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SUPERSEDING
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MILITARY SPECIFICATION

HELMET, COMBAT VEHICLE CREWMAN, BALLISTIC SHELL, DH-132A

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

1. SCOPE

1.1 Scope. This document covers the requirements for the DH-132A combat vehicle crewman's helmet consisting of a ballistic shell and an inner helmet with attached microphone headset.

1.2 Classification. The helmet shall be one type and in the following sizes as specified (see 6.2).

Small - Small inner helmet with medium shell
Medium - Medium inner helmet with medium shell
Large - Large inner helmet with large shell

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Documents. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to U.S. Army Natick Research, Development, and Engineering Center, Natick, MA 01760-5014, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 8470

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SPECIFICATIONS

FEDERAL

- | | |
|-----------|---|
| A-A-203 | - Paper, Kraft, Wrapping |
| L-P-378 | - Plastic, Sheet and Strip, Thin Gauge, Polyolefin |
| PPP-B-26 | - Bag, Plastic (General Purpose) |
| PPP-B-566 | - Boxes, Folding, Paperboard |
| PPP-B-636 | - Box, Shipping, Fiberboard |
| PPP-F-320 | - Fiberboard: Corrugated and Solid, Sheet Stock (Container Grade), and Cut Shapes |

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- | | |
|-------------|--|
| MIL-P-116 | - Preservation, Methods Of |
| MIL-L-35078 | - Loads, Unit: Preparation of Semiperishable Subsistence Items; Clothing, Personal Equipment and Equipage; General Specification For |
| MIL-C-44050 | - Cloth, Ballistic, Aramid |
| MIL-C-46168 | - Coating, Aliphatic Polyurethane, Chemical Agent Resistant |
| MIL-P-46593 | - Projectile, Calibers .22, .30, .50, and 20 mm Fragment-Simulating |

STANDARDS

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- | | |
|-------------|---|
| MIL-STD-105 | - Sampling Procedures and Tables for Inspection by Attributes |
| MIL-STD-129 | - Marking for Shipment and Storage |
| MIL-STD-147 | - Palletized Unit Loads |
| MIL-STD-662 | - Ballistic Test for Armor |

DRAWINGS

U.S. ARMY NATICK RESEARCH, DEVELOPMENT, AND ENGINEERING CENTER

- | | |
|---------|-------------------------------------|
| 8-2-57 | - Wiring Diagram, Test Set |
| 8-2-524 | - Packaging |
| 8-2-600 | - Helmet, Assembly |
| 8-2-601 | - Outer Helmet Assembly |
| 8-2-602 | - Inner Helmet (Less Pads) Assembly |
| 8-2-603 | - Chin Strap Assembly |
| 8-2-604 | - Attachment Tab Assembly |

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| | |
|---------|---|
| 8-2-605 | - Buckle Assembly |
| 8-2-606 | - Tab Assembly, Snap Fasteners |
| 8-2-607 | - Beading, Edge |
| 8-2-610 | - Post |
| 8-2-611 | - Pad Assembly, Chin Strap |
| 8-2-612 | - Ring, Earcup Securing |
| 8-2-613 | - Nape Strap Assembly |
| 8-2-614 | - Tunnel Assembly, Cordage |
| 8-2-615 | - Tab, Pull |
| 8-2-616 | - Tab, Attachment Assembly |
| 8-2-617 | - Pads |
| 8-2-618 | - Inner Helmet (With Pads) Assembly |
| 8-2-658 | - Shell, Ballistic, Medium and Small (DH-132A) |
| 8-2-659 | - Shell, Ballistic, Large (DH-132A) |
| 8-2-661 | - Helmet, Ground Troops' - Parachutist's: Pinwheel Preform |
| 8-2-830 | - Dimensions for Examination of DH-132A Helmet Shell Production Lots |

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

2.1.2 Other Government documents. The following other Government documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues shall be those in effect on the date of the solicitation.

JOINT COMMITTEE ON PRINTING (JCP) PUBLICATIONS

Government Paper Specification Standards No. 9

(Application for copies should be addressed to the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.)

2.2 Other 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 shall be those listed in the issue of the DODISS specified in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS shall be the issues of the nongovernment documents which are current on the date of the solicitation.

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AMERICAN NATIONAL STANDARDS INSTITUTE, INC. (ANSI)

S12.6-1984 - Method for Measurement of the Real-Ear Attenuation
of Hearing Protectors

Z90.1 - Specification for Protective Headgear for Vehicular Users

(Application for copies should be addressed to the American National Standards Institute, 1430 Broadway, New York, NY 10018.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

D 3951 - Standard Practice for Commercial Packaging

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

(Technical society and technical association documents are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

2.3 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 shall take precedence. Nothing in this document, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Guide sample. Samples of the helmet or components, when furnished, are solely for guidance and information to the contractor (see 6.4). Variations from this document may appear in the sample, in which case this document shall govern.

3.2 First article. When specified in the contract or purchase order, a sample shall be subjected to first article inspection (see 4.3, 6.2, and 6.3). The headset microphone shall be inspected as specified on Drawing 8-2-600.

3.3 Materials and components. Materials and components shall be as specified on the applicable drawings and as specified herein (see 6.5). For materials or components for which it is stated "or equal", if the contractor proposes to use an item considered to be equal to the material or component specified, prior to its use the contractor shall furnish a sample of the material or component, with supporting data to the contracting officer for subsequent evaluation by the responsible military agency.

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3.3.1 Cloth, ballistic, aramid. The aramid ballistic cloth (reinforcing material) for the helmet shell shall conform to type II, class 1 of MIL-C-44050.

3.3.1.1 Laminating resin. The resin for coating and laminating the reinforcing material shall be a catalyzed system composed of 50 percent phenol formaldehyde and 50 percent polyvinyl butyral resins. The resin shall be pigmented to match the color of the coating specified in 3.3.3.

3.3.2 Adhesive for bonding helmet shell edge beading. The adhesive specified on Drawing 8-2-601 for binding the helmet shell edge beading shall meet the bonding requirements specified in 3.5.4 and 3.5.5.

3.3.3 Coating. The coating for finishing the helmet shell shall conform to MIL-C-46168, color Olive Drab 34087.

3.3.4 Texturing of coating. Texturing aggregate incorporated in the second coat (see 3.4.10.3) for the outer surface of the helmet shell shall be silica sand or walnut shell flour.

3.3.4.1 Sand texturing. The aggregate for sand texturing shall be banded silica sand, water washed and kiln dried, free of salts and deleterious matter, and containing not more than 1.5 percent of dirt or foreign matter. The sand aggregate shall be that known commercially as No. 70 and shall have a screen analysis as follows:

| <u>Sieve No. (U.S. Standard)</u> | <u>Percent Accumulated</u> |
|----------------------------------|----------------------------|
| No. 40 | 0.5 maximum |
| No. 50 | 6.0 \pm 3 |
| No. 70 | 34.0 \pm 5 |
| No. 100 | 82.0 \pm 5 |
| No. 140 | 97.0 \pm 3, - 5 |

The coating-sand mixture shall contain 6 pounds of sand to one base gallon of coating and shall be reduced to spraying consistency.

3.3.4.2 Walnut shell flour texturing. The aggregate for walnut shell flour texturing shall be 40/100 mesh walnut shell flour. The coating-walnut shell flour mixture shall contain 10 ounces of walnut flour to one base gallon of coating and shall be reduced to spraying consistency.

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3.3.4.3 Replacement attachment strip kit. The replacement attachment strip kit shall consist of the following:

Attachment Strip, Part No. 8-2-601-3 - 1 each
Adhesive Pack^{1/} - 1 each
Paper Instruction Label (see 3.3.4.3.1) - 1 each

^{1/} The adhesive pack shall be a two-part polyurethane, black in color, of A-85 Shore hardness, and 3.5 grams per pack net weight (see 6.6).

3.3.4.3.1 Paper, identification and instruction label. The label paper shall be a white commercial quality writing or printing paper having a minimum basis weight of 20 pounds (17 by 22/500). Printing shall be black. Size of characters shall be approximately 1/8 inch high for the instruction label and approximately 1/4 inch high for the identification label. The contents of the label shall be as follows with the identification label first:

(Identification label contents)

Item description
Contract number
Stock number
Contractor's name

Instructions for use of replacement attachment strip kit:

1. Kit contents:

- a. Attachment strip - 1 each
- b. Adhesive pack (with mixing stick) - 1 each

2. Install replacement attachment strip on helmet as follows:

- a. Abrade the inner section of the helmet in the area where the previous attachment strip was located using 80 grit aluminum oxide abrasive cloth (NSN 5350-00-192-5047) to the point of leaving a rough surface.
- b. Wash abraded area with a lint free cotton cloth wet with denatured ethyl alcohol.
- c. Allow to air dry for 5-10 minutes.

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- d. Mix the adhesive pack components following directions on the packet.
- e. Apply the mixed adhesive to the back (smooth) side of the attachment strip and to the abraded area in the helmet.
- f. Set attachment strip in place and allow to remain untouched for 15-20 minutes.

3.3.4.4 Replacement attachment tab kit. The replacement attachment tab kit shall consist of the following:

| | |
|---|----------|
| Attachment Tab, Part No. 8-2-604 | - 1 each |
| Screw, Item 7, Drawing 8-2-601 | - 1 each |
| Washer, Item 8, Drawing 8-2-601 | - 1 each |
| Post, Part No. 8-2-610 | - 1 each |
| Paper Instruction Label (see 3.3.4.4.1) | - 1 each |

3.3.4.4.1 Paper, identification and instruction label. The paper and printing requirements shall be as specified in 3.3.4.3.1. The contents of the label shall be as follows with the identification label first:

(Identification label contents)

Item description
Contract number
Stock number
Contractor's name

Instructions for use of replacement attachment tab kit:

1. Kit contents:

- a. Attachment tab - 1 each
- b. Screw - 1 each
- c. Washer - 1 each
- d. Post - 1 each

2. Install replacement tab on helmet shell as follows:

- a. Install post through tab eyelet and place washer on post. Align tab eyelet and post with hole in shell. Snap fastener socket on tab must face inward.

