INCH-POUND

MIL-V-43511C
16 July 1990
SUPERSEDING
MIL-V-43511B
30 September 1976

MILITARY SPECIFICATION

VISORS, FLYER'S HELMET, POLYCARBONATE

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

1. SCOPE

1.1 Scope. This specification covers general and performance requirements for curved eyeshield visors for flight helmets worn by aircrew personnel.

1.2 Classification. The visors shall be of the following classes as specified (see 6.2).

Class 1 - Clear
Class 2 - Neutral Gray
Class 2G - Neutral Gray Gradient (Air Force)

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 document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

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

AMSC N/A

FSC 8415

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

SPECIFICATIONS

FEDERAL

PPP-B-636 - Boxes, Shipping, Fiberboard.
PPP-B-665 - Boxes: Paperboard, Metal Edged and Components.
PPP-B-676 - Boxes, Setup.
PPP-T-45 - Tape, Gummed, Paper, Reinforced and Plain, for Sealing and Securing.

MILITARY

MIL-L-35078 - Loads, Unit: Preparation Of Semiperishable Subsistence Items; Clothing, Personal Equipment and Equipage; General Specification For.
MIL-C-83409 - Coatings, Visor, Polycarbonate, Flying Helmet.

STANDARDS

MILITARY

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 Acceptance Test Method for Personal Armor Material.
MIL-STD-731 - Quality of Wood Members For Containers and Pallets.

(Unless otherwise specified, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Bldg. 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.1.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

NATIONAL TECHNICAL INFORMATION SERVICE

NBS Special Publication 374

(Copies are available from the U.S. Department of Commerce National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161)

2.2 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of the documents which are not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

D 1003 - Haze and Luminous Transmittance of Transparent Plastics
D 3935 - Standard Specification For Polycarbonate (PC) Unfilled and Reinforced Material
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 19103-1187)

(Non-Government standards and other publications are normally available from the organizations that prepare or 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 document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 First article. When specified (see 6.2), a sample shall be subject to a first article inspection (see 6.3) in accordance with 4.3.

3.2 Design and dimensions. The design and dimensions of the visor shall be as specified in the end item specification, drawing or contract as applicable.

3.3 Materials and components. Unless otherwise specified in the end item specification, drawing, or contract as applicable, the visor shall be fabricated from bisphenol type polycarbonate plastic molding material conforming to ASTM D 3935. All other material and components used in the construction of the visor shall be as specified in the end item specification, drawing, or contract, as applicable. It is encouraged that recycled material be used when practical as long as it meets the requirements of this specification.

3.4 Areas of vision. Unless otherwise specified, the visor shall have three areas of vision which are identified as: outside the area of vision (no optical requirement), non-critical area of vision, and critical area of vision. The center point for the left and right optics shall be identified as point "C". The location of point "C" and the location and size of the three areas of the visor identified above shall be as specified in the end item specification, drawing, or contract as applicable. Figure 4 shows a typical layout of a visor and is intended to serve as a guide only for use by Government agencies to develop their detailed requirements. Unless otherwise specified in the end item specification, drawing, or contract as applicable, the numbered circles within the critical areas are designated as points of choice for prismatic and distortion tests. Points bearing the same number, for example 5R and 5L, shall be compared with each other, except points 2R and 2L (outermost points on left and right sides of visor) shall be compared with point 3 (center point of visor) when measuring refractive power or prismatic deviations.

3.5 Performance

3.5.1 Prismatic deviation. Prismatic deviation stated herein includes the inherent prismatic power resulting from nonparallel surfaces of the material and dissimilar curvature between the critical areas. The vertical and horizontal prismatic deviations shall be tested as specified in 4.4.5.

3.5.1.1 Vertical prismatic deviation. The algebraic difference between the vertical prismatic deviation of points "C" and all other points of choice for the right and left eyes shall be no more than 0.18 diopters, nor shall the vertical prism at any point in the critical area of vision exceed 0.18 diopters.

3.5.1.2 Horizontal prismatic deviation. The algebraic sum of the horizontal prismatic deviation at points "C" and all other points of choice for the right and left eyes shall not exceed 0.50 diopters. The algebraic difference between the horizontal prismatic deviation at points "C" and all other points of choice for the left and right eyes shall not exceed 0.18 diopters.

3.5.2 Refractive power. The refractive power shall not exceed plus or minus 0.125 diopters at point "C" and at all other points of choice for the left and right optics, when tested as specified in 4.4.5.

3.5.3 Luminous transmittance (see 6.4).

3.5.3.1 Class 1 visor. The luminous transmittance of class 1 visor shall be not less than 85 percent throughout the critical area when tested as specified in 4.4.5.

3.5.3.2 Class 2 visor. The luminous transmittance of class 2 visor shall be within 12 to 18 percent when measured at point "C", left and right optics. The total visible transmittance of the visor shall not vary more than 3.0 percent. Tests shall be as specified in 4.4.5.

3.5.4 Optical density.

3.5.4.1 Class 2G visor. The optical density (OD) of the class 2G visor shall be within 0.83 and 0.60 OD when measured at point "C" left and right optics. The OD at any point in a horizontal meridian of a given visor shall not vary by more than 0.1 OD from other points on the same meridian. The class 2G visor shall consist of a class 1 visor with a gradient tint, darker at the top, conforming to an OD gradient of 0.4 OD/inch $\pm$ 0.06 OD when measured at point "C" to a vertical distance of 1-inch above or below point "C". The resultant gradient shall be smooth and uniform when tested as specified in 4.4.5.

