MIL-B-10743E
22 October 1980
SUPERSEDING
MIL-B-10743D
27 May 1965

MILITARY SPECIFICATION

BALLOON, PILOT AND CEILING

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

1. SCOPE

1.1 Scope. This specification covers eleven types of neoprene latex balloons (see 6.1).

1.2 Classification. Neoprene latex balloons shall be of the following types, as specified (see 6.2):

Nomenclature	Type	Weight	Color
Balloon ML-50-A	Pilot	30 grams	Uncolored
Balloon ML-51-A	Pilot	30 grams	Black
Balloon ML-64-A	Pilot	30 grams	Red
Balloon ML-155-A	Pilot	30 grams	Orange
Balloon ML-156-A	Pilot	30 grams	Yellow
Balloon ML-157-A	Ceiling	10 grams	Black
Balloon ML-158-A	Ceiling	10 grams	Red
Balloon ML-159-A	Pilot	100 grams	Uncolored
Balloon ML-160-A	Pilot	100 grams	Black
Balloon ML-161-A	Pilot	100 grams	Red
Balloon ML-408/AM	Pilot	100 grams	Orange

Beneficial comments (recommendations, additions deletions) and any pertinent data which may be of use in improving this document should be addressed to: US Army Electronics Research and Development Command, Combat Surveillance and Target Acquisition Laboratory, ATTN: DELCS-PE, Fort Monmouth, NJ 07703, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

FSC 6660

2. APPLICABLE DOCUMENTS

2.1 Issues of documents. The effective issue or revision of the following document shall be that listed in the Department of Defense Index of Specifications and Standards (DODISS) and supplements thereto, unless (i) specific issues are set forth therefor in the cited specifications or (ii) different issues than those specified in the cited specifications are set forth in the solicitation. The date of the applicable DODISS and supplements thereto shall be as specified in the solicitation or contract.

SPECIFICATIONS

MILITARY

MIL-B-14417 - Balloons, Meteorological: Pilot, Ceiling, and Sounding, Packaging of.

STANDARDS

FEDERAL

FED-STD-595 - Color.

MILITARY

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.

(Copies of specifications, standards, drawings, and publications required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The effective issue or revision of the following document shall be that listed in the Department of Defense Index of Specifications and Standards (DODISS) and supplements thereto, unless (i) specific issues are set forth therefor in the cited specifications or (ii) different issues than those specified in the cited specifications are set forth in the solicitation. The date of the applicable DODISS and supplements thereto shall be as specified in the solicitation or contract.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D412-75 - Rubber, Determination of Tension Characteristics.

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

3. REQUIREMENTS

3.1 First article. When specified, the contractor shall furnish sample units for first article inspection and approval (see 4.2 and 6.2d).

3.1.1 Fabrication. First article samples shall meet specified requirements, shall be made and assembled by tools and methods that will be used for quantity production, and shall be accompanied by a statement to that effect (see 3.1.2 for exception).

3.1.2 Deviation. When deviation from 3.1.1 is unavoidable, the first article samples may be submitted for approval provided that the accompanying statement describes in detail each nonconforming feature, reasons therefor, and the manner in which it will be corrected in production of balloons on contract.

3.1.3 Waiver. Approval of first article samples shall not be construed as a waiver of any specified requirement.

3.2 Material. Balloons shall be made of the best quality neoprene latex. The material shall be of uniform texture, and shall be free from impurities.

3.2.1 Recycled, virgin and reclaimed neoprene. Without jeopardizing the intended use of balloons furnished to this specification, selection of neoprene will be governed by the following:

a. There is no exclusion to the use of recovered neoprene.
b. There is no requirement that balloons be manufactured of virgin neoprene.
c. Reclaimed neoprene is required to the maximum extent possible.

3.3 Design.

3.3.1 Neck. The balloons shall have a tubular neck of approximately constant cross-sectional area. The neck shall be molded integrally with the body of the balloon or securely attached thereto. The edge (free end) of the neck of each balloon shall have a bead formed around it for reinforcement, wherever the neck thickness is the same as the thickness of the body of the balloon.

3.3.2 Shape. Balloons shall meet the minimum ratio of axes requirements when inflated (see 4.9) at room temperature, ambient pressure and in still air, to the volume specified in table II for shape test. The ratio of axes is defined as the decimal equivalent of the ratio between the minimum axis and the maximum axis of the inflated balloon. The maximum axis represents the longest line passing through the balloon, exclusive of the neck, terminated at the balloon wall; the minimum axis represents the shortest line through the balloon, exclusive of the neck, bisecting the maximum axis at any angle and terminating at the balloon wall.

