

INCH-POUND**MIL-DTL-32115A (OS)**May 31, 2007

SUPERSEDING

MIL-DTL-32115

w/Amendment 1

06 May 2004

DETAIL SPECIFICATION

CARTRIDGE, FIRE EXTINGUISHER, AIRCRAFT, CCU-147/A (WB53)

This specification is approved for use by the Naval Sea Systems Command, Department of the Navy, and is available for use by all Departments and agencies of the Department defense.

1. SCOPE

1.1 Scope. This specification covers the requirements for the manufacture and acceptance of the CCU-147/A Aircraft Fire Extinguisher Cartridge, referred to herein as the "cartridge".

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 of this specification. This section does not include documents cited in other sections of this specification or documents 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 specified requirements for documents referenced in sections 3, 4, or 5 of this specification, whether or not they are listed.

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 cited in the solicitation or contract.

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-1168

Ammunition Lot Numbering

Comments, suggestions, or questions on this document should be addressed to DEPARTMENT OF THE NAVY, Indian Head Division, NSWC, Code E143D, Document Control, 4072 North Jackson Road Suite 106, Indian Head, MD 20640-5115 OFFICIAL BUSINESS, or emailed to amanda.penn@navy.mil. Since contact information can change, you may want to verify the currency of this information using the ASSIST Online database at <http://assist.daps.dla.mil>.

AMSC N/A

FSC 1377

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(Copies of these documents are available online at <http://assist.daps.dla.mil/> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 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 or contract.

DRAWINGS

NAVAL AIR SYSTEMS COMMAND (CAGE Code 30003)

DL 3205AS265	CCU-147/A Cartridge, Aircraft Fire Extinguisher
298AS105	Closed Chamber, 1.22 Cubic Inch Assembly

(Application for copies should be addressed to the DEPARTMENT OF THE NAVY Indian Head Division, NSWC, Code E143H, Document Control, 4072 North Jackson Road Suite 106, Indian Head, MD 20640-5115 OFFICIAL BUSINESS.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM E 1742	Standard Practice for Radiographic Examination (DoD Adopted)
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(Copies of these documents are available online at <http://www.astm.org/> or from the American Society for Testing and Materials Customer Service, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

AEROSPACE INDUSTRIES ASSOCIATION (AIA)

NASM21044	Nut, Self-Locking, Hexagon, Regular Height, 250°F, 125 KSI FTU and 60 KSI FTU
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(Copies of this document may be purchased from the Aerospace Industries Association of America 1250 Eye Street, N.W., Suite 1200, Washington, DC, 20005-3924 or on-line at <http://www.techstreet.com/aiaagate.html>.)

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.

3. REQUIREMENTS

3.1 First article. When specified (see 6.3), a sample shall be subjected to first article inspection in accordance with 4.2. 1.

3.2 Primary components. Only one lot of primary components shall be used in each lot of fire extinguisher cartridges, although a primary component lot may be used in more than one fire extinguisher cartridge lot. The squib subassembly and output charge in the squib subassembly are considered primary components.

3.3 Cartridge production. The cartridges shall be manufactured in accordance with DL 3205AS265 and the documents listed thereon. Each squib subassembly shall meet the requirements of 3.3.1 through 3.3.1.3 and each cartridge shall meet the requirements of 3.3.2 through 3.3.2.5. Failure of any cartridge to meet the applicable requirements of 3.3 shall result in rejection of that unit.

3.3.1 Squib subassembly inspection.

3.3.1.1 Visual inspection. All squib subassemblies manufactured under contract shall be visually inspected and screened for defects as outlined in 4.3.1.

3.3.1.2 Leakage. Squib subassemblies shall not exhibit a leak rate in excess of 1×10^{-5} cubic centimeters per second (cm^3/sec) of air when tested in accordance with 4.3.2.

