INCH-POUND

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DETAIL SPECIFICATION

CARTRIDGE, AIRCRAFT FIRE EXTINGUISHER, CCU-121/A

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 of Defense.

1. SCOPE

1.1 Scope. This specification covers the requirements for the manufacture and acceptance of the CCU-121/A Aircraft Fire Extinguisher Cartridge, which for the purpose of this specification, is referred to as "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 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 of documents cited 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 those are those cited in the solicitation or contract.

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-D-21625 Design and Evaluation of Cartridges for Cartridge Actuated Devices

Comments, suggestions, or questions on this document should be addressed to DEPARTMENT OF THE NAVY, Indian Head Division, NSWC, Code E11G3, 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

MIL-DTL-23659 Initiators, Electric, General Design Specification for

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-810 Environmental Test Methods and Engineering Guidelines

MIL-STD-1168 Ammunition Lot Numbering and Ammunition Data Card

(Copies of these documents are available online at http://assist.daps.dla.mil/quicksearch/ 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 (see 6.2).

DRAWINGS

NAVAL AIR SYSTEMS COMMAND (CAGE Code 30003)

DL 3205AS100 Cartridge, Aircraft Fire Extinguisher, CCU-121/A

838AS185 Aircraft Fire Extinguisher Cartridge Test Fixture

3205AS101 CCU-121/A Vibration Test Fixture

(Application for copies should be addressed to the Commanding Officer, Naval Aviation Supply Office, Cog I Support Branch (Code 03441), 5801 Tabor Avenue, Philadelphia, PA 19120-5099.)

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 the documents which are DOD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM E1742 Standard Practice for Radiographic Examination

(Copies of these documents are available from ASTM International, 100 Barr Harbor Dr., P.O. Box C700, West Conshohocken, PA 19428-2959 or online at http://www.astm.org/.)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, 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 6.2), a sample (see 6.3) shall be subjected to first article inspection in accordance with 4.3. A first article inspection shall be required if :

a. There has been more than 24 months since production of the latest accepted lot,
b. There has been a relocation of the production facility,
c. There has been a major change in personnel or procedures, or,
d. There has been a major change in the design.

3.2 Primary components. The ignition charge and the output charge are primary components. Only one lot of each primary component shall be used in a cartridge lot. One primary component lot may be used in more than one cartridge lot.

3.3 Cartridge requirements. The entire lot of production cartridges shall be inspected as specified in Table I of section 4. Failure of any cartridge to meet the requirements of Table I shall result in rejection of the cartridge.

3.3.1 Visual inspection. Each cartridge shall be free of visible defects when inspected against drawing 3205AS100 in accordance with 4.5.1.

3.3.2 Bridge circuit resistance. Each cartridge bridge circuit resistance shall be 1.00 ± 0.1 ohms when measured in accordance with 4.5.2.

3.3.3 Radiographic inspection. Each cartridge shall be radiographically inspected. The inspection shall verify proper assembly, presence of parts, sealing, and proper electrical connections when inspected in accordance with 4.5.3.

3.3.4 Leakage. Each cartridge shall pass a dry gas leak test. Cartridges that exhibit a leak rate in excess of 1.0×10^{-5} cm^3 per second at a differential of 1.0 ± 0.1 atmospheres shall be considered defective. The leak test shall be conducted as specified in 4.5.4.

3.4 Cartridge sampling inspection. Cartridges from each first article test sample shall meet the applicable requirements of 3.3 and 3.4 as defined in Table II of section 4. Cartridges from each lot acceptance test sample, shall meet the applicable requirements of 3.3 and 3.4 as defined in Table III of section 4.

3.4.1 No-Fire Current. The cartridge shall not fire or dud, when subjected to a direct current of one ampere at one watt of power for 5 minutes minimum when tested in accordance with 4.5.5. The cartridge shall meet the specification requirements when functioned in accordance with 4.5.12.

3.4.2 Static discharge. The static discharge shall not fire or dud the cartridge when tested in accordance with 4.5.6. The cartridge shall me meet the specification requirements when functioned in accordance with 4.5.12.

3.4.3 Stray voltage. Stray voltage shall not fire or dud the cartridge when tested in accordance with 4.5.7. The cartridge shall meet the specification requirements when functioned in accordance with 4.5.12.

