

MIL-H-87140A(USAF)  
 3 April 1987  
 SUPERSEDING  
 MIL-H-87140 (USAF)  
 4 September 1979

## MILITARY SPECIFICATION

### HELMET, FLYER'S HGU-36A/P

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

#### 1. SCOPE

1.1 Scope. This specification covers the HGU-36A/P flyer's helmet, which of one type, and provided in sizes medium and large.

#### 2. APPLICABLE DOCUMENTS

##### 2.1 Government documents

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this specification 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.

#### SPECIFICATIONS

##### FEDERAL

L-P-393	Plastic Molding Material, Polycarbonate, Injection and Extrusion
UU-P-553	Paper, Wrapping, Tissue
PPP-B-26	Bag, Plastic, (General Purpose)
PPP-B-601	Box, Wood, Cleated-Plywood
PPP-B-636	Boxes, Shipping, Fiberboard
PPP-C-843	Cushioning Material, Cellulosic

##### MILITARY

MIL-F-495	Finish, Chemical, Black, for Copper Alloys
MIL-P-12420	Plastic Material, Cellular, Elastomeric
MIL-P-19644	Plastic Molding Material (Polystyrene Foam, Expanded Bead)
MIL-F-21840	Fastener Tapes, Hook and Pile, Synthetic
MIL-H-27467	Headset Assembly, H-154A/AIC

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: ASD/ENES, Wright-Patterson AFB, OH 45433-6503 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 8475

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MIL-V-43511	Visor, Flying Helmet, Polycarbonate
MIL-C-44050	Cloth, Ballistic, Aramid
MIL-C-46168	Coating, Aliphatic Polyurethane, Chemical Agent
MIL-P-46593	Projectile, Calibers .22, .30, .50 and 20Mm Fragment and Simulating
MIL-C-83409	Coating, Visor, Polycarbonate, Flying Helmet

## STANDARDS

## FEDERAL

FED-STD-595 Colors

## MILITARY

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-130	Identification Marking of U.S. Military Property
MIL-STD-147	Palletized Unit Loads
MIL-STD-662	Ballistics Acceptance Test Method for Personal Armor Material
MIL-STD-1189	Standard Symbology for Marking Unit Packs, Outer Containers and Selected Documents
MIL-STD-2073-1	DoD Material Procedures for Development and Application of Packaging Requirements

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

## DRAWINGS

## Gentex Corporation

60B4278	Bracket, Connector Helmet
64A2217	Pads-Fitting, Flying Helmet
65D1585	Visor Housings, Large
65D1586	Visor Housings, Medium
80C4782	Chin Strap and Pad Assembly
80C4784	Nape Strap Assembly
82D5982	Helmet Assembly, Flyer's, HGU-36A/P
84D6675	Helmet Shell, Medium
84D6676	Helmet Shell, Large
84D6761	Energy Absorbing Liner
765AS211-1	Bag, Lens
954AS410-11	Visor Lens Assembly, Neutral Gray, Medium, MBU-12/P Trim
954AS410-12	Visor Lens Assembly, Clear, Medium, MBU-12/P Trim
954AS411-11	Visor Lens Assembly, Neutral Gray, Large, MBU-12/P Trim
954AS411-12	Visor Lens Assembly, Clear, Large, MBU-12/P Trim

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

**2.2 Other publications.** The following document(s) form a part of this specification 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 issue of the nongovernment documents which is current on the date of the solicitation.

AMERICAN NATIONAL STANDARDS INSTITUTE, INC.

Z90.1-1971/Z90.1A-1973 Protective Headgear for Vehicular Users

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

AMERICAN SOCIETY FOR TESTING MATERIALS

ASTM D 3951 Standard Practice for Commercial Packaging

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

(Nongovernment standards and other publications are normally available from the organizations which prepare or which distribute the documents. These documents also may be available in or through libraries or other informational services.)

**2.3 Order of precedence.** In the event of a conflict between the text of this specification and the references cited herein (except for associated detail specifications, specification sheets or MS standards), the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

### 3. REQUIREMENTS

**3.1 Qualification.** Helmet assemblies furnished under this specification shall be products which are authorized by the qualifying activity for listing on the applicable qualified products list at the time set for opening of bids (see 4.4 and 6.3).

**3.2 Materials.** The materials used in the fabrication and assembly of the helmet components shall comply with the requirements of specifications referenced on the applicable drawings and as specified herein. Materials which are not specifically designated, or which are offered as equivalent to specified manufacturer's part numbers, shall require approval by the procuring activity.

**3.2.1 Aramid ballistic cloth.** The aramid ballistic cloth used in the construction of the helmet shell shall conform to type I, class 1, of MIL-C-44050.

