

INCH-POUND

MIL-P-8587B
9 FEBRUARY 1993
 SUPERSEDING
 MIL-P-8587A
 8 JULY 1964

MILITARY SPECIFICATION

PLASTIC; SHEET, COLORED, INSTRUMENT FLYING TRAINING

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

1. SCOPE

1.1 Scope. This specification covers transparent, colored, cellulose-acetate base plastic sheet materials; it does not cover formed, molded, or fabricated articles made from these sheets.

1.2 Classification. Cellulose-acetate base plastic sheets covered by this specification shall be of the following types, as specified (see 6.2):

- a. Type I — For enclosures
- b. Type II — For goggles

2. APPLICABLE DOCUMENTS

2.1 Government documents

2.1.1 Specifications and standards. The following specifications and standards 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. (see 6.2).

SPECIFICATION

FEDERAL

PPP-B-636 Box, Fiberboard

MILITARY

MIL-P-116 Preservation, Methods of
 MIL-L-10547 Liners, Case, and Sheet, Overwrap, Water-Vaporproof, Flexible

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 9330

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

MIL-P-8587B**MILITARY**

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129	Marking for Shipment and Storage

ENGINEERING HANDBOOK SERIES FOR AIRCRAFT REPAIR

01-1A-12	Fabrication, Maintenance, and Repair of Transparent Plastics or T.O. 1-1A-12
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(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Defense Printing Service Detachment Office, Bldg 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.2 Non-Government publications. The following document(s) 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 specified in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D542	Standard Test Method for Index of Refraction of Transparent Organic Plastics
ASTM D570	Standard Test Method for Water Absorption of Plastics
ASTM D635	Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position
ASTM D637	Surface Irregularities of Flat Transparent Plastic Sheets
ASTM D792	Standard Test Methods for Specific Gravity (Relative Density) and Density of Plastics by Displacement

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

UNIFORM CLASSIFICATION COMMITTEE**Uniform Freight Classification Rules**

(Application for copies should be addressed to Uniform Classification Committee, 202 Chicago Union Station, Chicago, IL 60606.)

(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 regulation unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 First article. This specification makes provisions for first article testing (see 6.2).

3.2 Data. Unless otherwise specified in the contract or order, no data (other than reports and drawings accompanying first article samples) are required by this specification or any of the documents referenced in section 2 herein (see 6.2).

3.3 Materials. Materials shall be transparent, cellulose-acetate plastic conforming to all requirements of this specification applicable to the particular type and completely suitable for the intended use.

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3.4 Dimensions. Dimensions of sheets shall be as specified by applicable drawings or specifications. Unless otherwise specified, a tolerance of $\pm 1/16$ inch (± 1.59 mm) will be allowed on linear dimensions at $77^{\circ} + 5^{\circ}\text{F}$ ($25^{\circ} \pm 2.8^{\circ}\text{C}$).

3.5 Instruction sheets. When specified in the contract or order, instruction sheets approved by the procuring activity, covering the limitations of the material and the necessary precautions to be observed in handling, storing, cutting, bending, cementing, abrading, and cleaning shall be furnished with each shipping container as specified in section 5. Instructions sheets may refer to material in the handbook T.O. 1-1A-12 (BuWep 01-1A-12) by specific paragraph or page reference. Instruction sheets shall describe all compounds, materials, and equipment mentioned therein in sufficient detail to permit nonproprietary procurement, using Government specifications when available.

3.6 Workability. When any of the procedures of the instruction sheets are followed, the material shall not fail mechanically nor develop any surface or internal defects.

3.7 Color stability. The plastic shall continue to conform to all applicable colorimetric requirements after exposure of the color stability test specified in 4.7.2.

3.8 Spectral transmittance. The total spectral transmittance of the plastic of either type shall not exceed 3 percent at a wave length of 535 millimicrons.

3.9 Rate of burning. The sheet shall consist of either nonflammable or slow-burning material. The rate of burning shall not exceed 3.5 inches (88.9 mm) per minute.