3.4.4 Vibration. The cartridge shall not incur damage or deformation from the vibration test of 4.5.8. The cartridge shall me meet the specification requirements when functioned in accordance with 4.5.12.

3.4.5 Temperature-Shock/Humidity and Altitude (TSHA). The cartridge shall not incur damage or deformation after exposure to the TSHA environments per MIL-D-21625, as specified in 4.5.9. The cartridge shall me meet the specification requirements when functioned in accordance with 4.5.12.

3.4.6 Shock. The cartridge shall not incur damage or deformation from the shock test of 4.5.10. The cartridge shall me meet the specification requirements when functioned in accordance with 4.5.12.

3.4.7 Salt fog. The cartridge shall not incur deformations including corrosion, peeling, chipping, or blistering of the finish as a result of the salt fog test of 4.5.11. The cartridge shall me meet the specification requirements when functioned in accordance with 4.5.12.

3.4.8 Function. The cartridge, when tested in accordance with 4.5.12, shall produce a 0.015 inch minimum indent in the 6061-7651 Aluminum witness block when tested in accordance with 4.5.12.

3.4.8.1 Ignition time. The cartridge shall fire within 10 milliseconds (ms) of the application of 5.00 +0.25, -0.0 amps, when tested in accordance with 4.5.12.1.
The ignition time shall be defined from the application of power until the loss of continuity in the bridge circuit.

3.4.8.2 Misfire. There shall be no misfires.

3.5 Workmanship. The cartridge shall be constructed and finished in a manner to assure compliance with all requirements of this specification. Particular attention shall be directed to dimensions, finishes, sealing, and assembly operations.

4. VERIFICATION

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

a. Production inspection (see 4.2)

b. First article inspection (see 4.3)

c. Lot acceptance inspection (see 4.4)

4.2 Production. The entire lot of production cartridges manufactured under the contract shall be inspected and screened for defects as defined in Table I. Cartridges failing to meet the requirements of 3.3 defined in Table I shall be rejected and removed from the lot.

4.3 First article. Unless otherwise specified in the contract or purchase order (see 6.2), a first article sample of 33 cartridges shall be subjected to first article testing. Thirty of these cartridges shall be expended in the tests listed in Table II and three cartridges shall be retained for investigative purposes. Any damage inflicted by the environmental treatments, which would adversely affect the performance of the item in service application shall be cause for 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. The first article sample shall not be applied as part of the quantity specified for delivery by the contract. Failure of any cartridge to comply with the requirements of 3.3 and 3.4 defined in Table II shall be cause for rejection of the first article represented.

4.4 Lot acceptance inspection. Lot acceptance shall consist of the examinations and tests specified in Table III. Failure of any cartridge to comply with the requirements of the visual, bridgewire circuit resistance, radiographic or leakage nondestructive test (NDT) shall be cause for rejection of the cartridge represented. Any NDT failure will require that the production lot be subjected to 100% screening for the anomalous condition.

4.4.1 Sample size. A random sample from each production lot, including the retained sample for investigative purposes, shall be selected in accordance with Table IV for lot acceptance inspection.

4.5 Inspection and tests. Tolerances shall be as specified in the appropriate specification unless specified in this document.

TABLE I. Production lot inspections.

Test Sequence	Test Paragraph	Requirement Paragraph
1. Visual	4.5.1	3.3.1
2. Bridge circuit resistance	4.5.2	3.3.2
3. Radiographic	4.5.3	3.3.3
4. Leakage	4.5.4	3.3.4

TABLE II. First article test plan.

Test Sequence			Sample Group					
	Test Paragraph	Requirement Paragraph	I	II	III	IV	V	VI
1. Visual	4.5.1	3.3.1	6	6	6	6	6	3
2. Bridge circuit resistance	4.5.2	3.3.2	6	6	6	6	6	3
3. Radiographic	4.5.3	3.3.3	6	6	6	6	6	3
4. Leakage	4.5.4	3.3.4	6	6	6	6	6	3
5. Power Current[1]	4.5.5	3.4.1	6					
6. Static Discharge[1]	4.5.6	3.4.2	6					
7. Stray Voltage[1]	4.5.7	3.4.3	6					
8. Vibration[2]	4.5.8	3.4.4		6				
9. TSHA[1]	4.5.9	3.4.5			6			
10. Shock[2]	4.5.10	3.4.6				6		
11. Salt fog[1]	4.5.11	3.4.7					6	
12. Function test: -65°F +70°F +225°F	4.5.12	3.4.8	 2 2 2	 2 2 2	 2 2 2	 2 2 2	 2 2 2	

[1] A bridge circuit resistance test shall be conducted following specified test.