**3.2.2 Laminating resin.** The resin used for coating and laminating the reinforcing material used in the construction of the helmet shell shall be a catalyzed system composed of 50 percent phenol formaldehyde and 50 percent polyvinyl butyral resins (Gentex material code 71531, Kevlar prepreg, or equivalent).

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**3.2.3 Energy absorbing liner.** The energy absorbing liner shall be made from expandable polystyrene plastic foam conforming to type II, class 1 of MIL-P-19644, and the density shall be as specified in Drawing 84D6761. The inner surface (concave side) of the liner shall be given two coats of water-thinned, black latex coating which shall not collapse, soften, or visibly affect the foam structure.

**3.2.4 Adhesive material.** The adhesive for bonding the edge beading and the temporal pads to the shell shall be a synthetic-rubber-base, curing type, and shall not loosen when subjected to heat exposure (see 3.4.9).

**3.2.5 Hook and pile fasteners.** Hook and pile fasteners used in the helmet assembly shall be in accordance with type I, class 2 of MIL-F-21840.

**3.2.6 Visor housing.** The visor housing shall be molded polycarbonate, as specified in L-P-393. The color shall be lusterless olive drab, color number 34087, as specified in FED-STD-595 (see 3.6.2).

**3.3 Design and construction.** The helmet and its components shall be constructed in accordance with 82D5982, the subsidiary drawings listed below and their detail drawings, and the requirements specified herein. If the requirements of the drawings conflict with the requirements of this specification, the requirements of this specification shall govern.

#### DRAWINGS

84D6675	Helmet Shell, Medium
84D6676	Helmet Shell, Large
84D6761	Energy Absorbing Liner
65D1586	Visor Housing, Medium
65D1585	Visor Housing, Large
954AS410-11	Visor Lens Assembly, Medium, Neutral Gray, MBU-12/P Trim
954AS411-11	Visor Lens Assembly, Large, Neutral Gray, MBU-12/P Trim
954AS410-12	Visor Lens Assembly, Medium, Clear, HBU-12/P Trim
954AS411-12	Visor Lens Assembly, Large, Clear, MBU-12/P Trim
80C4782	Chin Strap and Pad Assembly
80C4784	Nape Strap Assembly

**3.3.1 Helmet shell construction.** The helmet shell shall be a laminated structure composed of resin-coated reinforcing material bonded by heat and pressure. The reinforcing material specified in 3.2.1 shall be coated on both sides with equal amounts of laminating resin as specified in 3.2.2.

**3.3.1.1 Layup of shell before molding.** Pattern sections shall be arranged to permit even distribution within the mold. Any fasteners used to control ply distribution shall be affixed outside the trim area.

**3.3.1.2 Construction.** Pattern segments shall overlap symmetrically to provide a minimum of 9-ply lamination in areas subject to ballistic requirements. Any area of ply reduction, caused by gapping, shall be repaired as specified in 3.3.1.3, provided each site does not exceed 3/4 (0.750) square inch. A maximum of 4 square inches total repaired gapping area per helmet shall be allowed.

3.3.1.3 Molded shell. The shell shall be formed without holes, voids, delaminations, pimples, blisters, cracking, crazing, dry spots, areas of no resin flow, and any pit greater than 1/8 (0.125) inch in diameter and the depth of one ply. Any repairable gaps, pleats, and wrinkles shall be repaired with epoxy resin, and finished to provide a smooth and even surface. The contractor shall perform a 100 percent inspection after molding cycle is complete, and following any necessary repairs. The finished shell shall conform in width, height, and contour to Drawing 84D6675 for size medium and 84D6676 for size large.

3.3.1.4 Holes for attachment of components. Holes for attaching the helmet components shall be drilled and shall be accomplished before finishing. There shall be no puncturing or tearing of the shell material. There shall be no excess fiber strands in the holes following drilling. Size and location of holes shall be as specified in Drawing 84D6675 for size medium and 84D6676 for size large.

### 3.4 Performance

3.4.1 Ballistic resistance of shell. The  $V_{50}$  ballistic limit for each helmet shell shall not be less than 1150 feet per second, when tested as specified in 4.6.4.

3.4.2 Impact resistance. When subjected to the impact test in 4.6.5, the helmet shall meet the following requirements.

3.4.2.1 The peak acceleration of the helmet shall not exceed 400 G.

3.4.2.2 The helmet shall not accelerate 200 G for more than 2 milliseconds.

3.4.2.3 The helmet shall not accelerate 150 G for more than 4 milliseconds.

3.4.2.4 The exterior finish of the helmet shall not flake, peel, or show loss of adhesion or any other failure of the finish except for the removal of particles of dried paint in the impact area.