3.3.1.3 Radiographic inspection. Each squib subassembly shall be examined radiographicly in accordance with 4.3.3.1. Presence of the propellant, non-metal parts, no foreign hydrogenous materials and the proper assembly of pyrotechnic/non-metallic materials will be ensured. Any observable imperfections in assembly will be cause for rejection.

3.3.2 Cartridge inspection.

3.3.2.1 Visual inspection. All cartridges manufactured under contract shall be visually inspected and screened for defects as outlined in 4.3.1.

3.3.2.2 Radiographic inspection. Cartridges shall show proper assembly, presence of parts, and sealing when examined radiographicly in accordance with 4.3.3.2.

3.3.2.3 Bridgewire resistance. Cartridges shall exhibit a bridgewire resistance between 0.90 and 1.40 ohms when tested in accordance with 4.3.4.

3.3.2.4 Filter Continuity. The cartridges shall exhibit 55 milli volts peak to peak maximum when tested per 4.3.5.

3.3.2.5 Torque. The crimp interface between the housing and insulator shall withstand 18 inch-pounds of torque without rotation of the insulator when tested in accordance with 4.3.6.

3.4 Cartridge performance. Cartridges shall be capable of meeting all requirements of 3.4.4.

3.4.1 Vibration. There shall be no evidence of deformation or derangement of components. The cartridge shall not autoignite, shall be safe to handle, and shall meet the requirements of 3.3.2.2 and 3.4.4 following vibration testing of 4.3.7.

3.4.2 Temperature, humidity, altitude cycling (THA). The cartridges shall meet the requirements of 3.3.2.2 and 3.4.4 after being exposed to the THA cycle in accordance with 4.3.8.

3.4.3 Shock. The cartridges shall meet the requirements of 3.3.2.2 and 3.4.4 following shock testing of 4.3.9.

3.4.4 Ballistic requirements. Cartridges from each production and first article lot shall meet the requirements of 3.4.4.1 through 3.4.4.4 when subjected to the tests of 4.3.10.

3.4.4.1 Cartridge pressure. The cartridge shall provide:

- a. The lower limit for maximum pressure when conditioned at -65°F shall be 475 psig.
- b. The lower limit for maximum pressure when conditioned at +70°F shall be 600 psig.
- c. The lower limit for maximum pressure when conditioned at +200°F shall be 670 psig.

3.4.4.2 Pressure rise time.

- a. The maximum pressure lower limit of 3.4.4.1.a shall be attained within 6 milliseconds.
- b. The maximum pressure lower limit of 3.4.4.1.b and 3.4.4.1.c shall be attained within 4 milliseconds.

3.4.4.3 Ignition delay. The time from application of the firing current to first indication of pressure in the closed chamber shall be less than 25 milliseconds at all conditioning temperatures.**3.4.4.4 Misfire.** There shall be no misfires.**4. VERIFICATION****4.1 Classification of inspections.** The inspection requirements specified herein are classified as follows:

- a. First article inspection (see 4.2.1)
- b. Production inspection (see 4.2.2)
- c. Lot acceptance inspection (see 4.2.3)

4.2 Types of inspections.

4.2.1 First article inspection. Before entering into quantity production, an acceptable first article sample of 63 cartridges shall be prepared using the same procedures and methods proposed for the production lot. A first article sample acceptable for functional and environmental testing shall be defined as a sample which has met the applicable requirements of 3.2 through 3.4 of this specification. Sixty cartridges shall be expended in the tests listed in Table I, and three shall be retained for investigative purposes. The contractor shall deliver the cartridges to the activity designated by the contracting agency for tests. Any damage inflicted by the environmental treatments, which would adversely affect the performance of the item in service application shall cause rejection of the first article sample. Any further production prior to notification by the contracting agency of first article sample acceptability shall be at the contractor's risk. Failure of any cartridge to comply with the requirements of section 3 shall be cause for rejection of the first article represented.

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TABLE I. First article test plan.