[2] A visual, bridge circuit resistance test, leakage, and radiographic inspection shall be conducted following the specified test.

TABLE III. Lot acceptance inspections and tests.

Inspection/Test	Test Paragraph	Requirement Paragraph	Quantity
1. Visual inspection	4.5.1	3.3.1	Test and Retain Sample
2. Bridgewire circuit resistance	4.5.2	3.3.2	Test and Retain Sample
3. Radiographic inspection	4.5.3	3.3.3	Test and Retain Sample
4. Leakage test	4.5.4	3.3.4	Test and Retain Sample
5. Function test: -65°F 70°F 225°F	4.5.12	3.4.8	 1/3 Sample 1/3 Sample 1/3 Sample

TABLE IV. Lot acceptance sampling.

Lot Size	Test Sample Size	Retained Sample Size
2 thru 50	9	2
51 thru 90	15	2
91 thru 150	21	3
151 thru 280	33	3
281 thru 500	51	3
501 thru 1200	81	3

4.5.1 Visual inspection. Cartridges shall be free of the following defects: burrs, dents, or other defects which may prevent entry of the cartridge into the firing chamber, or affect the resistance of the cartridge to moisture. All cartridge markings and identifications shall be correct and legible. Each cartridge shall meet the requirements of 3.3.1.

4.5.2 Bridge circuit resistance. The resistance of each cartridge, measured between pin "B" and pin "F", shall be measured with an accuracy of one percent using an apparatus which subjects the bridge circuit to a current of 5 milliamperes maximum. Each cartridge shall meet the requirements of 3.3.2.

4.5.3 Radiographic inspection. Each assembled cartridge (explosive cup, wiring harness and connector) shall be x-rayed in accordance with ASTM E1742. Any observable imperfections in assembly shall be cause for rejection. The item shall be positioned for the most revealing exposure. All items shall be identified with serial numbers prior to x-raying. The items for examination shall be arranged on trays or boards in consecutive numerical order by serial number and each radiographic plate shall carry a permanent identification of the items displayed thereon. The radiographic plate identification shall include the NAVAIR drawing number, the complete lot number per MIL-STD-1168, contract number, and the span of serial numbers displayed. Radiographic plates of the entire assembled cartridge production lot shall accompany the ballistic sample to the activity conducting the production lot acceptance test. Results shall be examined for conformance to 3.3.3.

4.5.3.1 Sample radiographic plate. A sample radiographic plate and technique shall be submitted for x-ray by the contractor for approval prior to submitting the radiographs for the production lot. The production lot radiographs shall be made using the identical technique utilized to produce the approved sample plate.

4.5.4 Leakage test. Bomb cartridges in Helium gas for 1 hour minimum at a pressure differential of 1 ± 0.1 atmospheres. After bombing the cartridges shall be vented with air under normal room conditions for 10 minutes. After venting, the cartridges shall be tested in a dry gas leak tester. Each cartridge shall meet the requirements of 3.3.4.

4.5.5 No-Fire Current test. A direct current of not less than one ampere supplying a minimum of one watt of power shall be applied between pin "B" and pin "F" for a period of at least 5 minutes. Failure of any cartridge to comply with the requirements of 3.4.1 shall be cause for rejection of the first article.

4.5.6 Static discharge. The cartridge shall be subjected to a static discharge test by being connected to a 500 ± 5% picofarad capacitor charged to 25,000 ± 500 volts and a 5,000 ± 5% ohm resistor connected in a 500 microhenry total inductance series circuit. The cartridge shall be subjected to the static discharge between shorted pins (B-F) and case and between shorted pins (B-F) and pin D. Failure of any cartridge to comply with the requirements of 3.4.2 shall be cause for rejection of the first article.