3.4 Quality. Balloons shall be not more than 120 days old when submitted for inspection. The material shall contain a suitable antioxidant to preserve the balloons in a serviceable condition. Balloons shall be properly cured by a process that shall not materially impair their elastic properties (see 4.7).

3.5 Construction. Balloons shall be manufactured in accordance with the requirements herein, and shall meet the tests specified in section 4.

3.6 Service conditions. When inflated with helium or hydrogen from a cylinder or generator balloons supplied under this specification shall be designed to provide satisfactory service under the following conditions:

a. Any climate or weather conditions.
b. Any ambient temperature in the range of -90°F to +140°F (-67.8°C to +60°C).
c. Any barometric pressure from 31 inches to 0.5 inch of mercury.
d. Any relative humidity up to 100 percent.
e. Any type of precipitation.
f. Exposure to icing conditions.
g. Exposure to ozone.
h. Exposure to strong ultraviolet radiation.

3.7 Elongation. The physical property used to measure the deterioration of neoprene balloons is the ultimate elongation since this is the primary property affecting the flight of the balloon. The ultimate elongation before and after the accelerated aging test (see 4.8) shall be:

a. Before aging: 700% minimum.
b. After aging: 600% minimum.

3.8 Dimensions.

3.8.1 Neck dimensions. Neck dimensions shall be as specified in table I.

TABLE I. Balloon weight vs dimensions (uninflated).

Balloon weight (grams)			Neck dimensions (inches)				
Nominal	Minimum	Maximum	Length Minimum	Inside diameter		Thickness	
				Minimum	Maximum	Minimum 1/	Maximum
10	8	12	2	0.875	1.125		0.018
30	25	35	2.50	1.125	1.625		0.025
100	90	110	2.50	1.125	1.625		0.025

1/ Same as body of balloon.

3.8.2 Bursting dimensions. Before bursting, balloons shall be capable of being inflated in accordance with 4.9 to either the minimum horizontal diameter dimension or the minimum volume dimension as specified in table II.

TABLE II. Dimensions: Shape, color and bursting test.

Balloon weight (grams)	Conditions for shape and color test			Bursting dimensions (Min)	
	Horizontal diameter (inches)	Volume (cubic feet)	Ratio of axes (Minimum)	Horizontal diameter (inches)	Volume (cubic feet)
10	17	1.4	0.90	22	3.21
30	25	5.0	0.90	38	16.69
100	39	18.3	0.90	84	127.7

3.9 Color of balloons. The balloons shall be colored as specified in 1.2. All colors shall be of sufficient density and brilliance so that when inflated to the volume specified in table II under "Conditions for Shape and Color test" the balloon will still be nearly opaque and glossy. The numbers listed below shall be as shown in FED-STD-595. All colors, except black, shall be viewed against a black background. Black balloons shall be viewed against a white background.

3.9.1 Uncolored. Uncolored refers to the color of the neoprene latex with no pigment added.

3.9.2 Black. Where black is specified, it shall be Black No. 17038, Dark Blue No. 15044, or a similar dark color so that, when inflated, the balloon will be equally opaque and glossy.

3.9.3 Red. Where red is specified, it shall be Red No. 11136.

3.9.4 Orange. Where orange is specified, it shall be Orange No. 12246.

3.9.5 Yellow. Where yellow is specified, it shall be Lemon Yellow No. 13655.

3.10 Dusting. Balloons shall be evenly dusted inside and outside with dry powdered material which will effectively prevent cohesion or adhesion of the balloon.

3.11 Item marking. The nominal weight in grams and the nomenclature of the balloon shall be printed on each balloon container.

3.12 Workmanship. Finished balloons shall be of uniform texture, shall contain no patches, shall be free of abrasions, pinholes, pinches, slugs, foreign matter, or similar defect. They shall feel dry and not greasy to the touch.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, 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 Classification of inspection. The inspection requirements specified herein are classified as follows:

a. First article inspection (see 3.1 and 4.2).
b. Quality conformance inspection (see 4.3).
c. Packaging inspection (see 5.1).

4.2 First article inspection. First article samples shall be subjected to all the tests and inspections of this specification and to such additional unspecified destructive or nondestructive tests as may be deemed necessary by the Government to determine compliance with these requirements.

4.3 Quality conformance inspection. Inspection shall consist of group A, and group B inspection as specified in 4.3.2 through 4.3.3.3. Group B inspection shall normally be performed on lots that have passed group A inspection and on samples selected from units that have been subjected to and met group A inspection. However, the order may be varied when the Government considers it more practical to select separate samples for group B inspection.