3.4.3 Adhesives. The adhesives shall meet the applicable performance requirements specified below.

3.4.3.1 Adhesion of edge beading before aging. The edge beading shall remain firmly bonded to the shell when tested in accordance with 4.6.6. Unbonded areas up to a total of 2 inches in length shall be 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.

3.4.3.2 Adhesion of edge beading after aging. When tested in accordance with 4.6.7, the edge beading shall not peel back more than 1/4 inch from the helmet shell.

3.4.3.3 Adhesion of fastener tapes. The adhesive for bonding the fastener tapes to the liner shall contain no solvents that dissolve or soften the liner material and shall meet the bonding requirements when tested as specified in 4.6.9.

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3.4.3.4 Adhesion of liner finish. The adhesion of the latex coating to the energy absorbing liner shall be so adhered that the unbonding of the coating in the tested area shall not exceed 10 percent, when tested as specified in 4.6.8.

3.4.3.5 Adhesion of shell finish. The coating for the shell finish shall not show any evidence of lifting of any squares, when tested as specified in 4.6.10.

3.4.3.6 Adhesion of liner and compatibility of adhesive with liner. When the liner is forcibly removed from the shell, the bond of the liner to the shell shall be so strong that any separation shall be in the liner material and not in the adhesive. The adhesive shall not collapse, soften, or dissolve the plastic foam material.

3.4.4 Heat exposure. When subjected to heat exposure, the helmet shell shall not change in weight more than one percent, nor shall there be a change in distance between the shell center reference dimples greater than 1/4 inch. No other change affecting appearance or serviceability, nor visible distortion of the components, shall take place as a result of the heat exposure.

3.4.5 Visor coating. The visor shall be coated on the front and rear surfaces with an abrasion resistant coating as specified in MIL-C-83409.

3.4.6 Visor optical characteristics. The visor shall be polycarbonate, in accordance with L-P-393. The optical performance characteristics shall be in accordance with Class 1 for the clear visor and Class 2 for the neutral gray visor, in accordance with MIL-V-43511.

3.5 Weight. The weight of the complete helmet assembly, consisting of the painted, beaded shell; single visor assembly; energy absorbing liner; and chin and nape straps shall not exceed 1080 grams for the size medium, and 1150 grams for the size large.

### 3.6 Color and finish

3.6.1 Shell finish. The exterior surface of the helmet shell shall be cleaned and smoothed, and the edges shall be sanded to remove sharp surfaces. The exterior surface shall then be primed and coated with polyurethane paint, as specified in MIL-C-46168. The color shall be lusterless olive drab, color number 34087, as specified in FED-STD-595. The dried finish shall be uniform in color and gloss over the entire exterior surface of the shell. The final finish shall be free of sags, runs, wrinkles, blistering, or other defects, either from improper application or from cure of the coating. After drying, the paint shall meet the requirements of 3.4.7.

3.6.2 Visor housing finish. The interior and exterior surfaces of the visor housing shall be cleaned and smoothed and all sharp edges removed. Outer surfaces shall be coated with the lusterless olive drab polyurethane paint specified in 3.6.1.

3.6.3 Hardware. Hardware components specified to be finished black shall be uniformly coated and free from flaking in accordance with MIL-F-495.



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3.7 Identification of product. Each helmet assembly and its components shall be identified in accordance with applicable drawing requirements and the requirements of MIL-STD-130.

3.8 Government furnished property. When applicable, the Government shall provide to the contractor the following communications components for accomplishing the impact test (see 6.4).

<u>Quantity</u>	<u>Item</u>
1	Headset Assembly, H-154A/AIC (MIL-H-27467)
1	Connector Bracket, P/N60B4278 (Gentex Drawing 60B4278)
1	Boom Microphone Assembly

3.8.1 When applicable, the Government shall provide to the contractor three sets of fitting pads conforming to Genetex Drawing 64A2217 for accomplishing the impact test (see 4.6.5) and the adhesion test (see 4.6.9).

3.9 Workmanship. The workmanship shall be in accordance with the high grade practices for the process involved. The helmet assembly shall be clean and well finished and shall completely meet the quality conformance levels specified in section 4.

#### 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 the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification 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 shall not authorize submission of known defective material, either indicated or actual, nor shall it commit the Government to acceptance of defective material.

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

- a. Qualification inspection (see 4.4)
- b. Quality conformance inspection (see 4.5)

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#### 4.3 Inspection conditions

4.3.1 Atmospheric conditions. Unless otherwise specified in the tests, all tests shall be performed at a temperature of 25°C  $\pm$ 8°C and at a relative humidity of 70 percent or less.