3.5.5 Optical distortion of critical areas. The optical distortion within the critical vision areas shall conform to the acceptable standards shown in figure 1 when tested as specified in 4.4.5.

3.5.6 Haze. The haze value of the visor shall not exceed 2.0 percent when tested as specified in 4.4.5.

3.5.7 Ultraviolet transmittance. The erythemal ultraviolet transmittance shall not be more than 1.00 percent when computed as the average spectral transmittance at wave lengths of 250, 270, 290, 300, 310 and 320 mu when tested as specified in 4.4.5.

3.5.8 Neutrality of class 2 and 2G visors. The spectral transmittance (see 6.5) of the class 2 visor may vary with wave lengths between 430 and 730 mu, the average percentage deviation within nine spectral bands shall be less than 12 when tested as specified in 4.4.5. The spectral distribution curve shall show a reasonable even distribution throughout the visible spectrum to insure that color distortion will not be excessive. The neutrality of the class 2G visor shall conform to the requirements specified for the class 2 visor except that the average percentage deviation shall be less than 20 when tested as specified in 4.4.5.

3.5.9 Chromaticity of classes 2 and 2G visors. The chromaticity coordinates x and y of the classes 2 and 2G visors shall be within the limits indicated in figure 2 when computed as described in 4.4.5.

3.5.10 Impact resistance. When tested as specified in 4.4.5, there shall be no penetration, spall, or cracks when tested with a caliber .22 T37 fragment simulating projectile at a velocity of 550 to 560 ft/sec.

3.5.11 Abrasion resistant coating. When specified in the end item specification, drawing, or contract, the visor shall be given an abrasion resistant coating which shall conform to MIL-C-83409 (see 6.2).

3.6 Workmanship. The visors shall be free from all defects which would affect proper functioning in service. The visors shall conform to the quality and grade of product established by this specification and the occurrence of defects shall not exceed the applicable acceptable 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 (examinations and tests) 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 methods specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in this specification where such inspections are deemed necessary to ensure 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 ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.1.2 Responsibility for dimensional requirements. Unless otherwise specified in the contract or purchase order, the contractor is responsible for ensuring that all specified dimensions have been met. When dimensions cannot be examined on the end item, inspection shall be made at any point, or at all points in the manufacturing process necessary to ensure compliance with all dimensional requirements.

4.1.3 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. When a first article is required (see 3.1 and 6.2), it shall be examined as specified in 4.4.3 and 4.4.4 and tested for the characteristics specified in 4.4.5. Any nonconformance shall be cause for the 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.

4.4.1 Inspection lots. For purposes of sampling, a lot shall consist of visors produced from a single batch of resin during one continuous injection molding operation. Any shutdown of the molding operation shall be considered as the termination of that operation and lot.

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

4.4.2.1 Component and material certification. A certificate of compliance may be acceptable as evidence that the bisphenol type polycarbonate conforms to the requirements of 3.3.

4.4.3 End item visual examination. The end items shall be examined for the defects listed in table I. The lot size shall be expressed in units of visors. The sample unit shall be one visor. The inspection level shall be II the

acceptable quality level (AQL), expressed in terms of defects per hundred units, shall be 2.5 for major defects and 4.0 for total (major and minor combined) defects. The presence of any critical defect shall be cause for rejection of the lot.

TABLE I. End item visual defects

Examine	Defect	Classification Critical	Major	Minor
Appearance	Pit, bubble, scratch, foreign matter, void, inclusions or blister:			
	-Critical area of vision.	1		
	-Non-critical area of vision.		101	
	-Area outside area of vision.			201
	Cloudiness:			
	-Critical area of vision.	2		
	-Non-critical area of vision.		102	
	Crack, hole, chip, or break:			
	-Any area.	3		
	-Evidence of warpage.	4		
	Visible striae or waviness:			
	-Critical area of vision.	5		
	-Non-critical area of vision.		103	
	Surface abraded, dulled or not smooth:			
	-Critical area of vision.	6		
	-Non-critical area of vision.		104	
	Stain or discoloration not readily removed with water:			
	-Critical area of vision.	7		
	-Non-critical area of vision.		105	
	Sharp edge or burr:			
	-Affecting serviceability.		106	
	-Not affecting serviceability.			202
	Transmittance gradient not smooth and uniform (class 2G visor).	8		
Design	Not as specified.	9		

4.4.4 End item dimensional examination. The visors shall be examined for conformance to the dimensions specified in the end item specification, drawings, or contract. Any dimension not within the specified tolerance shall be

classified as a defect. The lot size shall be expressed in units of visors. The sample unit shall be one visor. 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 visors shall be tested for the characteristics listed in table II. The sample unit shall be three visors. The inspection level shall be S-2. Any test failure shall be cause for rejection of the lot.

TABLE II. End item tests

Characteristic	Requirement paragraph	Test method	Number of determinations	Results to nearest
Prismatic deviation	3.5.1	4.5.1	1/unit	0.01 diopter
Refractive power	3.5.2	4.5.2	2/unit	0.001 diopter
Luminous transmittance	3.5.3	4.5.3	1/unit for class 1 2/unit for class 2	1 percent
Optical density	3.5.4	4.5.4	2/unit for class 2G	1 percent
Optical distortion of critical areas	3.5.5	4.5.5	1/unit	Pass or fail
Haze	3.5.6	4.5.6	1/unit	0.1 percent
Ultraviolet 1/ transmittance	3.5.7	4.5.7	1/unit	1 percent
Neutrality of class 2 and 2G	3.5.8	4.5.8	1/unit	1 percent
Chromaticity of class 2 and 2G	3.5.9	4.5.9	1/unit	1 percent
Impact resistance	3.5.10	4.5.10	2/	Pass or fail

1/ The test for ultraviolet transmittance shall be performed only on the first lot of visors from each batch of molding material. For each subsequent lot from the batch, the contractor shall submit a certificate of compliance stating that the visors are from the same batch of molding material represented by the test.