4.3.1 Inspection lots. Only balloons of a single function, nominal weight, material and color shall be grouped together in an inspection lot. A lot shall consist of balloons made from a single batch of compounded latex within a period not exceeding 7 consecutive calendar days. Each lot shall contain a grouping of balloons as nearly homogenous as possible. The minimum lot size shall be 2000 balloons or total quantity on order if less than 2000. If the number of balloons remaining at the end of a contract is one-half or more of the minimum lot size, it shall be considered a lot; if less than one-half, it shall be grouped with the next succeeding lot for sampling or included in the preceding lot when there is no succeeding lot.

4.3.2 Group A inspection. This inspection, including sampling, shall conform to table III and the inspection procedures of MIL-STD-105 using Level II of the General Inspection Levels.

TABLE III. Group A inspection.

Inspection	Requirement paragraph	Test method paragraph	AQL percent defective
Visual and mechanical			
Major	3.12	4.4	1
Minor	3.12	4.4	4

4.3.3 Group B inspection. Group B inspection shall be in accordance with table IV.

4.3.3.1 Order of inspection within group B. Group B inspection shall be performed in any order which is satisfactory to the Government.

TABLE IV. Group B inspection.

Inspection	Requirement paragraph	Test method paragraph	AQL percent defective	Inspection level
Neck dimensions:				
Length	3.8.1	4.5.1	4.0	S-4
Thickness	3.8.1	4.5.2		
Diameter	3.8.1	4.5.3		
Weight	Table I	4.6	6.5	S-4
Bursting dimensions	3.8.2	4.9	15.0	S-3
Shape	3.3.2	4.7		
Color	3.9	4.7		
Accelerated aging	3.7	4.8	1/	

1/ There shall be no failures.

4.3.3.2 Sampling procedure. Samples shall be selected in an unbiased manner by the Government inspector. Unless otherwise specified, inspection shall be started using level II of the specified table. If the number of defective sample units from a lot exceeds the acceptance number specified on the table, the lot shall be rejected. Disposition of rejected product (sample unit and lots) shall be in accordance with MIL-STD-105 and 4.3.4.

4.3.3.3 Procedure in case of failure. When a lot is rejected, the contractor shall immediately investigate the cause of failure and shall report to the Government inspector the results thereof and details of corrective action taken. If the contractor and Government inspector cannot agree on the effectiveness of the corrective action, the matter shall be referred to the contracting officer for resolution.

4.3.4 Disposition of nonconforming product. When defective sample units or rejected lots are resubmitted for acceptance, such items shall be suitably tagged or identified by equivalent means to indicate the cause of failure and means employed to correct the fault. The record shall be presented to the Government when the items are resubmitted and shall become the property of the Government.

4.4 Visual and mechanical inspection. Balloons shall be inspected for workmanship, for compliance with requirements of 3.4, 3.6, 3.10 and other miscellaneous defects contrary to specified requirements. Each balloon sample shall be inflated and visually inspected for all the defects enumerated in 3.12 and shall be classified major or minor in accordance with the classification of defects in table V. This inspection shall preferably be performed just prior to packaging after all other handling operations have been completed. At the discretion of the inspector, it may be performed at another time if considered more practical, provided positive, effective precautions, satisfactory to the Government are taken to assure protection from subsequent mechanical injury prior to final packaging. Visual and mechanical defects, not specified in 3.12 shall be classified by the inspector as major or minor in accordance with the definitions of MIL-STD-105.

TABLE V. Classification of defects.

Major	Minor
1. Balloon contains impurities, lumps, foreign matter. 2. Balloon contains patches. 3. Balloon contains holes or cracks. 4. Balloon contains non-removable pinches. 5. Neck not securely attached to balloon. 6. Balloon not dusted inside and outside. 7. Wrong color. 8. Unevenness of thickness.	1. Balloon contains warped or rubbed areas. 2. Nomenclature or instruction notice missing, illegible or incorrect. 3. Unevenness of color.

4.5 Neck dimensions inspection.

4.5.1 Length. The length of the tubular (approximately constant cross-sectional area) portion of the neck shall be measured to determine compliance with 3.8.1.

4.5.2 Thickness. At ten different points, the thickness of the neck shall be measured. These measurements shall be within the limits specified in table I. The measurements may be made of a double thickness of the neck provided the neck is flattened so that a true measure is obtained of only the two neck thicknesses.