4.3.2 Items required for impact and adhesion tests. The Government furnished items specified in 3.8 and 3.8.1 shall be required in conducting the impact and adhesion tests.

#### 4.4 Qualification inspection

4.4.1 Qualification test samples. The qualification test samples shall be representative of the production equipment and shall be identified with the manufacturer's part number and such other information as required by applicable drawings.

4.4.1.1 HGU-36A/P helmet assemblies. Unless otherwise modified by the contract or purchase order, qualification test samples shall be as follows:

##### 4.4.1.1.1 Sample 1

a. One each chin strap and pad assembly with installation hardware (Drawing 80C4782).

b. One each nape strap assembly with installation hardware (Drawing 80C4784 for sizes medium and large).

c. One each molded shell of each size, trimmed and drilled, unpainted and without edge beading (Drawing 84D6675 for size medium, and Drawing 84D6676 for size large).

d. One each visor assembly components:

##### (1) Visors

(a) Clear (Drawing 954AS410-12 for medium, and Drawing 954AS411-12 for large)

(b) Neutral gray (Drawing 954AS410-11 for medium, and Drawing 954AS411-11 for large)

(2) Visor housings: Drawing 64D1586 for medium, and Drawing 64D1585 for large.

4.4.1.1.2 Sample 2. Two helmet shell assemblies of each size specified on the contract or purchase order, trimmed, drilled and without edge beading and energy absorbing liner (Drawing 84D6675 for size medium, and 84D6676 for size large).

4.4.1.1.3 Sample 3. Two helmet assemblies of each size specified on the contract or purchase order that are completely finished and assembled in accordance with this specification and Drawing 82D5982.



4.4.1.1.4 Sample 4. One helmet assembly of each size specified on the contract or purchase order that are completely finished and assembled in accordance with this specification and Drawing 82D5982.

4.4.1.1.5 Sample 5. Clear and neutral gray visors shall be sampled and inspected in accordance with MIL-V-43511 and MIL-C-83409.

4.4.2 Qualification testing. The qualification test samples shall be subjected to the tests listed in table I.

4.4.3 Retention of qualification. To retain qualification, the manufacturer shall forward certification at 2-year intervals to the qualifying activity stating that the company still has the capabilities and facilities necessary to produce the item and that the product has not changed in any way. The qualifying activity shall establish the initial reporting date.

4.5 Quality conformance inspection. Quality conformance inspections shall be as specified in 4.5.1 and table II.

4.5.1 Materials and component inspections. The materials and components used in the fabrication and assembly of the HGU-36A/P helmet shall be inspected/ tested to determine compliance with the requirements of applicable specifications, standards and drawings.

4.5.1.1 Classification of defects. Classification of defects shall be in accordance with tables III and IV. Defects classified as minor shall be corrected on all helmets by replacement or repair of defective components. Defects classified as major shall be cause for removal from production and nonacceptance of all units that exhibit the defect. Any components which cannot be corrected shall be rejected and removed from production.

#### 4.5.2 Sampling plans

##### 4.5.2.1 Inspection lot and sample unit

4.5.2.1.1 Inspection lot. An inspection lot shall be expressed in units of the helmet assemblies made under essentially the same conditions and from the same materials.

4.5.2.1.2 Sample unit. The sample unit shall be one component and shall be expressed in units for one component. The sample unit shall be one helmet assembly of each size.

4.5.2.2 Sampling plan A. Group A examinations shall be visually examined for applicable defects listed in tables III and IV. The inspection level shall be 100 percent. All non-conforming items, except for delaminations and blisters in the molded unfinished shell, shall be repaired and returned to production. Items which cannot be repaired, including a defective molded shell, shall be removed from production.

4.5.2.3 Sampling plan B. Group B examinations, as listed in table III, shall be subjected to the examination of components prior to assembly of helmet. The inspection level shall be level II of MIL-STD-105, and the acceptable quality level (AQL), expressed in terms of percent defective, shall be 2.5 for major defects and 6.5 for total defects.

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TABLE I. Qualification tests.