2/ A minimum of three impacts.

4.4.6 Packaging inspection. 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.

Examine	Defect
Markings (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, or inadequate stapling. Bulged or distorted container.
Contents	Number per container is more or less than required.

4.4.7 Palletization examination. The fully packaged and palletized end items shall be examined for 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 2.5.

Examine	Defect
Finished dimensions	Length, width, or height exceeds specified maximum requirement.
Palletization	Pallet pattern not as specified. Load not bonded as specified.
Weight	Exceeds maximum load limits.
Marking	Omitted; incorrect; illegible; of improper size, location, sequence, or method of application.

4.5 Methods of inspection.

4.5.1 Prismatic deviation test. A telescope, lensometer, projection lantern or any other suitable instrument shall be used to test the prismatic deviation. The instrument shall include a target which can be brought into sharp focus, as observed through an eyepiece or projected upon a screen, and an aperture not over 1 centimeter in diameter fixed at a definite position along the axis of the optical system. The design of the instrument shall be such that the refractive power in the principal meridian of the visor placed across the test aperture can be determined to within 0.03 diopter. The applicable paragraph of NBS Special

Publication 374, may be used as a guide for a method of checking refractive power. Vertical and horizontal prismatic deviations shall apply to readings taken on the visor "as worn" that is the distance of 1.70 inches from the concave surface of the visor when instruments other than the lensometer are used. All measurements shall be made in areas delineated in the end item specification, drawing, or contract, as applicable.

4.5.1.1 Vertical prismatic deviation. Base up prism shall be designated positive (+) and base down prism shall be designated negative (-). The vertical prismatic deviation is calculated by determining the algebraic difference between point "C" for the right eye and point "C" for the left eye, as well as comparison of other points as stated in 3.4.

4.5.1.2 Horizontal prismatic deviation. Base out prismatic deviation (deflection of target to the left for the left side of the visor as worn, and deflection of the target to the right for the right side of the visor as worn) shall be designated positive (+) and base in prismatic deviation (deflection of the target to the right for the left side of the visor as worn, and deflection of the target to the left for the right side of the visor as worn) shall be designated negative (-). The algebraic sum and the difference of horizontal prismatic deviation shall be calculated to determine compliance with 3.5.1.2.

4.5.2 Refractive power test. The refractive power shall be determined with the same apparatus used for measuring prismatic deviation.

4.5.3 Luminous transmittance test. The luminous transmittance of the visors shall be determined in accordance with ASTM D 1003.

4.5.4 Optical density of class 2G test. The optical density of the class 2G visors shall be calculated by first determining the luminous transmittance in accordance with ASTM D 1003. The optical density shall be calculated by the formula:

$$\text{Optical Density} = \text{Log} \frac{1}{\text{Transmittance}}$$

4.5.5 Optical distortion of critical areas test. The optical distortion of the critical area of the visors shall be determined by inserting the visor with its surface normal to the line of sight into the apparatus described in figure 3. The degree of off-parallelism shall constitute the amount of distortion. The visor shall be compared with the plates in figure 1.

4.5.6 Haze test. The haze shall be determined in accordance with ASTM D 1003.

4.5.7 Ultraviolet transmittance test. The erythemal ultraviolet transmittance shall be measured by a spectrophotometer.

4.5.8 Neutrality of class 2 and 2G visors test. The spectral transmittance of the class 2 or 2G visor as applicable, shall be measured by a spectrophotometer having a monochromator band width of 10 mu or less and a reproduction of plus or minus 1 percent. The neutrality shall be calculated by the Judd Daylight Duplication Method. Table III shows an example for the calculation of spectral transmittance deviations.

TABLE III. Example for calculation of spectral transmittance deviations

Average Wave length (mu)	Band T	n	wave length range	trans-mittance Tn	Percent deviation 100(1-Tn/Tc)	Weight	Product
430	0.114						
440	0.118						
450	0.127						
460	0.137	1	430-490	0.133	14	5	70
470	0.142						
480	0.144						
490	0.145	2	460-520	0.145	7	10	70
500	0.147						
510	0.149						
520	0.151	3	490-550	0.151	3	10	30
530	0.153						
540	0.154						
550	0.155	4	520-580	0.155	0	10	0
560	0.157						
570	0.158						
580	0.159	5	550-610	0.159	2	10	20
590	0.160						
600	0.160						
610	0.160	6	580-640	0.160	2	10	30
620	0.161						
630	0.161						
640	0.160	7	610-670	0.160	3	10	30
650	0.159						
660	0.159						
670	0.158	8	640-700	0.158	2	5	10
680	0.157						
690	0.156						
700	0.153	9	670-730	0.153	1	1	1
710	0.151						
720	0.149						
730	0.148						
					Totals	71	261

NOTES:

a. Spectral transmittance, Tc = 0.155.
b. T = Transmittance at 10 mu intervals.
c. Tn = Average transmittance of 60 mu band.
d. The average transmittance Tn for a given band is the average of the seven tabulated values within that band except that the first and last values are divided by 2 and the average computed by dividing the sum of the values by 6.
e. Average percentage deviation of spectral transmittance within nine spectral bands. (Average deviation - 261/71 = (3.7%)
f. This table is based on illuminant "C".