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b. Install washer on screw and apply thread sealing compound (NSN 8030-00-058-5398) to screw threads. Insert screw through helmet shell and thread into post. Screw head shall be on outside of helmet.

3.3.5 Instruction manual. An instruction manual shall be furnished by the contractor with each helmet. The manual shall be placed into the crown of the helmet. The printing, collation, folding, and stitching of the manual shall be in accordance with the standard sample (see 6.4). The cover shall be antique white book paper conforming to Joint Committee Printing-A-100, 140 pound basis weight 25 by 38 inches per 1,000 sheets. The text paper shall be white offset book paper conforming to JCP-A-60, 120 pound basis weight 25 by 38 inches per 1,000 sheets.

3.3.6 Identification labels.

3.3.6.1 Helmet shell. Each helmet shell shall have a durable type identification label applied to the interior surface of the helmet shell in the location shown on Drawing 8-2-601. The label shall be white, approximately 1 by 2 inches in size, and the characters shall be black, 3/32 inch high minimum. The label, after being applied to the helmet, shall be coated with clear lacquer or resin. The label shall have the following information:

Nomenclature
Size
Contract number
Lot number
Contractor

3.3.6.2 Inner helmet. The inner helmet shall have an identification label attached to the nape strap in accordance with requirements specified on Drawing 8-2-613.

3.3.6.3 Special marking, helmet shell and inner helmet. In addition to the markings required on the labels specified in 3.3.6.1 and 3.3.6.2 for the helmet shell and inner helmet, the labels shall include, using characters 3/32 inch high, the following information with the blanks filled in for the specific contract: "Manufactured under license agreement granted U.S. Government pursuant to Contract No. _____ with _____ (corporation) ."

3.4 Construction. The construction shall conform in all respects to Drawings 8-2-57, 8-2-524, 8-2-600 through 8-2-607, 8-2-610 through 8-2-618, 8-2-658, 8-2-659, 8-2-661, and 8-2-830 and as specified herein.

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3.4.1 Helmet shell. The helmet shell shall be a laminated structure composed of resin coated reinforcing material compression molded by heat and pressure. The reinforcing material specified in 3.3.1 shall be coated on both sides with equal amounts of the laminating resin specified in 3.3.1.1 (see 4.4.1.2). The resin content of the coated reinforcing material shall be 15 to 18 percent solids by weight (volatile free) based on the uncoated reinforcing material weight.

NOTE: A sample of coated material that has been subjected to 320°F for 5 minutes in a forced air circulating oven is considered as being volatile free.

3.4.1.1 Forming of shell before molding. Forming of the helmet shell shall be accomplished using either pinwheel preforms or a combination of pinwheel preforms and rectangular panels. For either method, metallic fastening devices, such as staples, are not permitted unless they are in the trim area. Application of resin shall not be permitted in this operation. Spot welding or sewing with thread is permitted provided that evidence of these methods is not visible on the outside surface of the finished helmet.

3.4.1.1.1 Pinwheel preform construction. The pinwheel preforms shall be similar in configuration to that shown on Drawing 8-2-661 but may vary in size. The pinwheels shall each be one continuous, integral piece of fabric. To facilitate forming of the preform, the pinwheels may be cut up to within 2 1/2 inches of the center point of the pinwheel, leaving an uncut area measuring a minimum of 5 inches across in any direction. There shall be no more than eight legs, of approximately equal dimensions, on each pinwheel. A maximum of one pinwheel, other than the innermost or outermost preform layer, may be formed by using 2 half pinwheels joined together with a minimum 3 inch by 5 inch rectangle of the same material used for the pinwheels. The 5 inch dimension shall be centered and parallel to the butted joint of the 2 half pinwheels. This segmented pinwheel layer may be located anywhere within the preform layup. The pinwheel preforms shall be assembled with crown plies, if necessary, similar to Drawing 8-2-661 so that there are not less than 9 layers of fabric throughout any cross-sectional area of the shell. The pinwheel preforms shall be superimposed over each other such that the gaps of each layer are offset from the gaps of all other layers. Gaps in the pinwheel preforms shall not exceed 3/32 inch in width. There shall be no pleat, wrinkle, or crease greater than 1/2 inch width. Any pleat, wrinkle, or crease 1/2 inch or less in length shall be smooth.

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3.4.1.1.2 Combination pinwheel preform and rectangular panel construction. The combination pinwheel preform and rectangular panel construction shall consist of a single outer and a single inner fabric layer of pinwheel construction with rectangular panels sandwiched between. The panels shall be rectangular in shape, cut in the warp and filling direction, and the size may vary providing that no dimension is less than 3 inches. In addition to rectangular panels, the crown may contain circular or oval-shaped plies providing that the radius to any point on the periphery is not less than 2 1/2 inches. The individual preform layers shall be superimposed over each other such that the gaps of any two adjacent layers are offset by a minimum of 1/2 inch. The panels shall be laid up so that there are not less than 9 layers of fabric, including the inner and outer pinwheel layers, throughout any cross-sectional area of the shell. There shall be no pleat, wrinkle or crease greater than 1/2 inch in length. Any pleat, wrinkle, or crease 1/2 inch or less in length shall be smooth.

3.4.1.1.3 Approval of helmet shell preform. Prior to beginning production under any contract, the following shall be submitted to the contracting activity for examination for compliance to the specified requirements:

- a. One complete set of individual pieces to be used to form on preform assembly for each size helmet.
- b. One completely assembled preform for each size helmet for which the pieces were furnished in 3.4.1.1.3.a.
- c. One completely finished helmet shell of each size being procured made from like cut parts furnished in 3.4.1.1.3.a.

Approval by the Government of the individual pieces and the preform assembly required above will authorize the contractor to use his preforming method in production. Approval of the preforming method does not relieve the contractor from meeting any of the requirements specified herein. Any changes to the preforming method shall require reapproval.

3.4.1.2 Molding of shell. The shell shall be formed during a single molding cycle, which is defined as the time between the closing and opening of the mold one time only (breathing, degassing, or pinching off is not considered opening or closing the mold in this context). The shell shall not be remolded after this single molding cycle. The outer and inner surfaces of the molded shell shall be smooth. Both the inside and outside surfaces shall be free from any hole, void, delamination, pimple, blister, cracking, crazing, dry spot, area of non-resin flow, and also any pit greater than 1/8 inch in diameter and greater than the depth of one ply. Permissible gaps and pits

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shall be filled with epoxy resin composition to provide smooth and continuous surfaces on both surfaces of the shell. There shall be no pleat, wrinkle, or crease on the inside or outside of the helmet shell, except as allowed in 3.4.1.1.1 or 3.4.1.1.2. Before further processing is undertaken, the contractor is responsible for 100 percent inspection immediately after the molding cycle for delamination and blisters (see 4.4.2.2). Delaminations and blisters, as well as evidence of delaminations and blisters, are not acceptable; neither is any shell that contains a delamination or blister as a result of the molding operation that was modified by any means prior to finishing.

3.4.1.3 Holes for attachment of components. Holes for attaching the helmet components shall be drilled; this shall be accomplished before finishing. There shall be no delamination of the shell material as a result of the drilling operation.

3.4.2 Stitching. All stitching shall be as specified on the applicable drawings and as specified herein.

3.4.3 Type 301 stitching. Unless otherwise specified, ends of all stitching shall be backstitched or overstitched 1/2 inch minimum, except where ends are turned under in a hem or held down by other stitching. Thread tension shall be maintained so that there will be no loose stitching resulting in loose bobbin or top thread, or no excessively tight stitching resulting in puckering of the sewn materials. The bottom and top thread interlock shall be embedded in the sewn materials.

3.4.4 Repairs of type 301 stitching. Repairs of type 301 stitching shall be as follows:

a. When a thread break or bobbin run-out occurs during sewing, the stitching shall be repaired by restarting the stitching a minimum of 1/2 inch back from the end of the stitching. 1/

b. Any thread break, or two or more consecutive skipped or run-off stitches noted during inspection of the item (in-process or end item) shall be repaired by overstitching. The stitching shall start a minimum of 1/2 inch in back of the defective area, continue over the defective area, and continue a minimum of 1/2 inch beyond the defective area onto the existing stitching. Loose or excessively tight stitching shall be repaired by removing the defective stitching, without damaging the materials, and restitching in the required manner. 1/

1/ When making the above repairs, the ends of the stitching are not required to be backstitched.

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3.4.5 Bartacking. Unless otherwise specified, bartacks, if used, shall be $3/4 \pm 1/16$ inch long, $1/8 \pm 1/32$ inch wide, and contain 42 stitches per bartack. Bartacking shall be free of thread breaks and loose stitching.

3.4.6 Automatic stitching. Automatic stitching machines may be used to perform any of the required stitch patterns provided the requirements for the stitch pattern, stitches per inch, size and type of thread are met, and at least three or more tying, overlapping, or back stitches are used to secure the ends of the stitching.

3.4.7 Thread ends. All thread ends shall be trimmed to a length of not more than $1/4$ inch.

3.4.8 Setting of snap fasteners. On all textile and leather components, the holes punched before inserting the male or female part of the snap fasteners shall be smaller than the outside diameter of the fastener barrel so that the barrel must be forced through the hole. The fasteners shall be securely clinched without cutting the adjacent material, and no more than two splits shall occur in the button on the eyelet barrel.

3.4.9 Finish of hardware. Hardware components specified to be finished black on the applicable drawings shall be uniformly coated and free from flaking.

3.4.10 Finish of helmet shell and attachment of edge beading.

3.4.10.1 Outside surface preparation. Prior to attachment of edge beading and application of protective coating, all permissible surface gaps and pits on the outside surface of the helmet shell shall be filled with epoxy resin composition to provide a smooth and continuous surface. Cutting and filling of blisters of any size is not permissible. The outside surface of the shell shall be prepared for painting as required in order to meet the performance requirements specified in 3.5.7. If abrasion is included in surface preparation, abrading to the point where the aramid cloth fibers become visibly cut and raised shall be prohibited and dust from the abrading operation shall be completely removed before application of the coating. The prepared surface shall not be allowed to become contaminated by oil, grease, dust or other foreign matter prior to coating.