Test Sample	Characteristic	Requirement Paragraph	Test Method
1	Dimensional examination	3.3., 3.3.1.3, 3.3.1.4	4.6.1, 4.6.2.3, 4.6.2.4
2	Ballistic resistance	3.4.1	4.6.4
3	Impact resistance	3.4.2	4.6.5
4	Adhesion of beading before aging	3.4.3.1	4.6.6
4	Adhesion of beading after aging	3.4.3.2	4.6.7
4	Adhesion of liner finish	3.4.3.4	4.6.8
4	Adhesion of fastener tapes	3.4.3.3	4.6.9
3	Adhesion of shell finish	3.4.3.5	4.6.10
4	Adhesion of liner and compatibility of adhesive with liner	3.4.3.6	4.6.11
4	Heat exposure	3.4.4	4.6.12
5	Visor optical characteristics	3.4.6	4.6.13
5	Visor coating	3.4.5	4.6.14
4	Weight	3.5	4.6.15

TABLE II. Quality conformance inspection.

Examination or tests	Requirement Paragraph	Examination or Test Paragraph	Sampling Plan
Group A			4.5.2.2
Inprocess visual examination of molded, unpainted shell	3.3.1.3	4.6.2.1	
Inprocess visual examination of shell prior to installation of edge beading	3.6.1	4.6.2.2	
End item visual examination	3.9	4.6.3	
Group B			4.5.2.3
Inprocess visual examination (other than Group A)	3.9	4.6.2	
Inprocess dimensional examination chin and nape strap assemblies	3.3	4.6.2.3	
Group C			4.5.2.4
End item test:			
Ballistic resistance	3.4.1	4.6.4	
Impact resistance	3.4.2	4.6.5	
Adhesion of beading before aging	3.4.3.1	4.6.6	
Adhesion of beading after aging	3.4.3.2	4.6.7	
Adhesion of shell finish	3.4.3.5	4.6.10	

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TABLE III. Classification of defects, inprocess visual and dimensional examination.

Examine	Defect	Classification	
		Major	Minor
<u>Molded shell, unpainted</u>	Any fabric fibers visibly cut or raised on the shell body	X	
	Any surface dent, depression or area not smooth	X	
	Any delamination, pimple or blister	X	
	Any evidence of cracking or crazing	X	
	Any evidence of dry spot, any area of no resin flow or other deficiency	X	
	Any pleat, wrinkle or crease longer than 1/2 inch		X
	Any pleat, wrinkle or crease 1/2 inch or less in length that is not smooth		X
	Any permissible gap or pit not resin filled as specified		X
<u>Helmet shell, painted, prior to beading</u>	Thin film (coating)		X
	Finish wet or tacky	X	
	Coating furrows, flakes or peels when scratched with fingernail		X
	Peeling, blistering or flaking	X	
	Runs and sags		X
	Foreign matter (dirt, oil, grease)		X
	Color not as specified	X	
	Design not as specified	X	
<u>Energy absorbing liner, unpainted</u>	Hole, tear, crack or compressed area	X	
	Density less than specified	X	

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TABLE III. Classification of defects, inprocess  
visual and dimensional examination. - Continued

Examine	Defect	Classification	
		Major	Minor
<u>Chin strap or nape strap assemblies</u>	Material not as specified	X	
	Any grommet incorrectly installed	X	
	Snap fastener not securely set	X	
	Loose or skipped stitches, or not back-stitched		X
	Ends of webbing not seared		X
	Dimensions not as specified in drawing		X
<u>Visor housing</u>	Hole locations not as specified	X	
	Color not as specified		X
	Burrs or sharp corners or edges		X
	Peels, runs, gaps, blisters, flakes in paint		X
<u>Visor</u>	Visual examination (see 3.6.2)		

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TABLE IV. Classification of defects,  
and item visual examination.

Examine	Defect	Classification	
		Major	Minor
<u>Shell and visor assembly</u>	Exterior coating scuffed		X
	Exterior coating containing lint, oil, grease, or paint smudge		X
<u>Energy absorbing liner</u>	Fastener tapes incorrectly located or not securely adhered or missing	X	
	Not assembled as specified	X	
	Color not as specified		X
<u>Hardware</u>	Any hardware missing	X	
	Any hardware loose, or too tightly installed		X
	Any hardware broken, corroded, or improperly assembled		X
	Not coated as specified		X
<u>Edge beading</u>	Missing, torn, or cracked; improperly adhered to shell	X	
<u>Helmet assembly fit and function</u>	Visor rotation difficult	X	
	Visor lock not functioning properly	X	



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4.5.2.4 Sampling plan C. Two complete helmet assemblies from each lot of 500 or fraction thereof shall be subjected to the Group C end item tests. The lot shall be unacceptable if the sample fails to meet any of the specified tests:

- a. ballistic resistance
- b. impact resistance
- c. adhesion of beading before aging
- d. adhesion of beading after aging
- e. adhesion of shell finish