4.5.9 Chromaticity of class 2 and 2G visors test. The chromaticity coordinates x and y shall be calculated from spectrophotometric data. Table IV illustrates a sample calculation.

TABLE IV. Sample computation table of coordinates

Wave length (mu)	$\bar{x}$	$\bar{y}$	$\bar{z}$	T	$\bar{x}T$	$\bar{y}T$	$\bar{z}T$
380	4		20	0.104	0	0	2
390	19		89	0.240	5	0	21
400	85	2	404	0.301	26	1	122
410	329	9	1,570	0.275	90	2	432
420	1,238	37	5,949	0.174	215	6	1,035
430	2,997	122	14,628	0.110	330	13	1,609
440	3,975	262	19,938	0.093	370	24	1,854
450	3,915	443	20,638	0.092	360	41	1,899
460	3,362	694	19,299	0.100	336	69	1,930
470	2,272	1,058	14,972	0.110	250	116	1,647
480	1,112	1,618	9,461	0.122	136	197	1,154
490	363	2,358	5,274	0.132	48	311	696
500	52	3,401	2,864	0.140	7	476	401
510	89	4,833	1,520	0.142	13	686	216
520	576	6,462	712	0.142	82	918	101
530	1,523	7,934	388	0.141	215	1,119	55
540	2,785	9,149	195	0.141	393	1,290	27
550	4,282	9,832	86	0.155	664	1,524	13
560	5,880	9,841	39	0.170	1,000	1,673	7
570	7,322	9,147	20	0.167	1,223	1,528	3
580	8,417	7,992	16	0.153	1,288	1,223	2
590	8,984	6,627	10	0.142	1,276	941	1
600	8,949	5,316	7	0.136	1,217	723	1
610	8,325	4,176	2	0.136	1,312	568	0
620	7,070	3,153	2	0.137	969	432	
630	5,309	2,190		0.137	727	300	
640	3,693	1,443		0.138	510	199	
650	2,349	886		0.150	352	133	

TABLE IV. Sample computation table of coordinates (cont'd)

Wave length (mu)	$\bar{x}$	$\bar{y}$	$\bar{z}$	T	$\bar{x}T$	$\bar{y}T$	$\bar{z}T$
660	1,361	504		0.199	256	94	
670	708	259		0.270	191	70	
680	369	134		0.368	136	49	
690	171	62		0.475	81	29	
700	82	29		0.576	47	17	
710	39	14		0.620	24	9	
720	19	6		0.636	12	4	
730	8	3		0.643	5	2	
740	4	2		0.642	3	1	
750	2	1		0.632	1	1	
760	1	1		0.630	1	1	
770	1			0.600	1	0	
				Totals	13,992 (X)	14,790 (Y)	13,228 (Z)

NOTES:

a. $X = \Sigma\bar{x}T$, $Y = \Sigma\bar{y}T$, $Z = \Sigma\bar{z}T$
b. Spectral transmittance, Tc = Y/1,000 = 14.8 percent
c. Chromaticity coordinates:
   $x = X/(X + Y + Z) = 13,992/(13,992 + 14,790 + 13,228) = 0.3331$
   $y = Y/(X + Y + Z) = 14,790/(13,992 + 14,790 + 13,228) = 0.3521$
d. Spectral transmittance, Tc, and chromaticity coordinates, $\bar{x}$ and $\bar{y}$, for standard illuminant "C".
e. The symbol "T" represents the transmittance, the ratio of transmitted to homogeneous radiant flux.

4.5.10 Impact resistance test. The impact test shall be conducted in accordance with MIL-STD-662 and using a caliber .22 T37 fragment simulating projectile. The visor shall be rigidly mounted with the area to be impacted normal to the line of fire. An aluminum foil witness sheet, 2 mils thick, shall be mounted 2 inches behind the area of impact. Three valid impacts shall be made on the visor; one in the center and one in each vision area. An impact shall be considered valid only if it meets any of the following:

a. The impact velocity of the projectile is between 550 feet per second and 560 feet per second.
b. The impact velocity of the projectile is less than 550 feet per second and the impact fails to meet the requirements in 3.5.10.
c. The impact velocity of the projectile is more than 560 feet per second and the impact meets the requirements in 3.5.10.

The visor containing the three valid impacts and the witness sheet shall be examined for conformance to the requirements in 3.5.10. Any penetration on the witness sheet shall be considered evidence of spall.

4.5.11 Abrasion resistance coating test. The abrasion resistance coating test shall be conducted in accordance with MIL-C-83409.

5. PACKAGING

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

5.1.1 Level A. Each visor shall be inserted in a cotton flannel bag and unit packed on edge within a metal stayed paperboard box conforming to class 2, style A or C of PPP-B-665 or setup paperboard box conforming to type I, class A, style 4, variety 2 of PPP-B-676. Inside dimensions of each paperboard box shall approximate 8-1/2 inches in length, 3-1/4 inches in width, and 5-1/2 inches in depth. Approximate dimensions are furnished as a guide only. Box closure shall be secured with 2-inch minimum width gummed tape conforming to type III, grade A of PPP-T-45.