3.10 Specific gravity. The specific gravity of the conditioned material shall be less than 1.40.

3.11 Index of refraction. The index of refraction of the conditioned material shall be 1.50 ± 0.030 .

3.12 Water absorption. The water absorption of the conditioned material shall not exceed 7.0 percent.

3.13 Formability. When formed in accordance with the procedure specified in 4.7.11, the plastic shall be in complete contact with the female form without fracture of the specimen.

3.14 Minor optical defects. When tested as specified in 4.7.6, the total number of minor optical defects in the plastic shall not exceed a limit determined by dividing the area of the sheet in square feet by 4.

3.15 Requirements applicable to type I only.

3.15.1 Color. Type I material shall be amber in color.

3.15.2 Thickness tolerance. The nominal thickness of the plastic sheet furnished shall be 0.04 inch (1.0 mm). The actual thickness of the sheet at any point shall be 0.04 ± 0.004 inch (1.0 mm ± 0.10 mm).

3.15.3 Light transmittance. The total visible light transmittance for light of daylight quality shall be at least 36 percent.

3.15.4 Total spectral transmittance. The spectral light transmittance of the material shall not exceed 1 percent throughout the wavelength range from 400-530 millimicrons.

3.15.5 Diffuse spectral transmittance. The diffuse spectral transmittance shall not exceed 2.5 percent at a wavelength of 610 millimicrons.

3.16 Requirements applicable to type II only.

3.16.1 Color. Type II material shall be blue in color.

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3.16.2 Thickness tolerance. The nominal thickness of the plastic sheet furnished shall be 0.030 inch (0.76 mm). The actual thickness of the sheet at any point shall be 0.03 ± 0.004 inch ($0.76 \text{ mm} \pm 0.10 \text{ mm}$).

3.16.3 Light transmittance. The total visible light transmittance for light of daylight quality shall be at least 6 percent.

3.16.4 Total spectral transmittance. The spectral light transmittance of the material shall not exceed 1 percent throughout the wavelength range from 540–700 millimicrons.

3.16.5 Diffuse spectral transmittance. The diffuse spectral transmittance shall not exceed 12.5 percent at a wavelength of 450 millimicrons.

3.17 Identification marking. Each plastic sheet or its attached covering shall be marked with the specification number, the nominal thickness, and the manufacturer's code designation for his approved product. If the marking specified is not plainly visible with the protective covering on the material in place, the same information shall be legibly marked on the protective covering of each sheet in such manner that the markings produced will not be damaged by contact incident to normal handling during shipment.

3.18 Workmanship. Workmanship shall be in accordance with high-grade commercial practice for this class of work.

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 their 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 ensure that the 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 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.

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

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

4.3 First article inspection.

4.3.1 First article samples. The first article test samples shall consist of a sufficient number of plastic sheets to provide enough test specimens for the first article tests specified in 4.3.2.

4.3.2 Tests. First article tests shall consist of all the examination and tests specified under 4.5 and 4.7.

4.3.3 Test report. A report reflecting the complete results of all first article examinations and tests, including explanation for failures, shall be submitted in triplicate for approval prior to commencing production. The record of the test shall be listed in the report as specified in 4.6.

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4.4 Quality conformance inspection. Quality conformance inspection shall consist of all examinations and tests specified in 4.5 and 4.7.

4.4.1 Inspection lot. A lot shall consist of all material of the same type submitted for acceptance and delivery at one time. The lot size shall be as specified in units of sheets and units of shipping containers, as applicable.

4.4.2 Samples for quality conformance tests. The sample unit for each lot shall be as specified in 4.4.2.1, 4.4.3.3, and 4.4.2.3. The inspection level for determining the sample size shall be in accordance with MIL-STD-105 as specified in table I. The acceptable quality level (AQL) shall be as specified in table I.

TABLE I. Inspection Level and AQL

Examination or test	Examination or test reference	Inspection level	AQL
Appearance, workmanship and identification	4.5.1	I	2.5
Dimensional	4.5.2	I	4.0
Preparation for delivery	4.5.3	S-2	4.0
End item tests	4.7	S-1	6.5

4.4.2.1 Sampling for examination of end item defects. The sample unit for examination of the end item defects shall be one sheet. The samples may be selected before application of adhering cover material and shall be subjected to the examination specified in table II and III

4.4.2.2 Sampling for preparation for delivery. The sample unit for examination for determining compliance with the requirements of section 5 shall be one fully packed shipping container, prior to sealing. Defects shall be scored in accordance with table IV.