4.5.7 Stray voltage. The cartridge shall be subjected to 2,000 pulses of direct current from pin "B" to pin "F". Each pulse shall be 300 milliseconds applied at a rate of two per second. Each pulse shall have a minimum amplitude of 100 ± 5 milliamperes. The cartridges shall be conditioned for a minimum of 12 hours at 70 ± 5°F prior to testing. Failure of any cartridge to comply with the requirements of 3.4.3 shall be cause for rejection of the first article.

4.5.8 Vibration test. The cartridge shall be subjected to sine on random vibration testing in accordance with Method 514.3, paragraph I-3.2.6 of MIL-STD-810. The duration shall be 1 hour per axis at each temperature (-65°F, 70°F, and 200°F) for a total of nine (9) hours per

cartridge. Failure of any cartridge to comply with the requirements of 3.4.4 shall be cause for rejection of the first article.

4.5.8.1 Random vibration. Random vibration testing shall be conducted from 10 Hz to 2000 Hz at a fixed acceleration of 0.02 g.

4.5.8.2 Source dwell. Source dwell shall be conducted at the following frequencies: Helicopter overspeed Source dwell (Hz) at 6.9, 20.8, 41.7 and 62.5 Hz.

4.5.9 Temperature-Shock/Humidity/Altitude (TSHA). The TSHA test shall be conducted in accordance with the temperature-shock/humidity/altitude test of MIL-DTL-23659 omitting the reference to Table I in MIL-DTL-23659. Failure of any cartridge to comply with the requirements of 3.4.5 shall be cause for rejection of the first article.

4.5.10 Shock test. The shock pulse per MIL-D-21625 shall be applied to the cartridge's mounting points in both directions along each of three mutually perpendicular axes, for a total of 18 shocks. The shape of each shock pulse shall approximate as nearly as possible a half sine wave. The amplitude of each shock pulse shall exceed 200 g's for 1.5 ± 0.4 milliseconds and it shall exceed 65 g's for 9.0 ± 0.9 milliseconds. Failure of any cartridge to comply with the requirements of 3.4.6 shall be cause for rejection of the first article.

4.5.11 Salt Fog test. The cartridges shall be subjected to the salt fog test, with protective caps installed, in accordance with Procedure 1 of MIL-STD-810. The cartridges shall be exposed to a 5% salt solution for a 48-hour period on plastic trays that allow for drainage. Failure of any cartridge to comply with the requirements of 3.4.7 shall be cause for rejection of the first article.

4.5.12 Function test. Cartridges shall be conditioned for a period of not less than 4 hours nor more than 24 hours at the specified temperatures. The cartridges shall be removed from the conditioning chamber and test fired within 5 minutes. If any cartridge is not fired within 5 minutes after removal, it shall be reconditioned at the specified temperature for an additional 4 hours and then tested. The cartridges shall be tested in the Aircraft Fire Extinguisher Cartridge Test Fixture, drawing number 30003-838AS185 with the exception that 6061-T6 aluminum dent blocks will be used in place of the 2024-T351 aluminum specified in the drawing. Each dent block will be used only once and will be serialized with the cartridge serial number. The cartridge will be functioned by applying 28 VDC at 5.0, +0.25, -0.0 amperes. The cartridges shall meet the requirements specified in 3.4.8.

4.5.12.1 Ignition time. The ignition time shall be measured from the first application of current until the first sign of loss of circuit continuity and shall meet the requirements of 3.4.8.1.

4.5.12.2 Misfires. A cartridge that does not fire under the conditions specified in 4.5.3 shall be considered defective, and the lot considered unacceptable, unless the misfire is clearly attributable to faulty test equipment or procedure.

4.5.12.3 Retest. There shall be no retests.

4.5.12.4 Test failure. If the test failure is attributed to any specific cause excluding the cartridge, the original test results shall be discarded and that test re-conducted.

4.5.13 Inspection of packaging. Packaging, packing, and marking shall be visually examined for conformance to section 5.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When 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 commands. 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 maybe helpful but is not mandatory.)

6.1 Intended Use. The cartridge is intended for use in releasing fire extinguishing agent into the area surrounding an aircraft engine in the event of fire. This cartridge is used in the V-22 series engine nacelle fire extinguishing systems. The V-22 series systems are only used in military aircraft, therefore the cartridge has no 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 a first article inspection is required and. if so, specify the test activity (see 3.1 and 4.3).

d. Markings if other than as specified in 6.5.1.

e. If bar coding is not required on outer container.

f. Inspection conditions if other than specified in 4.5.

g. Production lot size (quantity) and test facility (see 4.2).

h. That the safety precaution requirements of the "Contractors' Safety Manual for Ammunition, Explosives and Related Dangerous Material," DOD 4145.26M are applicable.