5.1.2 Commercial. The visors shall be preserved in accordance with ASTM D 3951.

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

5.2.1 Level A packing. Twenty-four visors of one class 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. Level A unit packs shall be packed flat, two in length, four in width, and three in depth within a shipping container. Inside dimensions of each shipping container shall approximate 17 inches in length, 13 inches in width, and 16-1/2 inches in depth. Approximate dimensions are furnished as a guide only. Each fiberboard container shall be closed in accordance with method III, waterproofed in accordance with method V, and reinforced as specified in the appendix of PPP-B-636. 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. Twenty-four visors of one class only, preserved as specified in 5.1, shall be packed in a fiberboard shipping container conforming to style RSC, type CF (variety SW) or SF, class domestic, grade 275 of PPP-B-636. Level A unit packs shall be packed flat, two in length, four in width, and three in depth within a shipping container. Inside dimensions of each shipping container shall approximate 17 inches in length, 13 inches in width, and 16-1/2 inches in depth. Approximate dimensions are furnished as a guide only. Each shipping container shall be closed in accordance with method II as specified in the appendix of PPP-B-636.

5.2.2.1 Weather-resistant shipping container. When specified (see 6.2), the fiberboard shipping container shall be a grade V3c, V3s, or V4s fiberboard box fabricated in accordance with PPP-B-636 and closed in accordance with the appendix of PPP-B-636.

5.2.3 Commercial packing. Visors, preserved as specified in 5.1, shall be packed in accordance with ASTM D 3951.

5.3 Palletization. When specified (see 6.2), visors packed as specified in 5.2.2 or 5.2.3, shall be palletized on a 4-way entry pallet in accordance with load type 1a of MIL-STD-147. Pallet types shall be type I (4-way entry), IV, or V in accordance with MIL-STD-147. Pallets shall be fabricated from wood groups I, II, III, or IV of MIL-STD-731. Each prepared load shall be bonded with straps in accordance with bonding means C and D or film bonding means F or G. Pallet pattern shall be number 7 in accordance with the appendix of MIL-STD-147.

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

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The class 1, class 2 and class 2G visors are intended to be used on flight helmets used by aircrewmen.

6.2 Acquisition requirements. Acquisition documents must specify the following:

a. Title, number, and date of this specification.
b. Class of visor required (see 1.2).
c. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1 and 2.2).
d. When abrasion resistant coating is required (see 3.5.11).
e. Levels of preservation and packing (see 5.1 and 5.2).
f. Type and class of unit load (see 5.2.1).
g. When weather-resistant grade fiberboard shipping containers are required for level B packing (see 5.2.2.1)
h. When palletization is required (see 5.3).

6.3 First article. When a first article is required, it shall be inspected a3d approved under the appropriate provisions of FAR 52.209. The first article should be a preproduction sample. The contracting officer should specify the appropriate type of first article and the number of units to be furnished. The contracting officer should also include specific instructions in acquisition documents regarding arrangements for selection, inspection, and approval of the first article.

6.4 Luminous transmittance. For the purpose of this specification, luminous transmittance is defined as the ratio of the luminous flux transmitted by the visor to the luminous flux incident. It is measured with a sensor corrected to compare with the photopic sensitivity of the human eye without regard to specific wave lengths. ASTM D 1003 or a specified modification thereof is a way of determining luminous transmittance.

6.5 Spectral transmittance. For the purpose of this specification, spectral transmittance is defined as radiant transmittance evaluated for a specific range of wave lengths of incident energy. It is desirable that it be measured with an automatic recording spectrophotometer of the required range of sensitivity and evaluated according to the applicable instructions.

6.6 Subject term (key word) listing.

Aircrewman
Armor
Eye protection
Flight
Shield

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

Custodians:

Army - GL
Air Force - 99

Review activities:

Army - MD, AV
Air Force - 11, 82
DLA-CT

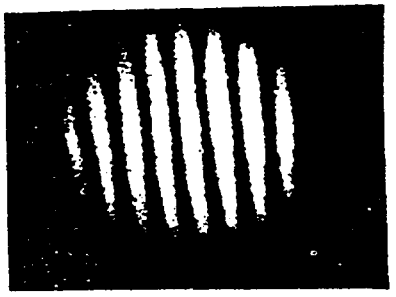
Preparing Activity:

Army-GL

(Project 8415-0743)

FIGURE 1 VISORS DISTORTION STANDARDS

ACCEPTABLE



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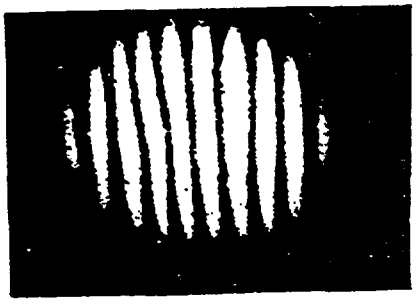

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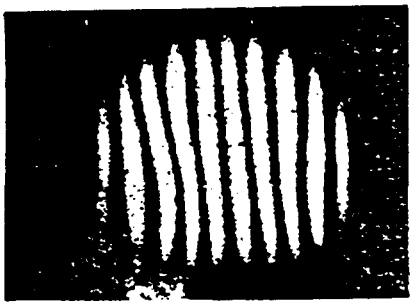

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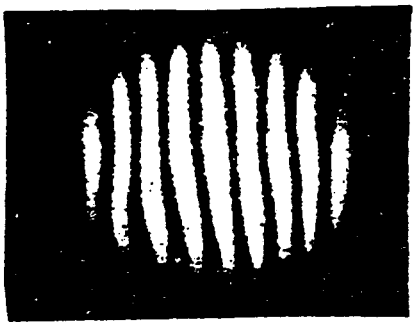