4.4.2.3 Sampling for testing of the end item. The sample unit for testing of the end item shall be one sheet or 4 square feet, having a minimum dimension of 6 inches. If less than a whole sheet is used, not more than one sample shall be taken from the same sheet.

4.5 Examination

4.5.1 Appearance and workmanship. Samples shall be examined for the defects specified in table II.

4.5.2 Dimensional. Samples shall be examined for the defects specified in table III.

4.5.3 Preparation for delivery. Samples shall be examined to determine conformance to the requirements of section 5 and the existence of defects specified in table IV.

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4.6 Record of test results. The results of tests listed in 4.7 shall be recorded as specified in table V.

TABLE II. Examination for defects (appearance, workmanship, and marking)

Examine	Defects
Appearance	<p>Material not uniform finish, color, transparency, or opacity (as applicable); not in accordance with contract requirements.</p> <p>Not clean, presence of dirt, foreign materials, embedded particles.</p> <p>Any cracks, cuts, breaks, holes, wrinkles or distortion.</p>
Workmanship	<p>Sheets not flat, edges not cleanly cut or square.</p> <p>Bubbles, striations, or blemishes.</p> <p>Note: Minor optical imperfections and blemishes shall be evaluated as indicated in 3.14 before being scored as defects</p>
Identification	<p>Individual sheets or cover materials not marked for identification as specified in 3.17.</p>

TABLE III. Examination for defects (dimensional)

Examine	Defects
Length and width	<p>Unless otherwise specified by contract or drawing, varies by more than $\pm 1/6$ inch (± 1.59 mm) from required size.</p>
Thickness	<p>Varies by more than ± 0.004 inch (± 0.10 mm) from nominal thickness specified in 3.15.2 or 3.16.2, as applicable.</p>

MIL-P-8587BTABLE IV. Examination or defects (preservation, packaging, packing, and marking)

Examine	Defects
Adhering cover material	Missing, does not cover both sides, contains holes, cuts, or tears.
Packaging	Not in accordance with the applicable level specified in 5.2. Packaging material not as specified.
Quantity Instruction sheets	Number of sheets less than indicated or specified. Instruction sheets not included when specified in the contract.
Packing Marking for shipment	Not in accordance with the applicable level specified in 5.3. Container material or construction not as specified. Closures not made in accordance with specified methods. Any nonconforming component, component missing, damaged, or otherwise defective so as to affect serviceability. Interior or exterior marking as applicable, omitted, illegible, incorrect, incomplete, or not specified.
Weight	Gross weight exceeds specified limits.

MIL-P-8587BTABLE V. Test results

Requirement	Test	Individual Unit	Number determinations per sample unit	Results (pass or fail)	Reported as numerically to nearest
3.15.3	4.7.3	X	Avg of 4	X	1.0 percent
3.15.4	4.7.4	X	Avg of 4		0.1 percent
3.15.5	4.7.5	X	Avg of 4		0.1 percent
3.16.3	4.7.3	X	Avg of 4		1.0 percent
3.16.4	4.7.4	X	Avg of 4		0.1 percent
3.16.5	4.7.5	X	Avg of 4		0.1 percent
3.7	4.7.2	X	1		
3.8	4.7.1	X	Avg of 2		0.1 percent
3.9	4.7.7	X	Avg of 3		1/4 per inch per minute
3.10	4.7.8	X	Avg of 2		0.001 unit
3.11	4.7.9	X	Avg of 2		0.001 unit
3.12	4.7.10	X	Avg of 2		0.1 percent
3.13	4.7.11	X	1		
3.6	4.8	X	1	X	

MIL-P-8587B**4.7 Test methods.**

4.7.1 Spectral transmittance. The measurement of spectral transmittance shall be conducted by means of a recording spectrophotometer, utilizing a double monochromator having a band width of 10 millimicrons. The photometric balance shall be achieved by photoelectric control operating from an integrating sphere which receives the sample beam alternately. The total spectral transmittance at any wavelength shall be determined with the specimen in position against the sphere wall and with identical reflectors (magnesium oxide or magnesium carbonate) at the sample and standard reflectance apertures. Precautions shall be taken to insure the proper adjustment of the 100-percent photometric balance, accurate wavelength and photometric calibration, and proper alignment of the record chart. Values below 1 percent will be regarded as 0.0 percent for purposes of computation. In case of dispute, referee tests will be conducted on a General Electric recording spectrophotometer, or equal, all measurement being made on the 100 percent cam.