4.5.2.4.1 Noncompliance. If a sample fails to pass Group C inspection, the manufacturer shall notify the qualifying activity and the cognizant inspection activity of such failure and take corrective action on the materials or processes, or both, as warranted, and on all units of products which can be corrected and which were manufactured with essentially the same materials and processes, and which are considered subject to the same failure. Acceptance and shipment of the product shall be discontinued until corrective action, acceptable to the qualifying activity, has been taken. After the corrective action has been taken, Group C inspection shall be repeated on additional sample units (all tests and examinations, or the test which the original sample failed, at the option of the qualifying activity). Groups A and B inspections may be reinstituted; however, final acceptance and shipment shall be withheld until the Group C inspection has shown that the corrective action was successful. In the event of failure after reinspection, information concerning the failure shall be furnished to the cognizant inspection activity and the qualifying activity.

#### 4.6. Inspection methods

4.6.1 Dimensional examination of molded shell prior to application of coating. The molded shell, prior to the application of coating, shall be dimensionally examined, in accordance with Drawing 84D6675 for size medium and 84D6676 for size large, for the following:

- a. hole locations
- b. shell trim
- c. overall shell width at the center reference dimples and the overall shell height at butt line 0.00 axis, in accordance with Drawing 84D6675 for size medium, and Drawing 84D6676 for size large. Each dimension shall be within 1/4 inch of the specified total value.

4.6.2 Inprocess examination. Visual and dimensional inspections shall be made during the manufacturing process to determine whether components conform to applicable requirements. Defects shall be corrected or removed, as detailed in paragraph 4.5.1.1.

4.6.2.1 Visual examination of molded, unpainted shell. The helmet shell, prior to preparation for finishing, shall be 100 percent visually examined for any evidence of blister or delamination. At its discretion, the Government may verify the results of the contractor's examination by sampling inspection.

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4.6.2.2 Visual examination of painted shell prior to installation of edge beading. The helmet shell, prior to installation of the edge beading, shall be 100 percent visually examined for defects in accordance with table III.

4.6.2.3 Dimensional examination of chin and nape straps. The completely assembled chin strap and nape strap shall be examined for compliance with dimensions required in the applicable drawings.

4.6.2.4 Dimensional examination of visor and visor housing. The visor and visor housing shall be examined for compliance with dimensions required in the applicable drawings.

4.6.3 End item visual examination. The complete HGU-36A/P helmet assembly shall be 100 percent visually examined for defects and cleanliness in accordance with table IV, prior to packing and shipping. Defects shall be corrected or removed, as detailed in paragraph 4.5.1.1.

4.6.4 Ballistic evaluation. The ballistic evaluation shall be conducted in accordance with MIL-STD-662, except as specified in 4.6.4.1. The fragment simulating projectile shall be the caliber .22, type 2, as specified in MIL-P-46593. The test report shall contain all individual values utilized in expressing the V<sub>50</sub> ballistic resistance for each helmet. Any helmet having a V<sub>50</sub> value below the requirement in 3.4.1 shall be considered as a test failure.

4.6.4.1 Ballistic test method. The helmet shall be stored in the ballistic test chamber for not less than 24 hours prior to testing. The test area of the helmet shall be any surface, except the line of surface directional change at the visor and at the ear sections. The impact points shall be a minimum distance of 1-1/2 inches from each other and from holes. 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 approximately 2 inches behind the area of impact.

4.6.5 Impact protection test. The helmet assembly, as described in 4.6.5b below, shall be fitted with the appropriate fitting pads to ensure proper fit to the test headform and then mounted on the headform. Impact tests shall be performed in accordance with ANSI Specification Z90.1-1971/Z90.1A-1973 by the rigid anvil method using the hemispherical impactor, and the following exception: Test at current ambient conditions only. Environmental tests specified in paragraph 7.2 of ANSI Specification Z90.1-1971/Z90.1A-1973 are not required. The helmet shall be subjected to single impacts only at the front, back, crown and each side location. The helmet-headform offset distance shall be measured at each impact site and the weight of the drop system (test headform and supporting arm) obtained prior to test. Based on the drop weight, the height of drop shall be determined to deliver 50 foot-pounds impact energy. The following information shall be recorded on the test summary sheet for each of the test locations on the helmet.

a. Drop weight (test headform and supporting arm only)

b. Helmet weight (basic helmet shell, liner, fitting pads, earcups, chin and nape straps only. The visor assembly, earphones, electrical cord, and boom microphone are not required for this test.)

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c. Helmet-headform offset distance. The contractor shall measure distance between headform and outer surface and shell at each impact site and shall record this data.

d. Drop height

e. Impact velocity

f. Impact energy

g. Acceleration-time data as follows:

(1) Peak acceleration. Shall not exceed 400 Gs.