3.4.10.2 Attachment of edge beading. The edge beading shall be attached to the helmet shell as specified on Drawing 8-2-601. The beading shall be attached after the outside surface of the helmet shell has been prepared for finishing as specified in 3.4.10.1. The beading shall be masked off prior to performance of the finishing operation specified in 3.4.10.3.

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3.4.10.3 Coating of helmet shell outer surface. Following the surface preparation specified in 3.4.10.1 and attachment of edge beading specified in 3.4.10.2, one or more coats of the coating specified in 3.3.4 shall be applied to the outside surface of the helmet shell. The coating shall completely and uniformly cover the shell surface. A coat of the same coating containing the texturing aggregate specified in 3.3.4 shall be applied uniformly on the outside surface of the helmet shell. The finishing equipment shall be capable of applying the texturing aggregate coating mixture without settling of the texturing aggregate, clogging of nozzle or lines, or other condition that would produce a nonuniform appearance.

3.4.11 Earcups. Seals shall be replaceable and manufactured from polyurethane film.

3.4.12 Spring device. A spring steel yoke that provides a means of applying force on the earcups toward the wearer's head shall be provided.

3.5 Performance.

3.5.1 Ballistic resistance. The V_{50} ballistic limit for each helmet shell shall be not less than 1,400 feet per second when tested as specified in 4.4.5.

3.5.2 Impact resistance. The helmet assembly shall not transmit an impact energy impulse to a standard headform accelerometer in excess of 75 G when tested as specified in 4.4.5.

3.5.3 Sound attenuation. The helmet assembly shall meet the minimum acoustical attenuation values listed in table I when tested as specified in 4.4.5.

TABLE I. Sound attenuation

| Octave band center frequency (Hz) | Real ear attenuation (dB) |
|--------------------------------------|------------------------------|
| 125 | 14 |
| 250 | 16 |
| 500 | 21 |
| 1,000 | 23 |

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TABLE I. Sound attenuation - Continued

| Octave band center frequency (Hz) | Real ear attenuation (dB) |
|--------------------------------------|------------------------------|
| 2,000 | 28 |
| 3,150 | 35 |
| 4,000 | 35 |
| 6,300 | 35 |
| 8,000 | 30 |

3.5.4 Adhesion of the shell edge beading before aging. The edge beading shall remain firmly bonded to the shell when tested as specified in 4.4.5. Unbonded areas up to a total of two inches in length are acceptable, providing no individual unbonded area is more than 1/2 inch in length and 1/8 inch in width. There shall be a minimum distance of 1/2 inch between any two unbonded areas.

3.5.5 Adhesion of the shell edge beading after aging. When tested as specified in 4.4.5, the edge beading shall not peel back more than 1/4 inch from the helmet shell.

3.5.6 Communication equipment operation. The communication equipment (headset-microphone assembly), after installation in the helmet, shall function satisfactorily when tested as specified in 4.4.5.

3.5.7 Water immersion. The coating on the outside surface of the helmet shell shall show no evidence of softening, peeling, or blistering when tested as specified in 4.4.5.

3.6 Repairs. Except as otherwise specified herein, repairs are not allowed to be made to the helmet assembly.

3.7 Replacement of defective components. During the spreading, cutting, and manufacturing process, textile and leather components having material defects or damages that are classified as defects in 4.4.2.5 and 4.4.3 shall be removed from production and replaced with nondefective components.

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3.8 Workmanship. The finished helmet assembly shall conform to the quality of product established by this document. The occurrence of defects shall not exceed the specified quality levels.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in this document where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items must meet all requirements of sections 3 and 5. The inspection set forth in this document shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirement in the document shall not relieve the contractor of the responsibility of assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

4.1.2 Certificates of compliance. When certificates of compliance are submitted, the Government reserves the right to inspect such items to determine the validity of the certification.

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

- a. First article inspection (see 4.3).
- b. Quality conformance inspection (see 4.4).

4.3 First article inspection. When a first article is required (see 6.2), it shall be examined for the defects specified in 4.4.2.5, 4.4.3, and 4.4.4 and tested for the characteristics specified in table VII. The presence of any defect shall be cause for rejection of the first article.

4.4 Quality conformance inspection. Unless otherwise specified, sampling for inspection shall be performed in accordance with MIL-STD-105.

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4.4.1 Component and material inspection. In accordance with 4.1, components and materials shall be inspected in accordance with all requirements of referenced documents unless otherwise excluded, amended, modified, or qualified in this document or applicable purchase document.

4.4.1.1 Testing of components. In addition, the components listed in table II shall be examined for all dimensions. The sample unit shall be as designated in table II. The sample size shall be as shown below. Any measurement not conforming to the specified dimension shall be cause for rejection of the applicable component lot.

| <u>Lot size</u> | <u>Sample size</u> |
|--------------------------------|--------------------|
| 800 or less | 2 |
| 801 up to and including 22,000 | 3 |
| 22,001 and more | 5 |

TABLE II. Inspection of components for dimensions

| Component | Dimensional requirement of Drawing | Number of determinations per unit | Results reported numerically to nearest | Sample unit |
|---------------------|------------------------------------|-----------------------------------|---|-------------|
| Buckle | 8-2-605 | <u>1</u> / | <u>2</u> / | 1 buckle |
| Post | 8-2-610 | <u>1</u> / | <u>2</u> / | 1 post |
| Beading, shell edge | 8-2-607 | <u>1</u> / | <u>2</u> / | 1 yard |

1/ One determination shall be made for each specified dimension.

2/ Results shall be reported to the nearest 0.001 inch or 1/64 inch, as applicable.

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4.4.1.2 Certification. The contractor shall furnish a certificate of compliance with each shipment or lot certifying the following:

a. That all adhesives, materials and components for which the requirements are not covered by a federal specification, military specification, or military standard conform to the requirements specified herein and on the applicable drawing.

b. That the laminating resin used is a catalyzed system composed of 50 percent phenol formaldehyde and 50 percent polyvinyl butyral resins as specified in 3.3.1.1.

c. That the distribution and amount of resin coating meets the requirements specified in 3.4.1.

4.4.2 In-process inspection. Inspection shall be made during the manufacturing process to determine whether cut lengths and sizes of cut parts of the components in table III conform to the applicable patterns or specified dimensional requirements. In addition, inspection shall be made during the manufacturing process to ensure that holes prepunched in textile and leather components for installation of snap fasteners are prepunched smaller than the outside diameter of the snap fastener barrel and that application of adhesives where required is uniform. In-process inspection shall be performed on the individual layers that will be used to form an assembled preform and also on preform assemblies before molding to verify compliance with the Government approved method and the requirements specified in 3.4.1.1.1 or 3.4.1.1.2, as applicable. Whenever nonconformance is noted, corrections shall be made to the affected parts and in-process lot. Components that cannot be corrected shall be removed from production.

TABLE III. In-process inspection

| Examine | Component | Drawing or part number |
|----------------------|-------------------------------|------------------------|
| Specified dimensions | Pads, chin strap pad assay | 8-2-611-1 |
| | Netting, chin strap pad assay | 8-2-611-2 |
| | Cover, chin strap pad assay | 8-2-611-3 |
| | Ring, earcup securing | 8-2-612 |
| | Pull tab, chin strap | 8-2-615 |

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TABLE III. In-process inspection - Continued

| Examine | Component | Drawing or part number |
|--------------------|----------------------------------|------------------------|
| Cut size or length | Straps, chin strap assay | 8-2-603-1 and -2 |
| | Tabs, snap fastener | 8-2-606-3 and -4 |
| | Panels, inner helmet | 8-2-602 |
| | Pads, inner helmet ^{1/} | 8-2-617 |

^{1/} Inspection of the inner helmet pads shall also include inspection for the specified thickness.

4.4.2.1 Mold and hole location authorization. Prior to beginning production under any contract (see 6.2), one helmet shell produced from each mold shall be submitted directly off the mold (with the only finishing operation being drilled holes) to the contracting activity for examination for conformance to the specified shell dimensions and hole locations. Approval of the shell will authorize that mold for use in production under that contract. Any change to the mold, drilling process, molding process, or materials shall require reauthorization.

4.4.2.2 Visual examination of helmet shell prior to finishing (immediately off the mold). Every helmet shell prior to the finishing operation shall be examined for any evidence of a blister or delamination. Any blister or delamination, as well as any evidence of a blister or delamination that was modified by any means after molding (see 3.4.1.2), shall be classified as a defect and the shell shall be rejected. At its discretion, the Government may verify the results of the contractor's examination by 100 percent examination or by sampling inspection. The Government may, at its discretion, reject the lot immediately when one defective helmet shell is found.

4.4.2.3 Dimensional examination of helmet shell production lots after drilling of holes. The helmet shell shall be examined to determine if the shell thickness ^{1/}, hole locations ^{2/}, hole diameters, peripheral contour ^{3/}, and inside height dimensions ^{4/} conform to the dimensional requirements specified on Drawing 8-2-830. Any of these dimensions exceeding the specified tolerance shall be classified as a defect. The lot shall be expressed in units of helmet shells of one size only. The sample unit shall

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be one helmet shell after drilling of holes (without rubber edging). The inspection level shall be S-1, and the acceptable quality level (AQL), expressed in terms of defects per hundred units, shall be 6.5 (see 5/).