4.7.2 Color stability. After 60 hours' exposure to a carbon arc of the fadeometer type, enclosed in a corex D globe, the plastic shall be tested for conformance to the three colorimetric requirements. The arc shall carry approximately 13 amperes and one of the electrodes shall be cored. The specimen shall be approximately 15 inches (38.1 cm) from the light source. The temperature of the specimen shall not exceed 131°F (55°C) during the test.

4.7.3 Light transmittance. The total visible light transmittance shall be computed from the spectral data for the visual response of the I.C.I standard observer and illuminate "C". The sum of the transmittance values of 1 percent, or more, at each of the wavelengths in table VI shall be multiplied by 0.0333 to yield the light transmittance.

TABLE VI. Wavelengths

465.9	525.4	548.4	568.9	594.8
489.4	529.8	551.8	572.5	600.8
500.4	533.9	555.1	576.4	607.7
508.7	537.7	558.5	580.5	616.1
515.1	541.4	561.9	584.8	627.3
520.6	544.9	565.3	589.6	647.4

4.7.4 Total spectral transmittance. The total spectral transmittance., measured as specified in 4.7.1, shall be obtained throughout the wavelength ranges specified. The values shall be determined with the 100 percent cam in position.

4.7.5 Diffuse spectral transmittance. The same area of the specimen shall be used for this measurement as was used for the total spectral transmittance determination. Diffuse spectral transmittance shall be obtained by means of the procedure specified in 4.7.1, modified as follows: The magnesium oxide or magnesium carbonate reflector at the reflectance sample aperture shall be replaced by an absorber. This absorber shall have a reflectance of 0.5 percent, or less at the wavelengths at which diffuse spectral transmittance is determined. The aperture at the absorber shall be 1-1/4 inches in diameter. It is recognized that the light scattered at very small angles from the direct beam is not included in this determination.

4.7.6 Minor optical defects. The existence of minor optical defects shall be determined in accordance with ASTM D637. Minor defects shall include any embedded particles, bubbles, or scratches which reduce visibility through the plastic and those localized imperfections which cause a variation in angular deviations of more than 5 minutes within a distance of not more than 20 inches of the screen specified in ASTM D637. It is not required to qualitatively survey the sheet for such variation in deviation, but localized imperfections which

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are suspected of being detrimental should be evaluated. Blemishes which do not individually reduce visibility through the plastic shall be disregarded unless they are grouped in an objectionable pattern. Minor defects within 1 inch of the edge shall be disregarded. The total objectionable defects shall not exceed the quantity specified in 3.14.

4.7.7 Rate of burning. This test shall be conducted in accordance with the test for flammability of plastic exceeding 0.05 inch in thickness, ASTM D635.

4.7.8 Specific gravity. The specific gravity of the material at $72.5^{\circ} \pm 2^{\circ}\text{F}$ ($22.5^{\circ}\text{C} \pm 1.1^{\circ}\text{C}$) with reference to distilled water at the same temperature shall be determined in accordance with ASTM D792.

4.7.9 Index of refraction. The index of refraction shall be determined in accordance with ASTM D542.

4.7.10 Water absorption. The percentage of water absorbed in 24 hours shall be determined in accordance with ASTM D570.

4.7.11 Formability. The test specimen shall be least 7-1/2 inches (19 cm) long and at least 4 inches (10.2 cm) wide. The temperature of the test specimen shall be $75.5^{\circ} \pm 5^{\circ}\text{F}$ ($23.9^{\circ}\text{C} \pm 2.8^{\circ}\text{C}$) prior to and during the performance of this test. Two test specimens shall be placed over a 5-inch diameter (12.7 cm) semi-cylindrical mold covered with a soft lintless cloth. The 7-1/2 inch (19 cm) dimension shall be parallel to the circumference of the mold. A 1-1/2 pound (0.68 Kg) weight shall be so placed on the test specimen as to shape the specimen 180 degrees about the covered surface of the mold. A 1-1/2 pound (0.68 Kg) weight shall be so placed on the test specimen as to shape the specimen 180 degrees about the covered surface of the mold. The specimens shall not break, crack, or exhibit any condition that does not exist in the flat condition.