(2) Total time of plus @ 200 Gs

(3) Total time of pluse @ 150 Gs

4.6.6 Adhesion of edge beading before aging. The adhesion of the edge beading to the helmet shell before aging shall be tested by manual and visual inspection of the edges of the beading on both the outside and inside of the helmet shell around its entire periphery. The beading shall be considered unbounded 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 unbounded areas exceed the limitations specified in 3.4.3, the test shall be considered as a failure.

4.6.7 Adhesion of edge beading after aging. The helmet shall be placed on its crown in a circulating air oven at 160°F  $\pm$ 5°F for 4 hours. The helmet shall then be removed from the oven and conditioned at the standard test conditions. After conditioning, the adhesion of the edge beading shall be tested as follows:

a. The adhesion test shall be performed on two separate areas, one at the bottom of one of the ear sections and the other in the rear of the helmet.

b. Using a sharp knife, the rounded portion of the beading shall be sliced off to expose the edge of the shell for a distance of two inches minimum. At one end of the cut, the remaining sides of the beading shall be severed. The beading shall be peeled back along the cut on both the inside and outside, to form tabs 1/2-inch,  $\pm$ 1/8, -0 inch in length.

c. A 0.25 pound weight shall be attached to one of the tabs. The helmet shall be positioned and secured so that the weight pulls at a right angle to the plane of the bond line to be tested. Gauge marks shall be made on the beading and shell for the measurement of the amount of peel back after completion of the test. The weight shall be suspended for one hour minimum, and the amount of peel back of the tab measured to the nearest 1/16-inch. The other tab shall be tested 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 3.4.3.2.

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4.6.8 Adhesion of liner finish. The adhesion of the finish to the energy absorbing liner shall be determined as follows:

- a. A complete liner finished with the latex coating shall be utilized.
- b. A tape conforming to type 1, class 3, of MIL-P-12420, natural color, that is approximately 6 inches long and 1 inch wide, shall be pressed firmly to the coated surface, allowed to remain in place for 24 hours, then tested, in accordance with 4.6.8.c.
- c. The test shall be conducted by grasping the free end of the strip of material and peeling it from the liner. The angle between the strip of material and the liner during the peeling operation shall be 90 degrees.

The peeling shall be performed by hand at a rate of approximately 20 inches per minute.

- d. The liner and the strip of material shall be visually examined for any evidence of unbonding of the finish from the liner to determine conformance with the requirements in 3.4.3.4.

4.6.9 Adhesion of fastener tapes. Inner fitting pads conforming to Drawing 64A2217 shall be firmly pressed in place over the fastener tapes at the front, crown, and back of the energy absorbing liner. The pads shall then be separated from the liner by peeling apart. The fitting pad installation and peeling sequence shall be performed twenty-five times.

4.6.9.1 All fastener tapes shall be examined, and any tape which has loosened more than 25 percent of its total area shall constitute failure to meet the bonding requirements.

4.6.10 Shell finish adhesion test. With a scribe held at approximately a 30-degree angle, three parallel lines 1/16-inch apart, shall be cut on the painted surface of the shell. These lines shall be crossed at right angles, with three parallel cuts 1/16-inch apart, forming four squares. Pressure shall be applied on the scribe to cut completely through the painted surface. Lifting of any of the squares shall constitute failure to pass this test.

4.6.11 Adhesion of liner and compatibility of adhesive with liner test. The energy absorbing liner shall be sliced into two equal halves with a sharp knife by slicing through the liner from one ear section to the other ear section. One half of the liner shall be forcibly removed from the shell by prying with the aid of a putty knife, a spatula, or a similar tool. The shell and the portion of each section of the liner that was removed from the shell shall be examined to determine conformance to the requirements specified in 3.4.3.6. Tearing of the shell or of the liner shall be evidence that the separation of the liner from the shell was not in the glue line.

4.6.12 Heat exposure test. The helmet shell shall be stabilized for one hour at standard test conditions. The helmet shell shall then be weighed, and the distance between the shell center reference dimples on the shell shall be measured. The helmet shall be placed on its crown in an air-circulating oven at a temperature of  $160^{\circ} \pm 5^{\circ}\text{F}$  for a 4 hour period. The helmet shell shall then be removed from the oven and stabilized for one hour at standard test conditions. Any change in weight shall not exceed one percent nor shall the measured distance vary more than 1/4 inch from the original measurement. A visual inspection of the helmet shall be made, and any appreciable distortion of helmet components, defects in finish, or loosening of adhesive bonds shall constitute failure to pass this test.