Test Sequence	Requirement Paragraph	Test Paragraph	Cartridge Groups						Total
			I	II	III	IV	V	VI	
Visual	3.3.2.1	4.3.1	6	6	12	12	12	12	60
Radiographic	3.3.2.2	4.3.3.2	6	6	12	12	12	12	60
Resistance	3.3.2.3	4.3.4	6	6	12	12	12	12	60
Filter Continuity	3.3.2.4	4.3.5	6	6	12	12	12	12	60
Torque	3.3.2.5	4.3.6	6	6	12	12	12	12	60
Shock	3.4.3	4.3.9	6						6
Vibration	3.4.1	4.3.7		6					6
Temperature Humidity Altitude	3.4.2	4.3.8			12				12
Visual	3.3.2.1	4.3.1			12				12
Radiographic	3.3.2.2	4.3.3.2	6	6	12				24
Resistance	3.3.2.3	4.3.4	6	6	12				24
Filter Continuity	3.3.2.4	4.3.5	6	6	12				24
Torque	3.3.2.5	4.3.6	6	6	12				24
Ballistic Test :	3.4.4	4.3.10				12			12
-65 ±5°F			6	6	12		12		36
70 ±5°F								12	12
200 ±5°F									

4.2.2 Production inspection. All production cartridges manufactured under contract shall be inspected and screened to requirements specified in 3.2 through 3.3.2.3. Any unit failing to meet the requirements listed in 3.2 through 3.3.2.3 shall be rejected and removed from the lot.

4.2.3 Lot acceptance inspection. Lot acceptance inspection shall consist of the examinations and tests specified in Table II. Failure of any sample cartridge to comply with the requirements listed in Table II shall be cause for rejection of the lot represented.

4.2.3.1 Sample size. A random sample from each production lot, including the retained sample for investigative purposes, shall be selected in accordance with Table III for lot acceptance inspection. Test sample cartridges and cartridges retained for investigative purposes shall not be applied as part of the quantity specified for delivery by the contract or purchase order.

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TABLE II. Lot acceptance inspections and tests.

Inspection/Test	Test Paragraph	Quantity
Visual	4.3.1	All
Radiographic	4.3.3.2	All
Resistance	4.3.4	All
Filter Continuity	4.3.5	All
Torque	4.3.6	All
Ballistic Test: -65 ±5°F 70 ±5°F 200 ±5°F	4.3.10	1/3 test sample 1/3 test sample 1/3 test sample

TABLE III. Lot acceptance sampling.

Lot Size	Test Sample Size	Retained Sample Size
2 to 50	9	3
51 to 100	12	3
101 to 150	21	3
151 to 280	33	3
280 to 500	51	3
501-1200	81	4

4.3 Inspections and tests.

4.3.1 Cartridge and squib subassembly visual inspection. Visually examine all squib subassemblies prior to cartridge assembly. Each assembled cartridge shall be visually examined. Reject those with inadequate or illegible descriptive markings or serial numbers, dents, deep scratches, or other defects which may prevent proper installation or function.

4.3.2 Squib subassembly leak test. Each squib subassembly produced shall be leak tested in a dry gas leak tester to determine conformance with 3.3.1.2. Units exhibiting a leak rate in excess of 1×10^{-5} standard cm^3/sec air at a pressure differential of 1.0 ± 0.1 atmosphere shall be rejected.

4.3.3 Radiographic examination.

4.3.3.1 Squib subassemblies examination. Radiographic examination of squib subassemblies shall be in accordance with ASTM E 1742. All squib subassemblies shall be identified with serial numbers beginning with 001 prior to examination. The squib subassemblies shall be arranged on trays or boards in consecutive numerical order with any missing serial numbers identified on the radiographic plate. The squib subassemblies shall be positioned for the most revealing exposure with the long axis perpendicular to the radiographic beam. Each radiograph shall carry a permanent identification of the items displayed thereon in a 4 x 6 inch region maximum. The radiographic identification shall include the part number, the complete lot number, the contract number, and the span of serial numbers displayed. Radiographs of the entire production lot shall accompany the ballistic sample to the activity conducting the tests (see 6.2).