- 1/ The thickness of the helmet shell shall be measured to the nearest 0.001 inch at five different locations. One measurement shall be taken at the approximate top center of the helmet and the other four measurements shall be taken in the approximate center of each of the four quadrants not less than 3 1/2 inches from the top center. All five measurements shall be averaged. The averaged thickness not within tolerance shall be scored as a defect.
- 2/ Reference Drawing 8-2-830. Chord dimensions between holes, taken from the inside of the helmet shell, shall be checked and any failure to conform to any of the dimensions specified on Drawing 8-2-830 shall be scored as a defect. Dividers should be used in measuring the chord distance from the bottom of the holes to the bottom of the holes involved.
- 3/ The peripheral contour dimensions shall be checked by measuring the inside length of the helmet between the points at 0° and at 180° as shown on Drawing 8-2-830. The inside width shall be measured between the points at 90° and 270° as shown on Drawing 8-2-830. Any failure to conform to any of the dimensions specified on Drawing 8-2-830 shall be scored as a defect.
- 4/ If all ten benchmarks appear on the helmet shell, the measurement of the height dimension is not necessary.
- 5/ For each production lot of helmet shells, the contractor shall furnish a certificate of compliance certifying that the manufacturing process, materials, and molds or dies have not been changed from that used in the initial production lot.

4.4.2.4 Visual examination of helmet shells prior to application of coating and edge beading. The helmet shell shall be examined for the defects listed in table IV. The lot shall be expressed in units of helmet shells of one size only. The sample unit shall be one helmet shell before application of coating and edge beading. The inspection level shall be II and the AQL, expressed in terms of defects per hundred units, shall be 2.5 for major defects and 6.5 for total defects.

NOTE: When an asterisk appears in the major defects column, the defect shall be classified as follows:

- Major - When seriously affecting appearance or serviceability.
- Minor - When not seriously affecting appearance or serviceability.

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TABLE IV. Visual examination of helmet shells prior to application of coating

| Examine | Defect | Classification | |
|---|--|----------------|-------|
| | | Major | Minor |
| Helmet shell (exterior and interior) | Any fabric fibers visibly cut or raised on the shell body except along edge | * | |
| | Any surface dent, depression, or area not smooth | * | |
| | Any delamination, pimple, or blister | X | |
| | Any evidence of cracking | * | |
| | Any evidence of dry spot, any area of nonresin flow or other molding deficiency | * | |
| | Any cloth gap, any pit except those specified as permissible (see 3.4.1.1.1, 3.4.1.1.2, and 3.4.1.2) | X | |
| | Any raised pleat or wrinkle or crease (groove) longer than 1/2 inch but less than 1 inch | | X |
| | Any raised pleat or wrinkle or any crease 1/2 inch or less in length that is not smooth | | X |
| | Any raised pleat or wrinkle or any crease 1 inch or longer | X | |
| | Any permissible gap or pit not resin filled as specified (see 3.4.1.2) | | X |
| | Any unauthorized repair or reworking | X | |
| | Any evidence of metallic fasteners | X | |
| | Any benchmarks omitted or obliterated ^{1/} | | X |
| ^{1/} There are ten benchmarks: 5 inside and 5 corresponding benchmarks on the outside of the helmet shell. | | | |

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4.4.2.5 Visual examination of inner helmet prior to installation of pads and headset. The inner helmet shall be examined for the defects listed in table V. The lot shall be expressed in units of inner helmets of one size only. The sample unit shall be one inner helmet prior to installation of pads and headset. The inspection level shall be II, and the AQL, expressed in defects per hundred units, shall be 2.5 for major defects and 10.0 for total defects.

TABLE V. Visual examination of inner helmet

| Examine | Defect | Classification | |
|---------------------------------|---|----------------|-------|
| | | Major | Minor |
| Webbing | Any hole, cut, tear, or frayed edge | X | |
| | Edges scalloped, not firmly and tightly woven | | X |
| | Ends not dipped as required | | X |
| | Needle chews: | | |
| | - 1/8 inch or more in length | X | |
| | - up to 1/8 inch in length | | X |
| Fastener tape | Any hole, cut, or tear | X | |
| | Hooks flattened or missing, impairing function | X | |
| Cloth, netting | Any cut or tear | X | |
| Cloth, simplex | Any hole, cut, tear, or needle chew | X | |
| Cloth, oxford (edge binding) | Any hole, cut, tear, or needle chew | X | |
| | Any abrasion marks, broken or missing yarns, or multiple floats | | X |
| Leather | Cut, hole, or tear | X | |
| | Finish flaky, peeling, or cracked | X | |
| | Grain surface of leather not facing outside | X | |
| | Deep scratch, heavy vein, or abraded area | | X |
| | Color not as specified | | X |

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TABLE V. Visual examination of inner helmet - Continued

| Examine | Defect | Classification | |
|--|---|----------------|--------------|
| | | <u>Major</u> | <u>Minor</u> |
| Hardware | | | |
| General | Broken or malformed; corroded areas; burrs or sharp edges | X | |
| | Finish omitted or not as specified, where required | X | |
| | Any required component improperly installed causing failure to serve intended purpose | X | |
| Snap fastener | Clinched excessively tight, cutting adjacent material | X | |
| | Clinched loosely, permitting any component to rotate freely | X | |
| NOTE: Inspect for a loosely clinched stud and eyelet by grasping the stud between the thumb and index fingers and determine if the stud can be rotated freely. Inspect for a loosely clinched button and socket by grasping the button and socket with the fingers of the left and right hands and determine if either can be rotated freely. If either the stud, button, or socket can be rotated freely, a defect shall be scored. | | | |
| | Incorrect style | X | |
| | Three or more splits in eyelet or button barrel | | X |
| | Any fastener on chin strap or on inner helmet for attaching chin strap not functioning properly (i.e. fails to snap closed, provide a secure closure, or open freely) | X | |

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TABLE V. Visual examination of inner helmet - Continued

| Examine | Defect | Classification | |
|---|---|----------------|--------------|
| | | <u>Major</u> | <u>Minor</u> |
| Seams and stitching | | | |
| Open seams | More than 1/2 inch 1/2 inch or less | X | X |
| NOTE: A seam shall be classified as open when one or more stitches joining a seam are broken or when two or more consecutive skipped or run-off stitches occur. | | | |
| Seams and stitch types | Wrong seam or stitch type | X | |
| Stitch tension | Loose, resulting in loose bobbin or top thread Locks not embedded in the material Excessively tight, resulting in puckering of material | | X X X |
| Stitches per inch | Two or more stitches less than minimum specified One stitch less than minimum specified | X | X |
| Thread breaks, skipped stitches, or run-offs | Overstitched less than 1/2 inch in each direction beyond defective stitching area | | X |
| NOTE: Thread breaks or two or more consecutive skipped or run-off stitches not overstitched shall be classified as open seams. | | | |
| Stitching ends | Not secured as specified (except when caught in other stitching) | | X |

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TABLE V. Visual examination of inner helmet - Continued

| Examine | Defect | Classification | |
|-----------------------------|--|----------------|-------|
| | | Major | Minor |
| Rows of stitching | Any row missing except on box-x stitching | X | |
| | - two or more rows omitted on box-x stitching | X | |
| | - one row omitted on box-x stitching | | X |
| Components and assembly | Any required component or operation omitted (unless otherwise classified herein) | X | |
| | Any component misplaced or not assembled as specified | X | |
| | Number of folds at ends of webbing, where required, less than number specified | | X |
| | Any unauthorized repair | X | |
| Binding | Loosely applied but not exposing raw edge of netting | | X |
| | Loosely applied exposing raw edge of netting | X | |
| Cleanness | Grease or oil stains clearly noticeable; thread ends not trimmed throughout as specified | | X |
| Color or textile components | Color of any component not as specified | | X |
| Identification label | Omitted, incorrect, illegible, not coated, or not as specified | | X |

4.4.2.6 Dimensional examination of inner helmet prior to installation of pads and headset. The inner helmet shall be examined for compliance with all dimensions shown on the applicable drawings including stitch margins and gage. Any dimension exceeding the applicable tolerance shall constitute a defect.

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The lot shall be expressed in units of inner helmets of one size only. The sample unit shall be one inner helmet prior to installation of pads and headset. The inspection level shall be S-3 and the AQL, expressed in terms of defects per hundred units, shall be 6.5.

4.4.3 End item visual examination of the completed helmet assembly. The helmet assembly shall be examined for the defects listed in table VI. The lot shall be expressed in units of complete helmet assemblies of one size only. The sample unit shall be one helmet complete with all components. The inspection level shall be II, and the AQL, expressed in terms of defects per hundred units, shall be 2.5 for major defects and 10.0 for total defects.

TABLE VI. End item visual examination

| Examine | Defect | Classification | |
|-------------------------------------|---|----------------|-------|
| | | Major | Minor |
| Exterior finish coating of shell | Any scuffed area or scratch | | X |
| | Thin film (shell showing through) | | X |
| | Finish wet or tacky to the touch | X | |
| | Coating: | | |
| | - texturing aggregate omitted | X | |
| | - texturing aggregate not uniformly distributed | | X |
| | - texturing aggregate overrun extending onto interior surface of shell | | X |
| | Coating furrows, flakes, or peels when scratched with the fingernail | | X |
| | Blemish, such as peeling, blistering, or flaking | X | |
| | Not a smooth, uniform coating (i.e., run or sag affecting an area more than one square inch) 1/ | | X |
| | Foreign matter (such as dirt, stain, oil, or grease) embedded in or appearing on the finish | | X |
| | Color of finish not as specified | X | |
| | Any unauthorized repair | X | |

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TABLE VI. End item visual examination - Continued

| Examine | Defect | Classification | |
|--|--|----------------|--------------|
| | | <u>Major</u> | <u>Minor</u> |
| Shell edge beading | Any cut, tear, or hole | X | |
| | Not fully positioned over edge of helmet shell | X | |
| | Any area not adhered to shell greater than 1/2 inch in length and 1/8 inch in width | | X |
| | Several unadhered areas the total length of which are 2 inches or more in length or any two unadhered areas less than 1/2 inch apart | X | |
| | Ends not butted together: | | |
| | - open by more than 1/8 inch | X | |
| | - open by 1/16 inch up to 1/8 inch | | X |
| | Coated with helmet shell finish | | X |
| | Excessive glue on beading or helmet shell | | X |
| Snap fasteners (applicable to snaps for attaching inner helmet to shell) | Any fastener not functioning properly (i.e. fails to snap closed, provide a secure closure or to open freely) | X | |
| | Clinched excessively tight, cutting webbing | X | |
| | Clinched loosely, permitting either component to rotate freely | X | |
| | Incorrect style | X | |
| Screws, posts, and washers on helmet shell | Any screw not securely tightened | | X |
| | Any screw too tight, causing cutting or crushing of shell | X | |
| | Post on outside surface of shell in lieu of inside | | X |
| | Washer omitted | | X |
| | Any burr or sharp edge | X | |
| | Not finished (when applicable) | | X |
| | Corroded | | X |

