, packaging, and packing requirements (see 5.1).

6.2.2 Data requirements. When this specification is used in an acquisition that incorporates a DD Form 1423, Contract Data Requirements List (CDRL), the data requirements identified below shall be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved CDRL incorporated into the contract. When the provisions of DAR 7-104.9 (n) (2) are invoked and the DD Form 1423 is not used, the data specified below shall be delivered by the contractor in accordance with the contract or purchase order requirements. Deliverable data required by this specification is cited in the following paragraphs.

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Paragraph no.	Data requirement title	Applicable DID no.	Options
a. 3 .2.4	Maintenance manual	DI-M-21368	-----
b. 4.1.2(a)	Failure summary report	UDI-R-21139	-----
c. 4.1.4	Reliability test plan	DI-R-7033	----- -
d. 4.1.4	Test procedures	UDI-T-21347	----- -
e. 4.1.6	First article inspection report	DI-T-4902	----- -

(Copies of DID's required by contractors in connection with specific acquisition functions should be obtained from the Naval publications and Forms Center or as directed by the contracting office.)

6.3 Definitions.

6.3.1 True boresight point. The geometric center of all the individual barrel boresight points generated when each of the barrels is in the indexed firing position. Each Individual barrel boresight point is determined by inserting a boresight tool in the muzzle of the barrel and marking a target at 25.4 m.

6.3.2 Contractor. The organization that contracts to manufacture the gun system.

6.3.3 Procuring activity. The organization that contracts to buy the gun system.

6.3.4 Failure. The inability of the gun system to meet the requirements as specified herein. Malfunction due to Government furnished equipment or human error will not be considered a failure.

6.3.5 Stoppage. Involuntary interruption of firing that cannot be resumed by the use of the remote gun system control.

6.3.6 Steady-state firing rate. Continuous firing of at least thirty rounds within the firing rate specified in 3.2.1.2.

6.4 Safety precautions. The loading, assembly, and handling of the explosives and the finished items covered by this specification involve hazardous operations and therefore require explosive safety precautions. Standard precautions for explosive-loaded items are contained in DoDD 4145.26M.

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6.5 First article. When a first article inspection is required, the Item will be tested and should be the first production item. The first article should consist of one unit. The contracting officer should include specific instructions in acquisition documents regarding arrangements for examinations, test, approval, and disposition of the first article.

6.6 Government-furnished property. The contracting officer should arrange to furnish the property listed in 3.1.2.

Preparing Activity
NAVY-AS

(Project 1005-N655)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

1. DOCUMENT NUMBER MIL-G-85536(AS)		2. DOCUMENT TITLE Gun System, 25MM, Aircraft A/A49E-10	
3a. NAME OF SUBMITTING ORGANIZATION		4. TYPE OF ORGANIZATION (Mark one)	
		<input type="checkbox"/> VENDOR <input type="checkbox"/> USER <input type="checkbox"/> MANUFACTURER <input type="checkbox"/> OTHER (Specify) _____	
b. ADDRESS (Street, City, State, ZIP Code)			
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)	