Defective assemblies found during radiographic review are to be marked on the radiographic plate and removed from the production lot.

4.3.3.2 Cartridge examination. Radiographic examination of cartridges shall include x-ray in accordance with ASTM E 1742. All cartridges shall be identified with serial numbers beginning with 001 prior to examination. The cartridges shall be arranged on trays or boards in consecutive numerical order with any missing serial numbers identified on the radiographic plate. The cartridges shall be positioned for the most revealing exposure with the long axis perpendicular to the radiographic beam. Each radiograph shall carry a permanent identification of the items displayed thereon in a 4 x 6 inch region maximum. The radiographic identification shall include the drawing number, the complete lot number in accordance with MIL-STD-1168, the contract number, the DODIC, and the span of serial numbers displayed. Radiographs of the entire production lot shall accompany the ballistic sample to the activity conducting the tests (see 6.2). Defective cartridge assemblies found during radiographic review are to be marked on the radiographic plate and removed from the production lot.

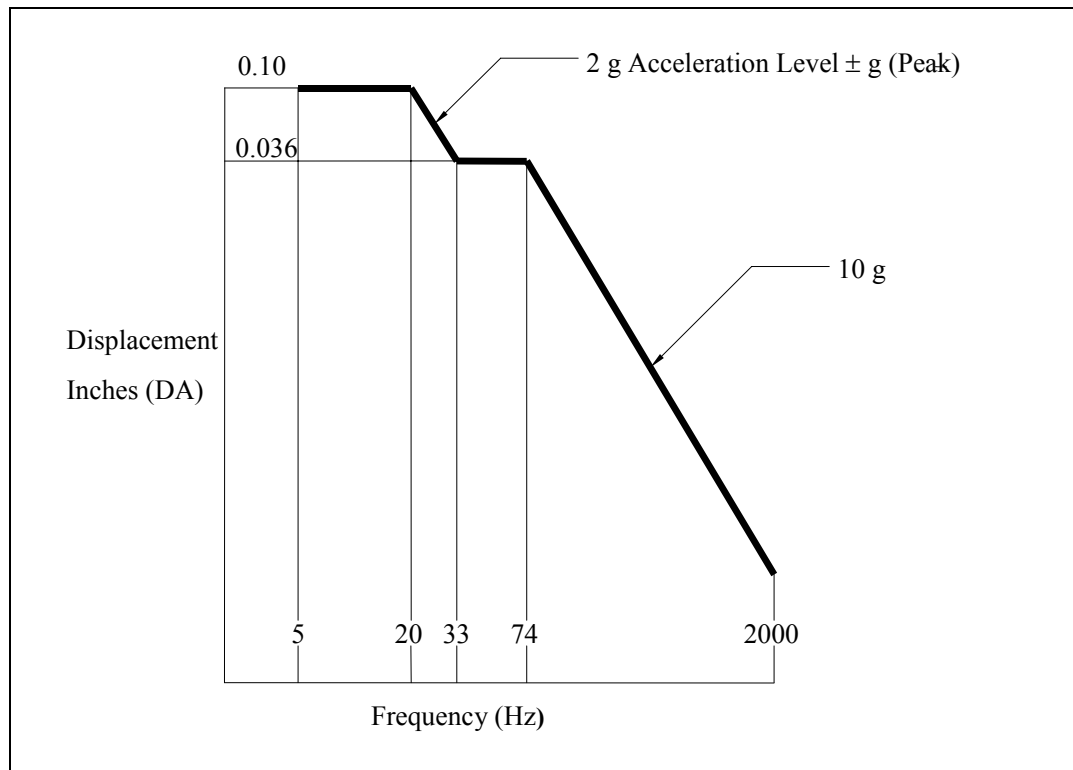
4.3.4 Bridgewire resistance. Each cartridge in the ballistic sample shall be screened for proper bridgewire resistance by use of a resistance bridge or other suitable test circuit. Current shall be limited to 50 milliamperes maximum.