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TABLE VI. End item visual examination - Continued

| Examine | Defect | Classification | |
|---|---|----------------|-------|
| | | Major | Minor |
| Attachment tabs on helmet shell | Any hole, cut, tear, or frayed edge | X | |
| | Scalloped edges, not firmly and tightly woven | | X |
| | Ends not dipped as required | | X |
| | Ends not double folded | X | |
| Fastener tape on helmet shell | Any hole, cut, or tear | X | |
| | Any area not firmly adhered to shell | X | |
| Headset assembly | Any wire cut, cracked, or abraded | X | |
| | Earcups not installed in inner helmet as specified | X | |
| | Any component omitted, cracked, chipped, broken, bent, or malformed | X | |
| Pads, inner helmet | Any pad installed with dimpled or scored surface of pad facing outside in lieu of inside or any pad with pimpled or scored surface omitted | | X |
| Replacement attachment strip/tab kits | Any required component missing or not as specified | X | |
| | Label printing not as specified | | X |
| | Label content not as specified: - identification label | X | |
| | - instruction label | | X |
| | Label content not in specified sequence | | X |
| Identification label on helmet shell | Omitted, incorrect, illegible, or not as specified | | X |
| Instruction booklet | Omitted, printing on figures illegible, any page omitted | | X |

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- 1/ The helmet shell shall be examined from a distance of approximately 3 feet.

4.4.4 End item dimensional examination of completed helmet assembly. The attachment tabs and fastener tape on the helmet shell shall be examined for dimensional defects. The sample unit shall be one complete helmet assembly. The lot shall be expressed in terms of complete helmet assemblies of one size only. Any dimension exceeding the applicable tolerance shall constitute a defect. The inspection level shall be S-3 and the AQL, expressed in terms of defects per hundred units, shall be 4.0.

4.4.5 End item testing. The complete helmet assembly shall be tested for the characteristics listed in table VII. The lot shall be expressed in units of helmets of one size only. The sample unit shall be one complete helmet assembly.

TABLE VII. End item tests

| Characteristic | Requirement | Test method | Inspection level | AQL (Defects per hundred units) |
|--|-------------|-------------|------------------|------------------------------------|
| Ballistic resistance <u>1/ 2/</u> | 3.5.1 | 4.5.2 | S-2 | <u>3/</u> |
| Impact resistance <u>4/</u> | 3.5.2 | 4.5.8 | S-2 | 2.5 <u>5/</u> |
| Sound attenuation <u>4/</u> | 3.5.3 | 4.5.6 | S-2 | 2.5 <u>5/</u> |
| Adhesion of beading before aging <u>2/</u> | 3.5.4 | 4.5.3 | S-2 | 2.5 |
| Adhesion of beading after aging <u>2/</u> | 3.5.5 | 4.5.4 | S-2 | 2.5 |

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TABLE VII. End item tests - Continued

| Characteristic | Requirement | Test method | Inspection level | AQL (Defects per hundred units) |
|-----------------------------------|-------------|-------------|--------------------|------------------------------------|
| Communication equipment operation | 3.5.6 | 4.5.7 | 100 percent of lot | <u>6/</u> |
| Water immersion <u>7/</u> | 3.5.7 | 4.5.5 | S-1 | 2.5 |

- 1/ The helmet shell only shall be used for ballistic testing. The inner helmet assembly shall be refitted with a new shell and put back into the lot.
- 2/ Helmet shells used for ballistic resistance testing may also be used afterwards for the edge beading tests.
- 3/ Any test failure shall be cause for rejection of the lot.
- 4/ Testing for sound attenuation and impact resistance shall be the responsibility of the contractor. Acceptance of the first lot shall be deferred pending verification by the Government. The Government reserves the right to verify part of or all tests on subsequent lots. Testing laboratories used by the contractor shall be certified by the Government. Certification of the testing laboratories will be made based on comparison of test data furnished by the contractor on the first lot and the test data obtained by the Government during verification testing and, if considered necessary, by the witnessing of contractor testing (see 6.7).
- 5/ All test reports shall contain the individual values utilized in expressing the final result.
- 6/ Any helmet failing this test shall be rejected and removed from the lot.
- 7/ Helmet shells that pass the water immersion test may be reattached to the inner helmet assembly and returned to the lot.

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4.4.6 Packaging examination. The fully packaged end items shall be examined for the defects listed below. The lot size shall be expressed in units of shipping containers. The sample unit shall be one shipping container fully packaged. The inspection level shall be S-2 and the AQL, expressed in terms of defects per hundred units, shall be 2.5.

| <u>Examine</u> | <u>Defect</u> |
|---------------------------------|--|
| Marking (exterior and interior) | Omitted; incorrect; illegible; of improper size, location, sequence, or method of application |
| Materials | Any component missing, damaged, or not as specified |
| Workmanship | Inadequate application of components, such as incomplete sealing or closure of flap, improper taping, loose strapping, inadequate stapling, or load not bonded as specified Open and noncontinuous heat-sealed seams and closure of polyethylene bag Bulged or distorted container |
| Content | Number of helmets per shipping container is more or less than specified |

4.4.7 Palletization examination. The fully packaged and palletized end items shall be examined for the defects listed below. The lot size shall be expressed in units of palletized unit loads. The sample unit shall be one palletized unit load, fully packaged. The inspection level shall be S-1, and the AQL, expressed in terms of defects per hundred units, shall be 6.5.

| <u>Examine</u> | <u>Defect</u> |
|---------------------|--|
| Finished dimensions | Length, width, or height exceeds specified maximum requirement |
| Palletization | Pallet pattern not as specified Interlocking of loads not as specified Load not bonded with required straps as specified |
| Weight | Exceeds maximum load limits |
| Marking | Omitted; incorrect; illegible; of improper size, location, sequence, or method of application |

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4.5 Methods of inspection.

4.5.1 Test conditions. Unless otherwise specified, all tests shall be performed at $23^{\circ} \pm 2^{\circ}\text{C}$ ($73^{\circ} \pm 4^{\circ}\text{F}$) and relative humidity of 50 ± 5 percent, and the test samples shall be exposed to these conditions for at least 24 hours prior to test.

4.5.2 Ballistic resistance test. The ballistic resistance test shall be conducted in accordance with MIL-STD-662 except as specified in 4.5.2.1. The fragment simulating projectile shall be the .22 caliber, type 2 conforming to MIL-P-46593 except as modified by figure 1 of this document and it shall weigh $17 \text{ grains} \pm 0.25 \text{ grain}$. Test reports shall contain all individual values utilized in expressing the V50 ballistic resistance for each helmet. Any helmet having a V50 ballistic resistance below the requirement in 3.5.1 shall be considered a test failure.

4.5.2.1 Ballistic test method. The helmet shell shall be stored in the ballistic test chamber for not less than 24 hours prior to testing. The test area of the helmet shell shall be any area on the helmet. The impact points shall be a minimum distance of $1 \frac{1}{2}$ inches from each other and from any holes. An impact shall be invalid if the impact point is in an area of delamination caused by a previous impact. The helmet shall be rigidly mounted with the area of impact normal to the line of fire. The witness plate shall be rigidly mounted inside the helmet 2 inches behind the area of impact.

4.5.2.1.1 Barrel. The barrel shall be a .30 caliber rifled barrel with a one-in-sixteen twist. The barrel length shall be 28 inches. The barrel shall be chambered to accommodate firing the specified sabot.

4.5.2.1.2 Yaw card measurement system. A yaw card shall be used to determine yaw. The following procedure shall be employed:

a. Place the yaw card directly in front of the test sample with the emulsion side facing the sample. (The yaw card will be devoid of any markings. Kodak photographic paper, single weight, Kodabromide, or equal may be used for the yaw card.)

b. After the test, carefully measure the yaw card to determine the largest dimension of the hole caused by penetration of the projectile. An optical magnification device with a magnification between 5X and 10X shall be used for making this measurement. Compare this measurement to the X-axis on figure 3. The Y-axis of figure 3 will be used for determining the degree of the yaw.

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c. Measure yaw at intervals no less than those indicated below. When the barrel is new, a minimum of 25 shots shall be fired to break in the barrel. Measurement of the yaw shall be five successive shots at each interval.

Measurement Interval

1. After break-in period.
2. After 250 shots.
3. After 500 shots.
4. After 750 shots.
5. After 1,000 shots.
6. After 1,000 shots, every 100 shots thereafter.

d. In the event that any shot fired indicates yaw greater than 5° , it shall not be used to calculate V50 ballistic resistance and the barrel shall be rechecked for affect on yaw as follows: Fire five shots, if three shots exhibit yaw, discard the barrel. If one or two shots exhibit yaw, investigate cause and correct.

e. In case of dispute concerning a particular barrel, yaw shall be measured by a photographic measurement system using a multiflash light source to determine projectile velocity and yaw. Yaw will be measured by the system to an accuracy of 0.5 degree.

4.5.2.1.3 Sabot. A sabot shall be used in loading and firing the projectile. The sabot shall be manufactured to conform to figure 2. Load the projectile in such a manner that the whole body of the projectile is in the sabot except for the gas ring and so that the base of the projectile is in contact with the pusher plate (4.5.2.1.4).