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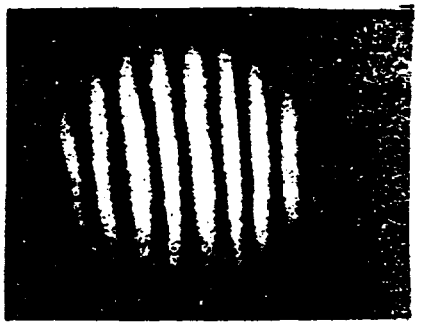

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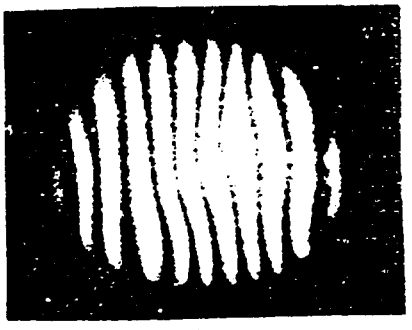
UNACCEPTABLE



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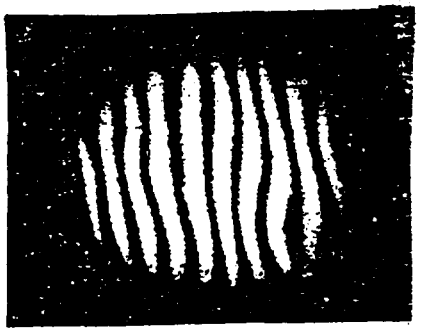

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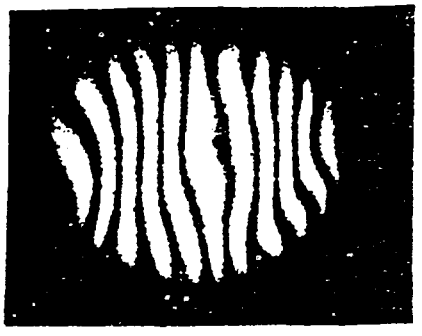

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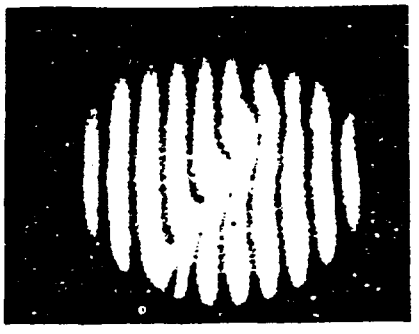