4.3.5 Filter Continuity. The signal from a signal generator shall be set using a calibrated 1 Ohm resistor for a load. A pulse of alternating current 100.0 ± 0.1 Milli-Volts peak to peak, at a frequency of $1.0 \pm .01$ Megahertz, shall be applied for 10 milliseconds maximum between the cartridge studs through a $47 \pm 10\%$ Ohm, 0.25 Watt minimum resistor. The voltage drop across the cartridge studs shall be monitored using an oscilloscope set to the appropriate scale. The oscilloscope shall be capable of a minimum of 20 meg-samples per second. The oscilloscope lead shall have a 50 Ohm terminator. With the WB53 cartridge installed in place of the calibrated 1 Ohm resistor, the voltage across the cartridge studs shall meet the requirements of 3.3.2.4

4.3.6 Torque. Each cartridge in the ballistic sample shall be subjected to a minimum torque of 18 inch-pounds. The torque shall be applied through the insulated (positive) terminal of the cartridge using an MS21044-CO6 nut and a calibrated torque wrench. No rotation of the insulator shall be allowed.

4.3.7 Vibration. The cartridges shall be installed in a suitable vibration test fixture and torqued to 78 to 80 in-lbs. The cartridges shall be vibrated in three mutually perpendicular axes. The cartridges shall be subjected to sinusoidal vibration at 70°F along axis I to the levels shown in Figure 1 for sixty minutes. The frequency shall be logarithmically swept from 5 to 2000 Hz and return to 5 Hz in approximately 20 minutes. After completion of vibration along axis I, the test shall be repeated along axes II and III. After completion of vibration at +70°F, the vibration procedure shall be repeated at +200°F. After completion of vibration at +200°F, the vibration procedure shall be repeated at -65°F.

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FIGURE 1. Vibration test level.

4.3.8 Temperature, Humidity and Altitude Cycling (THA). The cartridges shall be supported on screen trays so that all areas are exposed to the prescribed atmospheric conditions at all times. During weekdays the cycling scheduling is as follows:

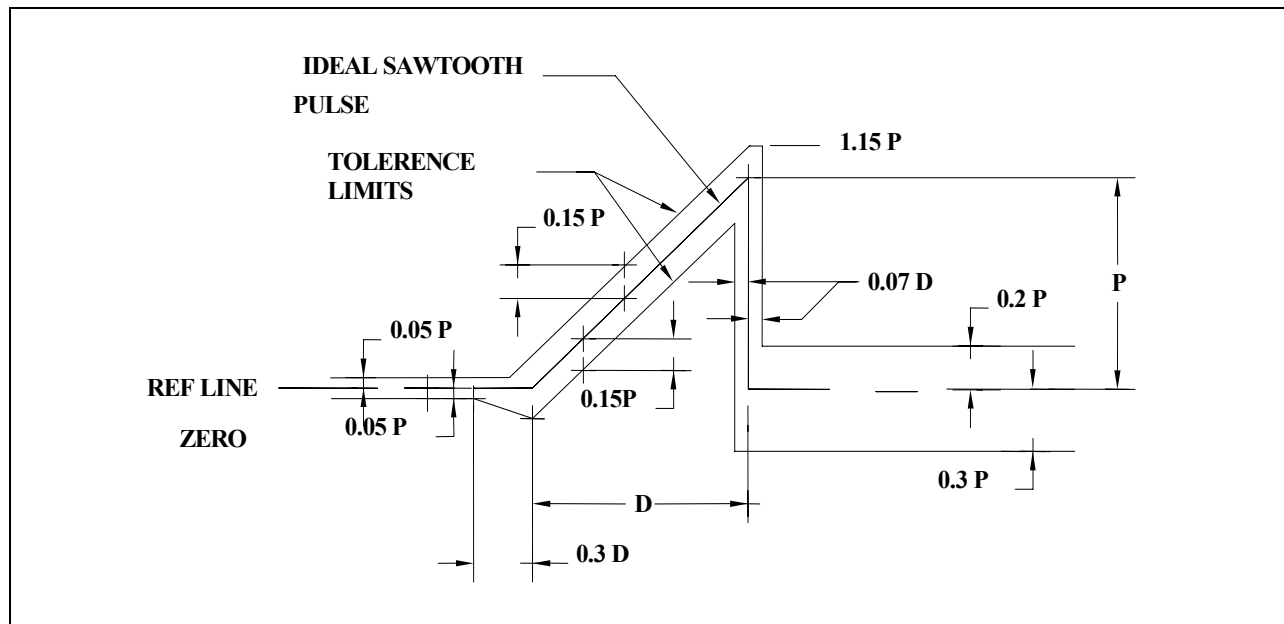
Monday	0800	Place test items in a chamber maintained at +70°F at 50 percent relative humidity (RH).
	1200	Raise chamber temperature to +160°F and the RH to 95 percent. The chamber temperature shall reach +160°F at 95 percent RH not later than 1300.
	1600	Remove test items from above chamber and immediately place in a chamber maintained at -65°F at a pressure altitude of 70,000 feet (0.65 psi).
Tuesday	0800	Remove test items from above chamber and place in a chamber maintained at 70°F at 50 percent RH.
	1200	Remove test items from above chamber and immediately place in a chamber maintained at -65°F and a pressure altitude of 70,000 feet (0.65 psi).
	1600	Remove test items from above chamber and immediately place in a chamber maintained at 160°F at 90 percent RH.
Wednesday	0800	Reduce chamber temperature to 70°F at 50 percent RH. The chamber temperature shall reach 70°F at 50 percent RH not later than 0900.