4.6.13 Visor optical characteristics. The visor shall be inspected and tested in accordance with MIL-V-43511.

4.6.14 Visor coating tests. The coating on the visor shall be inspected and tested in accordance with MIL-C-83409.

4.6.15 Weight test. The helmet shall be weighed to the nearest 0.01 pound and shall meet the requirement specified in 3.5.

4.7 Packaging inspection. An examination shall be made to determine that the preservation-packaging, packing and marking comply with section 5 requirements. Defects shall be scored in accordance with table V. The sample unit shall be one shipping container fully prepared for delivery with the exception that it may not be closed. Examination of closure defects listed below shall be made on shipping containers fully prepared for delivery. The lot size shall be the number of shipping containers in the end item lot. The inspection level shall be II and the AQL, expressed in terms of percent defective, shall be 2.5 units, in accordance with MIL-STD-105.

TABLE V. Packaging inspection.

Examine	Defect
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 components, such as incomplete closure of container flaps, improper taping, loose strapping, inadequate stapling.  Open and noncontinuous heat sealed seams of polyethylene bags or not closed as specified, when applicable. Incorrectly fabricated bag. Bulged or distorted container.
Content	Number of items per container is more or less than specified.



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## 5. PACKAGING

5.1 Preservation. Preservation shall be level A, C or Commercial as specified (see 6.2).

5.1.1 Level A. The clear visor shall be placed within the lens bag conforming to Drawing 765AS211-1, then wrapped in tissue paper conforming to UU-P-553 and placed within the helmet. Wrap helmet in cellulosic cushioning, type II, class B conforming to PPP-C-843. The helmet shall be placed in a snug-fitting bag fabricated from flexible polyolefin film conforming to type I, class 1, grade A, B or C, or 1 of PPP-B-26. The helmet shall be placed in a container conforming to PPP-B-636, class domestic.

5.1.2 Level C. Items shall be preserved and packaged in accordance with the applicable requirements of MIL-STD-2073-1.

5.1.3 Commercial. Items shall be preserved and packaged in accordance with the applicable requirements of ASTM D 3951.

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

5.2.1 Level A. Items that have been preserved and packaged as specified in 5.1 shall be packed in exterior-type shipping containers that conform to PPP-B-601, overseas type. The closure of the shipping container shall be in accordance with the appendix of the applicable shipping container specification.

5.2.2 Level B. Items that have been preserved and packaged as specified in 5.1 shall be packed in exterior-type shipping containers that conform to PPP-B-636, class weather-resistant. The closure of the shipping container shall be in accordance with the appendix of the applicable shipping container specification.

5.2.3 Level C. Items that have been preserved and packaged as specified in 5.1 shall be packed in accordance with the requirements of MIL-STD-2073-1.

5.2.4 Commercial. Items that have been preserved and packaged as specified in 5.1 shall be packed in accordance with the requirements of ASTM D 3951.

## 5.3 Marking

5.3.1 Levels A, B, and C. In addition to any special or other identification markings required by the contract (see 6.2), each unit pack and exterior container shall be marked in accordance with MIL-STD-129.

5.3.2 Commercial. Items shall be marked in accordance with the applicable requirements of ASTM D 3951.

5.4 Palletization. Unitized loads, commensurate with the level of packing specified in the contract or order shall be palletized in accordance with MIL-STD-147. Palletized loads shall be uniform in size and quantities to the greatest extent possible. If the container is of a size which does not conform to any of the pallet patterns specified in MIL-STD-147, the pallet pattern shall first be approved by the contracting officer.



## 6. NOTES

6.1 Intended use. This helmet assembly is intended to provide impact and ballistic protection to aircrew members in rotary-wing and fixed-wing aircraft.

6.2 Ordering data. Acquisition documents should specify the following:

- a. Title, number and date of this specification.
- b. Size of helmet.
- c. Qualification requirements.
- d. Selection of applicable levels of preservation-packaging and packing (see 5.1 and 5.2).
- e. When palletization is required (see 5.4).

6.3 Qualification. With respect to products requiring qualification, awards shall be made only for products which are, at the time set for opening of bids, qualified for inclusion in the applicable Qualified Products List, whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or purchase orders for the products covered by this specification. The activity responsible for the qualified products list is SA-ALC/MMIAC, Kelly AFB TX 78241, and information pertaining to qualification of products may be obtained from that activity.

6.4 Government furnished property. When applicable, the contracting officer should arrange to furnish the property listed in 3.8 and 3.8.1. If approved by the contracting officer, a mass simulating the weight of the communication components may be used instead of working communications.

Custodian:  
Air Force - 11

Preparing activity:  
Air Force - 11

Reviewers:  
Air Force - 82

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