9

FIGURE 2 CHROMATICITY COORDINATES

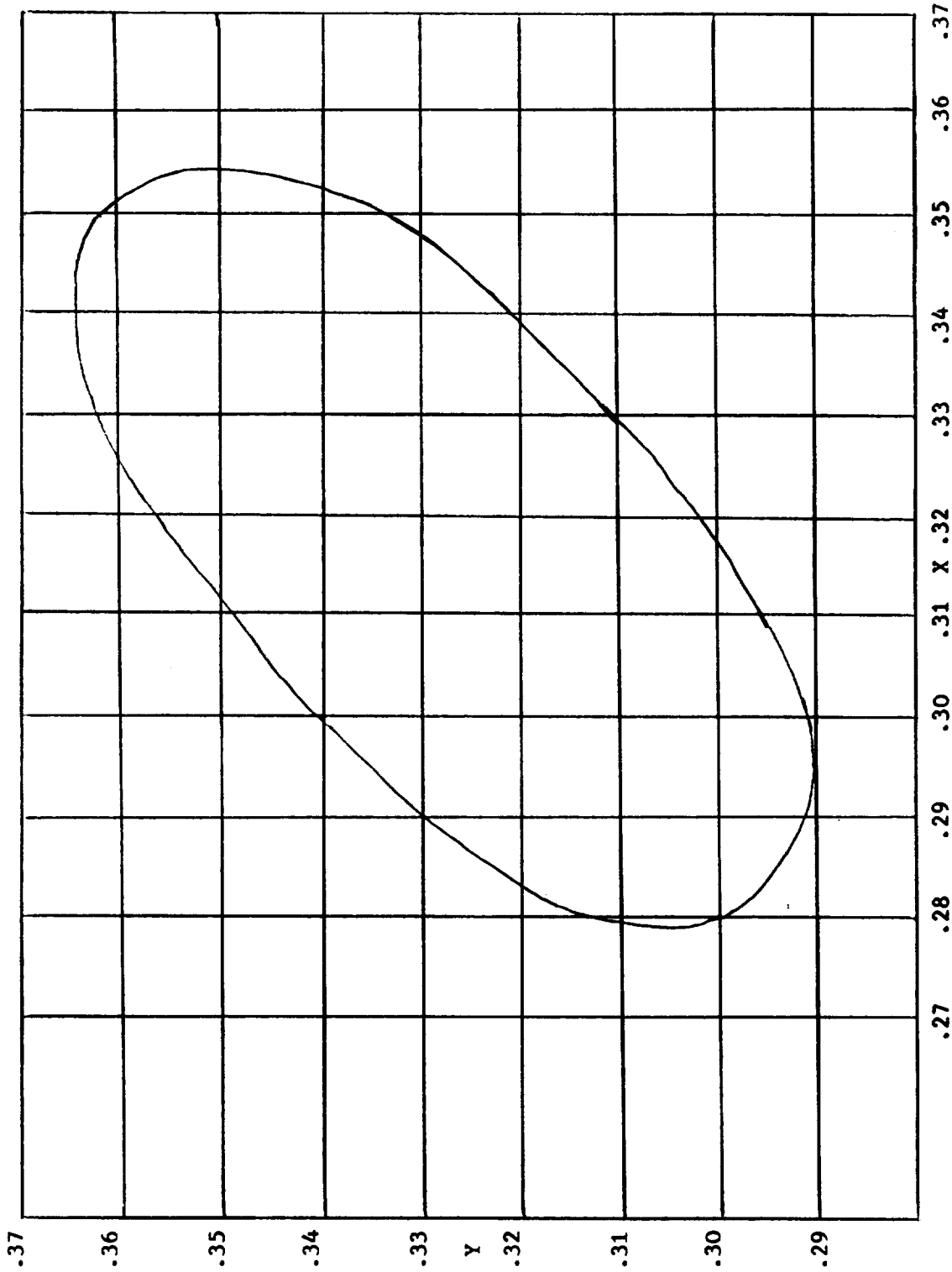
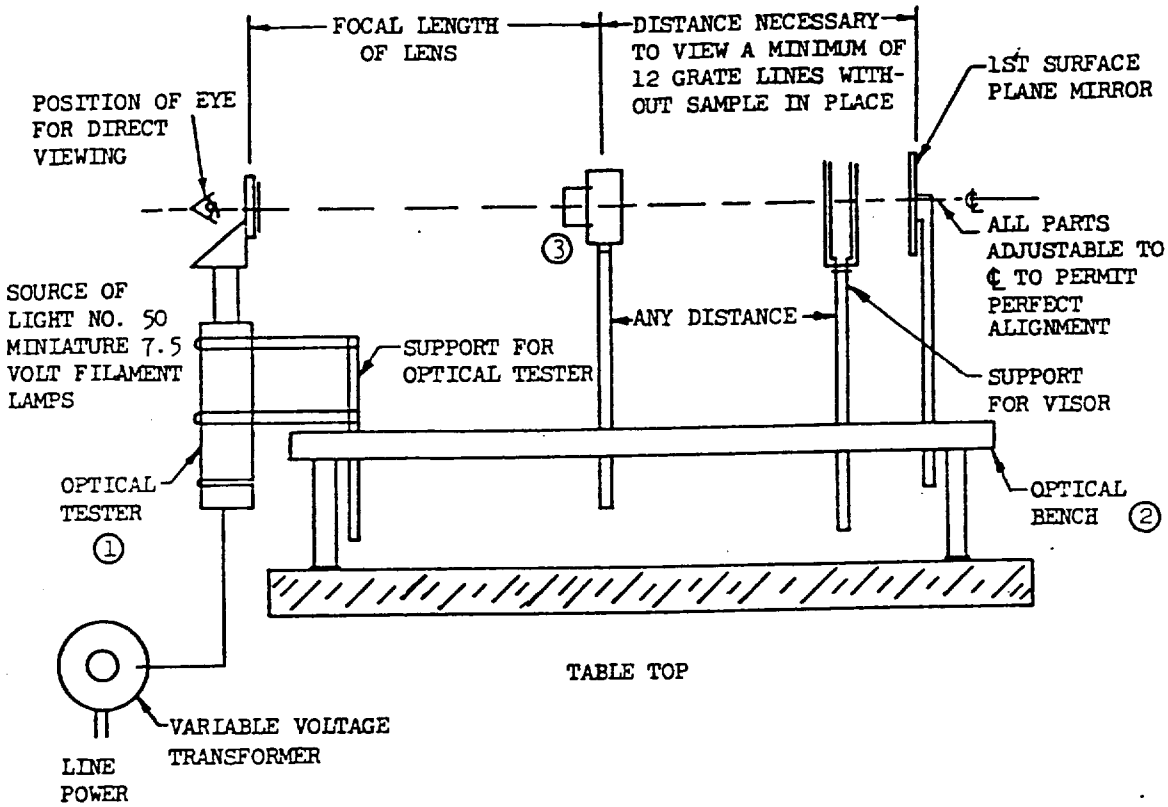