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	1200	Raise chamber temperature to 160°F and the RH to 95 percent. The chamber temperature shall reach 160°F at 95 percent RH not later than 1300.
	1600	Remove test items from above chamber and immediately place in a chamber maintained at -65°F and a pressure altitude of 70,000 feet (0.65 psi).
Thursday	0800	Remove test items from above chamber and immediately place in a chamber maintained at 70°F at 50 percent RH.
	1200	Remove test items from above chamber and immediately place in chamber maintained at -65°F and a pressure altitude of 70,000 feet (0.65 psi).
	1600	Remove test items from above chamber and immediately place in a chamber maintained at 160°F at 95 percent RH.
Friday	0800	Reduce chamber temperature to 70°F at 50 percent RH. The chamber temperature shall reach 70°F at 50 percent RH not later than 0900.
	1200	Raise chamber temperature to 160°F and the RH to 95 percent. The chamber temperature shall reach 160°F at 95 percent RH not later than 1300.
	1600	Remove test items from above chamber and immediately place in a chamber maintained at -65°F at a standard ambient pressure.

This schedule shall be followed for a total of 4 weeks (28 days) except that on the first and third weekends the cartridges are soaked at -65°F and ambient pressure, and on the second and fourth weekends the cartridges are soaked at 160°F at 95% RH. The weekend soak shall be from 1200 on Friday until 0800 on Monday.

4.3.9 Shock. The cartridges shall be installed in a suitable shock test fixture for the test. Three shocks shall be applied in each direction of three mutually perpendicular axes. The shock pulse waveform shall be a terminal peak sawtooth as shown in Figure 2. The peak amplitude P shall be 20 g and, the duration D shall be 11 milliseconds.

FIGURE 2. Shock pulse configuration.

4.3.10 Ballistic test. The cartridges shall be fired in a closed bomb test fixture, Drawing 298AS105, within 3 minutes after removal from temperature conditioning. If any cartridge is exposed to the temperature environment for greater than the time allowed or not fired within 3 minutes after removal it shall be re-exposed to the original environment for not less than 1 hour nor more than 24 hours before test firing. The re-exposure may be performed as many times as necessary to complete the required ballistic test. A firing pulse of $5 +0.5/-0.0$ Amperes shall be applied to the bridgewire circuit for 50 milliseconds. Instrumentation shall be provided to measure and record the cartridge pressure (psig) in the test chamber, the ignition delay (milliseconds), and the rise time (milliseconds). The test chamber shall be thoroughly cleaned after each cartridge firing. The production lot shall be accepted if the sample fulfills the acceptance criteria of 4.3.10.1.