NOTE: When this specification is used as a part of the description of work to be accomplished by a Government activity the safety precautions requirements of "Ammunition and Explosives," OP 5, are applicable.

6.3 First Article. When a first article inspection is required, the contracting officer should provide specific guidance to offeror(s) whether the item(s) should be a preproduction sample, a first article sample, a first production item, a sample selected from the first production items, standard production item from the contractor's current inventory and the number of items to be tested as specified in 4.3. The contracting officer should also include specific instructions in acquisition documents of the first articles. Invitation(s) for bid(s) should provide that the U.S. Government reserves the right to waive the requirements for samples for first article inspection to those bidders offering a product which has been previously acquired or tested by the U. S. Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior U.S. 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 Definitions.

6.4.1 Primary component. Primary components are all components in which a functional failure would result in a misfire or malfunction of the cartridge.

6.4.2 Flight critical part. A part, the single failure of which, during any operating condition, could cause the loss of aircraft or one of its major components, loss of control, or which may cause significant personnel injury, including during flight.

6.4.3 Caps. Plastic shipping caps should be installed on the end of the mounting studs and over the EED.

6.4.4 Level A packaging. The degree of preservation and packaging which will afford adequate protection against corrosion, deterioration and physical handling, shipment, indeterminate storage and world wide redistribution.

6.4.5 Level C packaging. The degree of preservation and packaging which will afford adequate protection against corrosion, deterioration and physical damage during shipment from the supply source to the first receiving activity for immediate use. This level may conform to the supplier's commercial practice when such meets the requirements of this level and MIL-STD-129.

6.4.6 Level A packing. The degree of packing which will afford adequate protection during shipment, handling, indeterminate storage and world-wide distribution.

6.4.7 Level C packing. The degree of packing which will afford protection against damage during direct domestic shipment from the supply source to the first activity for immediate use. This level in general will conform to the applicable carrier rules and regulations and may be the supplier's commercial practice when such meets the requirement of this level.

6.5 Contract packaging and markings. The following marking requirements should be specified in the contract.

6.5.1 Markings.

6.5.1.1 Special markings. Marking of interior, intermediate and exterior containers should be in accordance with 49 CFR 171-178 and MIL-STD-129.

6.5.1.2 Normal marking. Unless otherwise specified in the contract or purchase order (see 6.2), the marking on the container should be as specified below. The specified markings should be applied to the containers in accordance with the applicable provisions of MIL-STD-129.

Inner Container Marking

(a) National Stock Number and DODIC: 1377-01-454-7851 SS66
(b) Nomenclature: Cartridge, Aircraft Fire Extinguisher CCU-121/A
(c) Drawing and dash number
(d) Quantity: one
(e) Lot number in accordance with MIL-STD-1168
(f) Warning: Cartridge Powered Device

Outer Container Marking

(a) National Stock Number and DODIC: 1377-01-454-7851 SS66

(b) Nomenclature: Cartridge, Aircraft Fire Extinguisher CCU-121/A
(c) Drawing Number: 3205AS100
(d) Dash Number
(e) Quantity
(f) Lot Number in accordance with MIL-STD-1168
(g) Gross weight and Cube
(h) Contract or Purchase Order
(I) Warning: Cartridge Powered Device
(j) UN Hazard Class 1.4
(k) UN Storage Compatibility Group S
(l) UN Number: 0276

6.5.1.3 Bar Coding. Unless otherwise specified in the contract or purchase order (see 6.2), the outer container should be bar coded in accordance with MIL-STD-129-1, Part 2. Additionally, the above specified marking information should be applied to the containers in accordance with the provisions of MIL-STD-129.

6.5.1.4 Explanation of terms. For the purpose of this specification, NAVSUPINST 4030.28B should be used to clarify terms.

6.6 Subject term (key word) listing.

Aircraft engine compartment
Cartridge actuated devices
Electric explosive initiator
Fire extinguishing system

6.7 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.

Custodian:
Navy - OS

Preparing Activity:
Navy - OS
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