FIGURE 3 DISTORTION TESTER



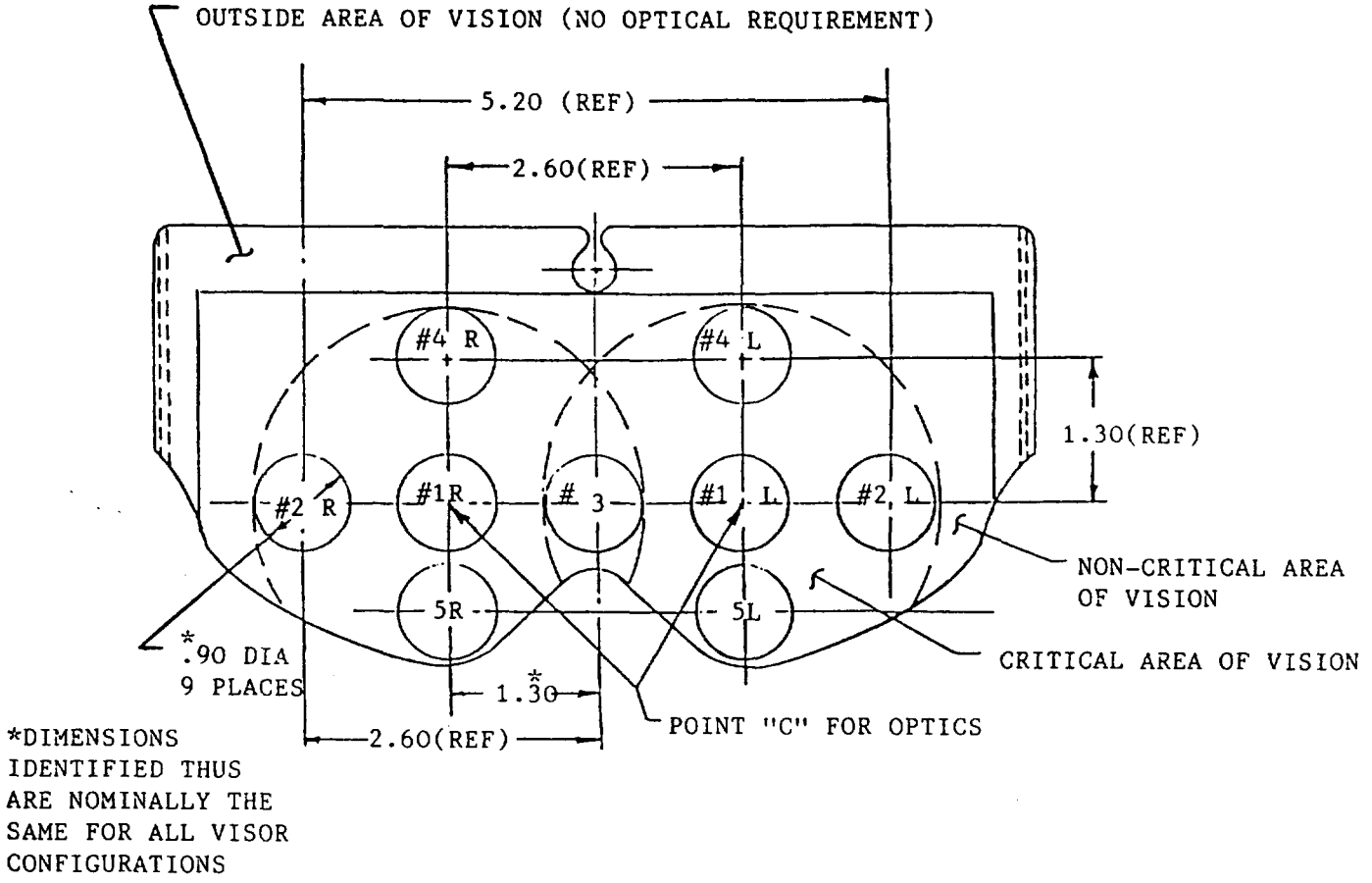
1 MODEL "B" OPTICAL TESTER WITH A 60-LINE GRATING, WITH MODEL "O" OPTICAL BENCH ADAPTER OR EQUIVALENT. (OBTAINABLE FROM ANN ARBOR OPTICAL CO, P.O. BOX 2056, ANN ARBOR, MICHIGAN)

2 OPTICAL BENCH OBTAINABLE FROM CENTRAL SCIENTIFIC CO., OR ITS EQUIVALENT OBTAINABLE FROM ANY EQUIPMENT SUPPLIER

3 TELEPHOTO CAMERA LENS - A SCHNEIDER TELE-ARTON 1:5.5/240 mm, NORMAL COLOR COATED, BARREL ONLY OR EQUIVALENT

(New London - Ann Arbor)

FIGURE 4 TYPICAL VISOR CONFIGURATION



CRITICAL AREAS ARE LOCATED WITHIN THE DOTTED SEGMENTS, NONCRITICAL AREAS ARE LOCATED OUTSIDE DOTTED SEGMENTS. NUMBERED CIRCLES WITHIN THE CRITICAL AREAS ARE DESIGNATED AS POINTS OF CHOICE FOR PRISMATIC AND DISTORTION TESTS. POINTS BEARING THE SAME NUMBER, FOR EXAMPLE, 5R AND 5L, SHALL BE COMPARED WITH EACH OTHER, EXCEPT THAT POINTS NO. 2R AND 2L SHALL BE COMPARED WITH POINT NO. 3 WHEN MEASURING REFRACTIVE POWER OR PRISMATIC DEVIATIONS. THIS FIGURE COVERS ONE SPECIFIC VISOR AND IS INTENDED TO SERVE ONLY AS A GUIDE SINCE VISOR CONFIGURATIONS DIFFER AMONG DIFFERENT HELMETS.

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER	2. DOCUMENT DATE (YYMMDD)
	MIL-V-43511C	1990 July 16

3. DOCUMENT TITLE
VISORS, FLYER'S HELMET, POLYCARBONATE

4. NATURE OF CHANGE *(Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)*

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (Last, First, Middle Initial)	b. ORGANIZATION	
c. ADDRESS (Include Zip Code)	d. TELEPHONE (Include Area Code) (1) Commercial (2) AUTOVON (If applicable)	7. DATE SUBMITTED (YYMMDD)

8. PREPARING ACTIVITY

a. NAME	b. TELEPHONE (Include Area Code) (1) Commercial	(2) AUTOVON
U.S. Army Natick RD&E Center	508-651-5221	256-5221
c. ADDRESS (Include Zip Code) Commander, U.S. Army Natick RD&E Center ATTN: STRNC-ES Natick, MA 01760-5014	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 AUTOVON 289-2340	