4.5.2.1.4 Pusher Plate. A pusher plate shall be utilized and placed flush with the edge of the throat of the cartridge. The pusher plate shall have the following characteristics:

- a. Diameter - 0.304 inch (reference dimension)
- b. Thickness - 0.050 inch (reference dimension)
- c. Material - Aluminum, 7075T6 or 6061T6

4.5.2.1.5 Location of rifle, triggering devices, and target material. The following dimensions may be varied slightly to fit individual conditions and range arrangement, but the accuracy of measurements must be maintained. The first triggering device shall be located 5 feet forward of the rifle muzzle and perpendicular to the trajectory of the projectile. The second triggering device shall be 10 feet forward of the rifle muzzle. It is mandatory that the 5 foot separation between the first and second triggering devices be

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maintained to a tolerance of 0.0125 inch. The test item shall be 12.5 feet forward of the rifle muzzle and perpendicular to the trajectory of the projectile.

4.5.2.1.6 Ballistic limit protection, BL(P). The BL(P) for each test target material shall be the average of 10 fair impact velocities consisting of the five lowest velocity complete penetrations and the five highest partial penetration velocities, provided that the spread for the 10 velocities is no greater than 125 fps. In cases where the zone of mixed results (the highest partial penetration velocity is higher than the lowest complete penetration velocity) is greater than 125 fps, the BL(P) shall be the average of 14 fair impact velocities consisting of the seven lowest complete penetration velocities and the seven highest partial penetration velocities. If the 14-round limit cannot be attained within a velocity spread of 150 fps or less, retesting shall be required.

4.5.3 Adhesion of edge beading to helmet shell before aging. The adhesion of the edge beading shall be tested on both the outside and inside of the helmet shell around its entire periphery. The beading shall be considered unbonded when the edge can be rolled back on itself and away from the shell by applying force with the ball of the thumb. If the unbonded areas exceed the limitations specified in 3.5.4, the test shall be considered a failure.

4.5.4 Adhesion of edge beading to helmet shell after aging. The helmet shell shall be placed on its crown in a circulating air oven at $160^{\circ} \pm 5^{\circ}\text{F}$ for 4 hours minimum but for not more than 24 hours. The helmet shell shall then be removed from the oven and conditioned at the standard conditions specified in 4.5.1. After conditioning, the adhesion of the edge beading shall be tested as follows:

a. Perform the adhesion test in two separate areas, one at the approximate center of one of the ear sections and the other in the rear of the helmet shell.

b. Slice off the rounded portion of the edge beading with a sharp knife to expose the edge of the shell for a minimum distance of 2 inches. At one end of the cut, sever the remaining sides of the beading. Peel back the beading along the cut on both the inside and outside to form tabs $1/2 \pm 1/8$ inch in length.

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c. To one of the tabs, attach a 0.25 pound weight. Position and secure the helmet so that the weight pulls at a right angle to the plane of the bond line to be tested. Make suitable gage marks on the beading and shell for the measurement of the amount of peel back after completion of the test. Suspend the weight for a minimum of 1 hour and measure the amount of peel back of the tab to the nearest 1/16 inch. Test the other tab in the same manner.

d. The test shall be considered a failure if one or more of the tabs peels back in excess of the limitation specified in 3.5.5.

4.5.5 Water immersion of helmet shell. The helmet shell shall be immersed in tap water at 60° to 80°F for 16 hours minimum. At the expiration of this time, the helmet shell shall be removed and allowed to air dry or shall be forced air dried under the same temperature conditions. The coating on the outside surface of the helmet shell shall be examined, and any evidence of softening, blistering, or peeling of the finish shall constitute failure of the test.

4.5.6 Sound attenuation. Sound attenuation of the helmet shall be determined in accordance with ANSI S12.6-1984. Failure of the helmet to meet any of the values specified in 3.5.3 shall constitute failure of the test.

4.5.7 Communication equipment operations. The communication equipment shall be considered satisfactory if continuity is indicated when the helmet is tested with the switch on the left earcup of the helmet checked in both the center position and forward position. The test equipment shall incorporate the test circuit shown on Drawing 8-2-57.

4.5.8 Impact resistance. Each helmet tested shall be impacted with two identical impacts within one to two minutes of each other in seven locations as follows: Apex, right front, left front, right rear, left rear, right side, and left side. The included drop height shall be 18 inches, and the anvil shall be a 1.9-inch radius steel hemisphere. The impact area shall be a minimum of 1 inch above the peripheral edge of the helmet shell. In addition, the headform is to be so located, prior to mounting, that a tangent plane between the headform and hemisphere is as nearly horizontal as can be obtained for all seven impact sites. Acceptance is based on the maximum value of the fourteen impact results. Impact resistance shall be measured in accordance with the method of helmet testing as set forth in ANSI Z90.1 except as specified herein. The helmet test apparatus shall be of the rigid anvil type utilizing an appropriately instrumented (accelerometers) standard headform, as outlined in ANSI Z90.1. Total headform and associated equipment weight, center of gravity, and alignment shall conform to ANSI Z90.1. Instrumentation

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and equipment calibration, before and after all tests, shall be in accordance with ANSI Z90.1. A modular elastomer programmer will be used for calibrations. All test reports shall contain the individual values.

5. PACKAGING

5.1 Preservation. Preservation shall be level A.

5.1.1 Level A.

5.1.1.1 Complete helmet assembly. Each complete helmet assembly shall be preserved in accordance with Method IC-3 of MIL-P-116 and as specified herein. The waterproof bag shall be fabricated from polyolefin material conforming to L-P-378. Excess air shall be expelled from each bag before final closure. The microphone boom shall be fully extended with the microphone in a horizontal position in the open area at the front of the helmet. The microphone shall be completely enclosed in minimum 1/4-inch thickness, paper-backed, cellulosic cushioning material and secured in place with pressure-sensitive tape. The telephone plug and cord, and the instruction manual shall be placed within the helmet. The chin strap shall then be snapped in place. Each preserved helmet shall be unit packed in a fiberboard box provided with a one-piece, die-cut fiberboard insert as shown in Drawing 8-2-524. The fiberboard box shall conform to style CSSC, grade W6c of PPP-B-636. The fiberboard insert shall be fabricated from the same material as the fiberboard box. Inside dimensions of the box shall be 11 1/4 inches in length, 11 1/4 inches in width, and 11 1/4 inches in depth ($\pm 1/8$ inch). The top and bottom flaps of each box shall be secured with 2-inch minimum width pressure-sensitive tape.

5.1.1.2 Outer helmet assembly. When procured separately, each outer helmet assembly shall be completely wrapped in a sheet of minimum 30-pound basis weight kraft paper conforming to type I of A-A-203. The sheet shall measure 24 inches by 24 inches ($\pm 1/2$ inch). The wrap shall be accomplished by placing the helmet assembly upside down in the approximate center of the sheet, with the ends of the two attachment tabs inside of the shell, and folding the edges of the sheet inside the shell.

5.1.1.3 Attachment strip kit. When procured separately, one complete kit as specified in 3.3.4.3 shall be unit packed in a close-fitting, clear polyethylene bag conforming to type II and style 1 of PPP-B-26. Approximate inside dimensions of bag shall be 3 inches by 5 1/2 inches. The identification and instruction label shall be folded and placed within the bag in such a manner that all the identification label contents can be easily read through the bag.

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5.1.1.4 Attachment tab kit. When procured separately, one complete kit as specified in 3.3.4.4 shall be unit packed in a close-fitting, clear polyethylene bag conforming to type II and style 1 of PPP-B-26. Approximate inside dimensions of the bag shall be 3 inches by 5 1/2 inches. The identification and instruction label shall be folded and placed within the bag in such a manner that all the identification label contents can be easily read through the bag.

5.1.1.5 Intermediate packs. Fifty kits of one description, unit packed as specified in 5.1.1.3 or 5.1.1.4, shall be packed together in a snug-fitting intermediate paperboard box conforming to variety 1, process I, style IV, type J, class 1, of PPP-B-566. Approximate inside dimensions of the box shall be 10 inches in length, 6 inches in width, and 3 inches in depth.

5.2 Packing. Packing shall be level A, B, or Commercial, as specified (see 6.2).

5.2.1 Level A packing.

5.2.1.1 Complete helmet assemblies. Six complete helmet assemblies of one size only, preserved as specified in 5.1, shall be packed in a fiberboard shipping container conforming to style FOL, grade V2s of PPP-B-636. The unit packs shall be packed flat, three in length, two in width, and one in depth within a shipping container. Inside dimensions of each shipping container shall be 35 inches in length, 23 1/2 inches in width, and 11 3/4 inches in depth ($\pm 1/8$ inch). Each shipping container shall be closed in accordance with method III and reinforced in accordance with the appendix of PPP-B-636, except that the inspection shall be as specified in 4.4.6. Toward the end of the contract, or when there are less than the required amount per container of the same size, mixed sizes may be packed within the same container. Shipping containers shall be arranged in unit loads in accordance with MIL-L-35078 for the type and class of load specified (see 6.2). Strapping shall be limited to nonmetallic strapping, except for type II, class F loads.

5.2.1.2 Outer helmet assemblies. When procured separately, twenty outer helmet assemblies of one size only, preserved as specified in 5.1, shall be packed in a fiberboard shipping container conforming to style RSC, grade V2s of PPP-B-636. The unit packs shall be packed with the front of the shell facing down, ten in length, two in width, and one in depth within a shipping container. During the packing operation, the wrapped helmet assemblies shall be nested with the front of the shells resting on the bottom of the shipping container. The inside of each shipping container shall have a full length and height fiberboard partition placed between the two rows of nested helmet assemblies. The partition shall be fabricated from material conforming to type CF, class weather-resistant, variety SW, grade V3c of PPP-F-320. Inside dimensions of each shipping container shall be 26 inches in length, 20 inches

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in width, and 12 inches in depth ($\pm 1/8$ inch). Each shipping container shall be closed in accordance with method III, waterproofed in accordance with method V, and reinforced in accordance with the appendix of PPP-B-636 except that the inspection shall be as specified in 4.4.6. Toward the end of the contract, or when there are less than the required amount per container of the same size, mixed sizes may be packed within the same shipping container. Shipping containers shall be arranged in unit loads in accordance with MIL-L-35078 for the type and class of load specified (see 6.2). Strapping shall be limited to nonmetallic strapping, except for type II, class F loads.