4.3.10.1 Acceptance criteria.

4.3.10.1.1 Maximum Pressure. The maximum pressure shall be measured at the point at which the pressure reaches its maximum in the test fixture. The lot shall be acceptable with respect to pressure limits if the ballistic sample meets the requirements of 3.4.4.1. The acceptance number of defects is zero and the rejection number of defects is one.

4.3.10.1.2 Ignition delay. The ignition delay shall be measured from the first application of 5 amps to the bridgewire circuit to first indication of pressure. The lot shall be acceptable with respect to ignition delay if the ballistic sample meets the requirements of 3.4.4.3. The acceptance number of defects is zero and the rejection number of defects is one.

4.3.10.1.3 Pressure rise time. The pressure rise time shall be measured from the first indication of pressure to the point at which the pressure reaches its minimum acceptable maximum pressure value in the test fixture. The lot shall be acceptable with respect to pressure rise if the ballistic sample meets the requirements of 3.4.4.2. The acceptance number of defects is zero and the rejection number of defects is one.

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4.3.10.1.4 Misfire. A cartridge that does not fire under the conditions specified in 3.4.4 shall be considered defective and the lot considered unacceptable, unless the misfire is clearly attributable to faulty test equipment or procedure.

4.3.10.2 Retests. There shall be no retests.

4.3.10.3 Test failure. If test failure is attributable to an assignable cause, excluding the test cartridge, the original test results shall be discarded and that test re-conducted.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DOD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service'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 that may be helpful but is not mandatory).

6.1 Intended use. The CCU 147/A Aircraft Fire Extinguisher Cartridge (DODIC WB53) provides power to initiate the emergency fire extinguisher system in the helicopter fire extinguisher systems. The cartridge creates gas pressure that separates the split sleeve. Pressure from the fire extinguisher container forces the valve open and releases the fire extinguisher agent. The cartridge is designed for military helicopter use and has no equivalent commercial application.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of this specification.
- b. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.2.1, 2.2.2, and 2.3).
- c. Whether first article inspection is required and, if so, specify the test activity (see 3.1 and 4.2.1).
- d. Directions for shipping radiographs of entire production lot along with the ballistic sample to the activity conducting the production lot acceptance tests (see 4.2.2 and 4.2.3).
- e. That the safety precaution requirements of the "DOD Contractors' Safety Manual for Ammunition and Explosives," DOD 4145.26-M, are applicable and should be specified in the contract as required by Federal Acquisition Regulation (FAR) 23.3. NOTE: When this specification is used as part of the description of work to be accomplished by a Government activity the safety precaution requirements of "Ammunition and Explosives Ashore," OP 5, are applicable.

6.3 First article. When a first article inspection is required, the contracting officer should provide specific guidance to offerors whether the item should be a first article sample or a sample selected from the first production items (see 3.1), and the number of items to be tested as specified in 4.2.1. The contracting officer should also include specific instructions in acquisition documents regarding

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arrangements for examination, approval of first article test results, and disposition of first articles. Limitations for bids should provide that the Government reserves the right to waive the requirement for samples for First article inspection to those bidders offering a product which has been previously acquired or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending contract. Bidders should not submit alternate bids unless specifically requested to do so in the solicitation.

6.4 Subject term (keyword) listing.

gas pressure
helicopter

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 extent of the changes. This amendment was authorized by ECP number 06E215D009.

Custodian:
Navy - OS

Preparing activity
Navy – OS
(Project 1377-2007-006)

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <http://assist.daps.dla.mil>.