4.8 Workability. The procedures described shall be performed in accordance with the instructions, and the specimen examined for mechanical failure or the presence of significant defects not originally present.

5. PACKAGING

5.1 Protective wrapping. Unless otherwise specified by the procuring activity, all material shall be separated by size and thickness when packed for shipment. Individual sheets shall be covered on both sides by a suitably adhered paper or film that can be readily removed without injury to the surfaces and that will adequately protect the surfaces from scratching or damage during handling, shipping or storage.

5.2 Preservation and packing. Preservation and packing shall be level A, or C as specified (See 6.2).

5.2.1 Level A. Plastic shall be packaged method III in quantities as specified by the contract in accordance with MIL-P-116.

5.2.2 Level C. Plastic shall be packaged in accordance with the manufacturer's commercial practice.

5.3 Packing. Packing shall be level A, B, or C, as specified (see 6.2).

5.3.1 Level A. Plastic, packaged as specified in 5.2.1, shall be packed in overseas-type shipping containers conforming to type I, class 2 of PPP-B-636. Insofar as practicable, exterior containers shall be of uniform shape and size, of minimum cube and tare consistent with the protection required, and shall contain identical quantities. The gross weight of each pack shall not exceed the weight limitations of the container. The container shall be closed and strapped in accordance with the applicable container specification or appendix thereto. Containers shall be provided with a case liner conforming to MIL-L-10547 and shall be sealed in accordance with appendix thereto.

5.3.2 Level B. Plastic, packaged as specified in 5.2.1, shall be packed in domestic-type shipping containers conforming to type I, class 1 of PPP-B-636. Exterior containers shall be of minimum cube and tare consistent with the protection required. Insofar as practicable, exterior containers shall be of a consistent shape and size and shall contain identical quantities. Containers shall be closed and strapped in accordance with applicable container specification or appendix thereto.

5.3.3 Level C. Plastic shall be packed in containers that will insure acceptance by common carrier at the lowest rates and safe delivery at the first receiving destination. Shipping containers shall conform to the Uniform Freight Classification Rules or other carrier regulations applicable to the mode of transportation.

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5.4 Instruction sheet. When specified in the contract or order (see 6.2), the manufacturer's instructions sheets (see 3.5) shall be included in each individual exterior container.

5.5 Marking of shipments. In addition to any special marking required by the contract or order, interior packages and shipping containers shall be marked in accordance with MIL-STD-129. The date of manufacture shall be marked by quarter and year (example 3Q91).

6. NOTES

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

6.1 Intended use. Type I and type II materials covered by this specification are to be used together, for the purpose of instrument flying training. Type sheet, amber in color, is intended for use in windows, windshield, canopy, etc., of the cockpit enclosures. Type II sheet, blue in color, is intended for use in goggles

6.1.1 For information regarding processes for installation and working of this material, reference should be made to T.O. 1-1A-12 or 01-1A-12 handbook.

6.2 Acquisition requirements. Acquisition requirements documents should specify:

- a. Title, number, and date of this specification
- b. Type (see 1.2)
- c. Issue of DoDISS to be cited in the solicitation and, if required, the specific issue for the individual documents referenced (see 2.1 and 2.2)
- d. Size of sheets (see 3.4)
- e. Number of sheets required
- f. Data requirements (see 3.2)
- g. If instruction sheets are required (see 3.5)
- h. Where the first article samples should be sent, the activity responsible for testing, and instructions concerning the submittal of test reports (see 4.3.3)
- j. Applicable levels of packaging and packing (see 5.2 and 5.3)

6.3 Subject term (key word) listing

Cellulose-acetate
Fabricated articles
Plastic sheet

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

Custodian
Navy – AS
Air Force – 11

Preparing Activity
Air Force – II

Review activities:

Air Force – 99

User activities:

DLA – GS

(Project 9330-1279)