5.2.1.3 Attachment strip kits or attachment tab kits. When procured separately, six hundred kits of one description only, preserved as specified in 5.1, shall be packed in a fiberboard shipping container conforming to style RSC, grade V2s of PPP-B-636. The intermediate packs shall be packed on end, three in length, four in width, and one in depth within a shipping container. Inside dimensions of each shipping container shall be 19 inches in length, 12 1/2 inches in width, and 10 1/2 inches in depth ($\pm 1/8$ inch). Each shipping container shall be closed in accordance with method III, waterproofed in accordance with method V, and reinforced in accordance with the appendix of PPP-B-636, except that the inspection shall be as specified in 4.4.6. Shipping containers shall be arranged in unit loads in accordance with MIL-L-35078 for the type and class of load specified (see 6.2). Strapping shall be limited to nonmetallic strapping, except for type II, class F loads.

5.2.2 Level B packing.

5.2.2.1 Complete helmet assemblies. Six complete helmet assemblies of one size only, preserved as specified in 5.1, shall be packed in a fiberboard shipping container conforming to style OSC (minimum 3-inch overlap), type CF, class domestic, variety SW, grade 275 of PPP-B-636. The unit packs shall be packed flat, three in length, two in width, and one in depth within a shipping container. Inside dimensions of each shipping container shall be 35 inches in length, 23 1/2 inches in width, and 11 3/4 inches in depth ($\pm 1/8$ inch). Each shipping container shall be closed in accordance with method II in the appendix of PPP-B-636, except that the inspection shall be as specified in 4.4.6. Toward the end of the contract, or when there are less than the required amount per container of the same size, mixed sizes may be packed within the same shipping container.

5.2.2.2 Outer helmet assemblies. When procured separately, twenty outer helmet assemblies of one size only, preserved as specified in 5.1, shall be packed in a fiberboard shipping container conforming to style RSC, type CF, class domestic, variety SW, grade 275 of PPP-B-636. The unit packs shall be packed with the front of the shell facing down, ten in length, two in width, and one in depth within a shipping container. During the packing operation,

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the wrapped helmet assemblies shall be nested with the front of the shells resting on the bottom of the shipping container. The inside of each shipping container shall have a full length and height fiberboard partition placed between the two rows of nested helmet assemblies. The partition shall be fabricated from the same material as the shipping container. Inside dimensions of each shipping container shall be 26 inches in length, 20 inches in width, and 12 inches in depth ($\pm 1/8$ inch). Each shipping container shall be closed in accordance with method II in the appendix of PPP-B-636 except that the inspection shall be as specified in 4.4.6. Toward the end of the contract, or when there are less than the required amount per shipping container of the same size, mixed sizes may be packed within the same shipping container.

5.2.2.3 Attachment strip kits or attachment tab kits. When procured separately, 600 kits of one description only, preserved as specified in 5.1, shall be packed in a fiberboard shipping container conforming to style RSC, type CF, class domestic, variety SW, grade 275 of PPP-B-636. The intermediate packs shall be packed on end three in length, four in width, and one in depth within a shipping container. Inside dimensions of each shipping container shall be 19 inches in length, 12 1/2 inches in width, and 10 1/2 inches in depth ($\pm 1/8$ inch). Each shipping container shall be closed in accordance with method II in the appendix of PPP-B-636, except that the inspection shall be in accordance with 4.4.6.

5.2.2.4 Weather-resistant fiberboard container. When specified (see 6.2), the shipping container shall be a grade V3c or V3s fiberboard box fabricated in accordance with PPP-B-636 and closed in accordance with method III in the appendix of PPP-B-636, except that the inspection shall be as specified in 4.4.6.

5.2.3 Commercial packing. Complete helmets or, when procured separately, outer helmet shell, attachment strip kits, or attachment tab kits shall be packed in accordance with ASTM D 3951.

5.3 Palletization. When specified (see 6.2), helmets or, when procured separately, outer helmet shells, attachment strip kits, or attachment tab kits, packed as specified in 5.2.2 and 5.2.3, shall be palletized on a 4-way entry pallet in accordance with load type Ia of MIL-STD-147. Pallet type shall be type I (4-way entry), type IV or type V in accordance with MIL-STD-147. Each prepared load shall be bonded with primary and secondary straps in accordance with bonding means K and L or film bonding means O or P. Pallet pattern number 89 shall be used for the complete helmet assemblies, pallet pattern number 90 shall be used for the outer helmet assemblies, and pallet pattern number 8 shall be used for the attachment strip kits or attachment tab kits in accordance with appendix of MIL-STD-147. Interlocking of loads shall be effected by reversing the pattern of each course.

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5.4 Marking. In addition to any special marking required by the contract or purchase order, unit packs, shipping containers, and palletized unit loads shall be marked in accordance with MIL-STD-129 or ASTM D 3951, as applicable.

5.4.1 Special marking for complete helmet assemblies. Arrows or prominent marks shall be placed on two sides of each complete helmet unit pack and the shipping container to indicate the position in which the container shall be handled in transit or storage. The word "UP" shall be placed at the point of the arrows. The letters and arrows shall be at least two inches in height. The side panels of each unit pack and shipping container shall be plainly marked as follows:

UP

HANDLE WITH CARE

UP

The top panel shall be plainly marked as follows:

HANDLE WITH CARE

THIS SIDE UP

6. NOTES

6.1 Intended use. The helmet is intended for use by the combat vehicle crewman.

6.2 Ordering data. Acquisition documents should specify the following:

- a. Title, number, and date of this document.
- b. Size of helmet desired (see 1.2).
- c. When a first article is required (see 3.2).
- d. Mold and hole authorization (see 4.4.2.1).
- e. Selection of applicable levels of packing (see 5.2).
- f. Type and class of unit load required (see 5.2.1.1).
- g. When weather-resistant grade fiberboard shipping containers are required for level B packing (see 5.2.2.3).
- h. When palletization is required (see 5.3).

6.3 First article. When a first article is required, it shall be inspected and approved under the appropriate provisions of FAR 52.209. The first article should be a preproduction sample consisting of one completed helmet assembly. The contracting officer should include specific instructions in all acquisition instruments regarding arrangements for selection, inspection, and approval of the first article.

6.4 Sample. For access to samples, address the contracting activity issuing the invitation for bids.

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6.5 Recycled material. It is encouraged that recycled material be used when practical as long as it meets the requirements of this document (see 3.3).

6.6 Adhesive pack. The adhesive pack supplied by Hardman, Inc., 600 Cortland Street, Bellville, NJ 07109 has been found to meet the requirements of this specification.

6.7 Certification of sound attenuation and impact resistance testing laboratories. The U.S. Army Aeromedical Research Laboratory, Fort Rucker, AL 36362, is responsible for certification of sound attenuation and impact resistance testing.

6.8 Subject term (key word) listing.

Body armor
Headgear
Helmet

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

Custodians:

Army - GL
Navy - NU

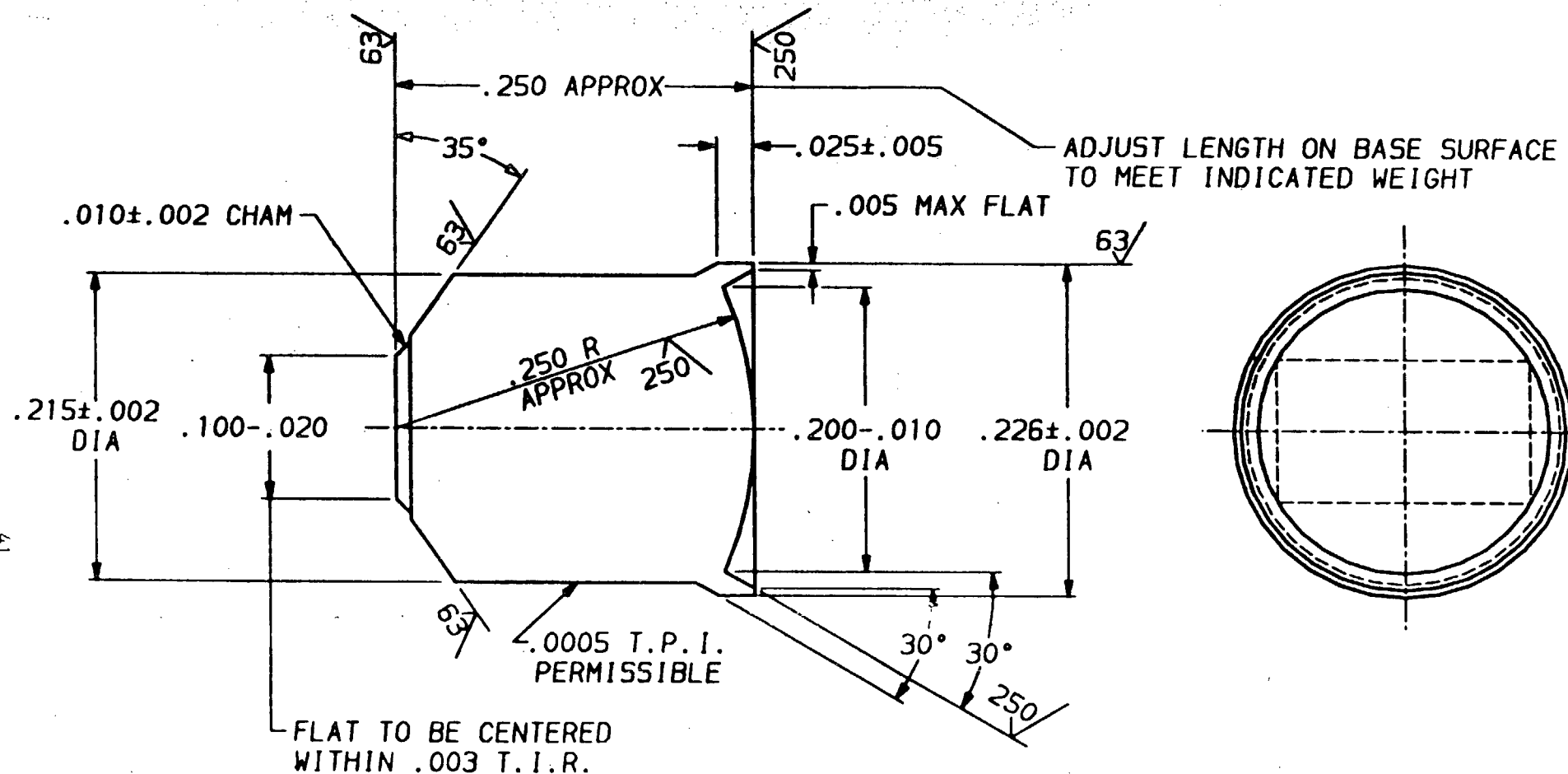
Preparing activity:

Army - GL

Project No. 8470-0114

Review activities:

Army - MD
Navy - MC
DLA - CT



NOTES:

1. NO SUBSTITUTES FOR STEEL
2. FINISH 125/ EXCEPT AS NOTED
3. TOLERANCES ON ANGLES $\pm 1^\circ$
4. SIMULATORS SHALL BE TUMBLED WITH AN APPROPRIATE GRIT TO REMOVE BURRS AND SHARP EDGES.
5. DIMENSIONS ARE IN INCHES

FIGURE 1. FRAGMENT SIMULATOR CALIBER .22, TYPE 2 (BODY ARMOR)

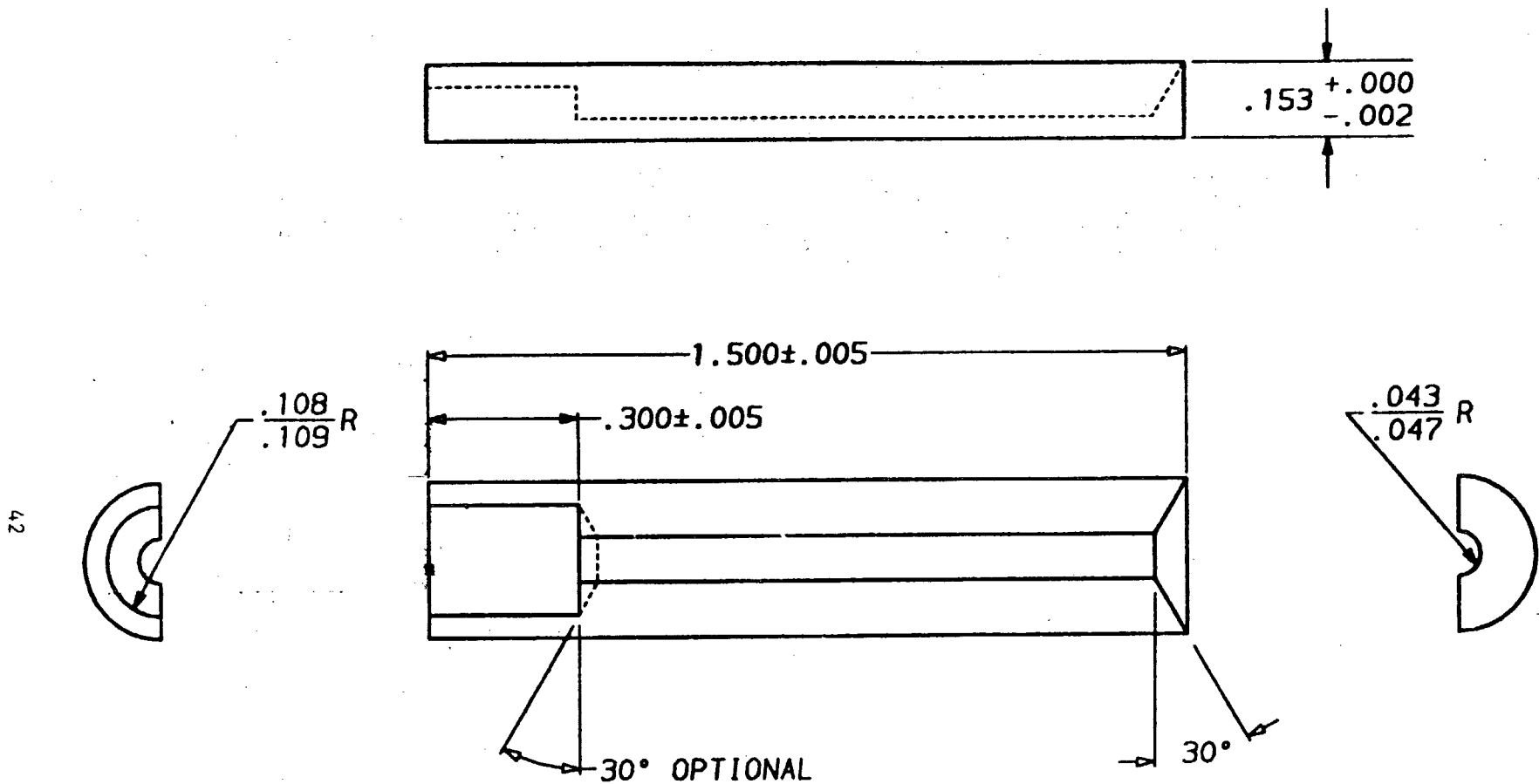


FIGURE 2. SABOT FOR 17 GRAIN FSP (FRAGMENT SIMULATED PROJECTILE)
 INJECTION MOLDED, TWO HALVES
 MATERIAL: POLYCARBONATE
 DIMENSIONS ARE IN INCHES

8-2-882

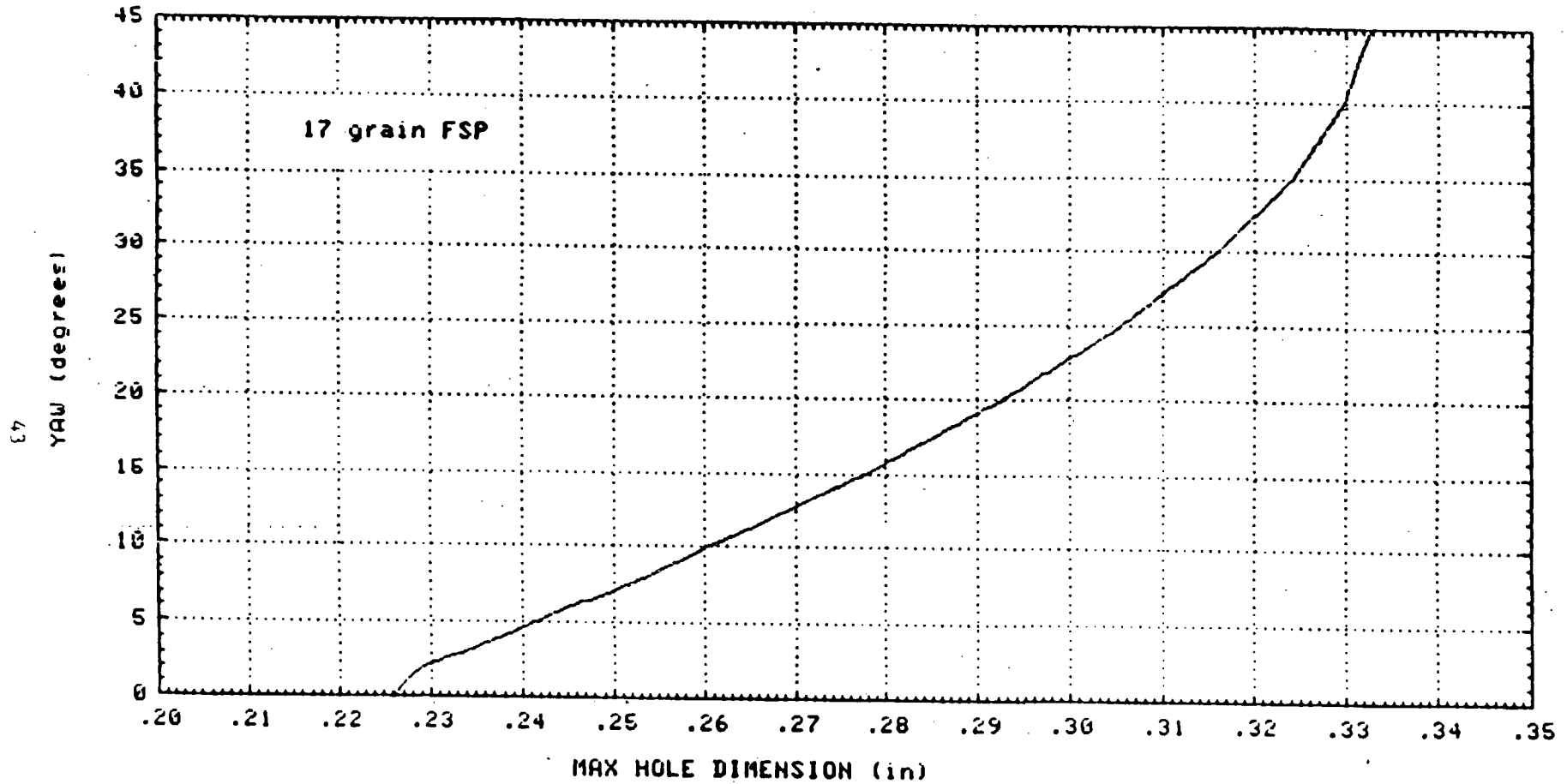


FIGURE 3 PROJECTILE YAW VERSAS MAXIMUM HOLE DIMENSION

STANDARDIZATION DOCUMENT IMPROVEMENT POSAL

(See Instructions - Reverse Side)

1. DOCUMENT NUMBER
MIL-H-44117A

2. DOCUMENT TITLE
Helmet, Combat Vehicle Crewman, Ballistic Shell, DH-132A

3a. NAME OF SUBMITTING ORGANIZATION

4. TYPE OF ORGANIZATION (Mark one)

☐

VENDOR

☐

USER

☐

MANUFACTURER

☐

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)