4.5.3 Diameter. The inside diameter of the neck shall be measured by fitting it over rigid tubes or cylinders of circular cross section. The dimensions of these gages shall be the minimum and maximum diameters given in table I. The neck shall fit the gage of minimum diameter without stretching but shall require stretching to fit the gage of maximum diameter.

4.6 Weight. The balloon to be tested shall be separately weighed on a balance which is accurate to one-half gram. The weight of the balloon shall be as specified in 1.2 and within the limits given in table I. Weight shall include that of talc or equivalent dusting material provided that any amount in excess of that required for adequate protection against adherence of balloon folds shall be emptied before weighing.

4.7 Shape and color. Balloons to be tested in accordance with 4.9 shall be visually examined against a white or black background (depending on the color of the balloon) at the diameter or volume specified in table II under conditions for color and shape tests. Balloons shall comply with the shape and color requirements of 3.3.2 and 3.9.2 through 3.9.5, respectively. The axes may be measured on a photograph taken so as to show the most distorted shape of the balloon, or may be determined by other means which allow these values to be measured accurately: for example, the measurement of a shadow thrown by the balloon, or using hoops, calipers, or other mechanical means. The photographic method for obtaining an axis measurement is the preferred method.

4.8 Accelerated aging test. This test is intended to estimate the relative resistance of cured neoprene balloons to aging. No direct correlation between this accelerated test and natural life of neoprene balloons is given or implied.

4.8.1 Nature of test. This aging test of neoprene balloons consists of subjecting test specimens, having previously determined physical properties, to controlled elevated temperature in air at atmospheric pressure. It does not include exposure to light.

4.8.2 Apparatus. An air oven shall be used and shall meet the following requirements:

a. Provision shall be made to lay test specimens between two layers of cheesecloth on a perforated platform.
b. The heating medium for the aging chamber shall be air circulated within it at atmospheric pressure.
c. The heated air shall be thoroughly circulated in the oven by means of mechanical agitation. The air must not come in contact with any electric motor brush discharge because of the danger of ozone formation.
d. The source of heat shall be located outside the aging chamber proper.
e. The temperature shall be automatically controlled.
f. A recording thermometer shall be used to record the temperature in the aging chamber.
g. Actual checks of the oven temperature shall be made by means of a maximum reading thermometer.

4.8.3 Number of test specimens. Three balloons shall be selected for aging tests from each production lot.

4.8.3.1 Three specimens from each balloon shall be used for testing the ultimate elongation of the unaged balloon film. A total of nine specimens shall be tested.

4.8.3.2 Three specimens from each balloon shall be used for testing the ultimate elongation of the balloon film after aging. A total of nine specimens shall be tested.

4.8.4 Test results. The final value of the ultimate elongation for the aged and unaged balloon shall be the median of results from nine specimens tested.

4.8.5 Test temperature. Oven aging shall be for 8 hours at 100°C ± 1°C (212°F ± 1.8°F).

4.8.6 Test specimens. Dumbbell-shaped specimens shall be cut by using a standard die having a waist of 0.25 inch. The test specimen shall be free of wrinkles, creases, lumps, and blisters.

4.8.7 The thickness of the test specimen shall be measured prior to exposure in the aging chamber. Gage lines used for measuring elongation shall be applied after the specimens have been aged, and just prior to testing. Identically spaced gage lines shall be used on the unaged samples.

4.8.8 Testing of specimens. All specimens shall be tested on the Scott Tester per A.S.T.M. D412-75. Elongation shall be:

a. Before aging: 700% minimum.
b. After aging: 600% minimum.

4.8.8.1 All samples will be kept in a desiccator for a minimum of 24 hours before testing.

4.8.8.2 All samples will be tested within 96 hours after removal from the aging chamber.

4.9 Bursting test. The balloon to be tested shall be inflated with air at room temperature until it has either burst or reached the applicable bursting requirement given in table II. If equipment to measure the volume of air is available, the volume method of measurement shall be used. Any balloon which bursts before the value specified in table II is reached, shall be considered as failing. Presence of leaks or pinholes during inflation shall be considered a failure regardless of ability to obtain specified bursting value. The inflation rate shall be controlled so that bursting dimensions are reached within 5 minutes. There shall not be more than two failures in the burst test.

5. PACKAGING

5.1 Packaging requirement. Packaging requirement shall be in accordance with MIL-B-14417.

6. NOTES

6.1 Intended use. Pilot balloons are used to determine wind direction and speed aloft; ceiling balloons are used to determine cloud height.

6.2 Ordering data. Procurement documents should specify the following:

a. Title, number, and date of this specification.
b. Type of balloon required.
c. Whether domestic or overseas shipment is required.
d. First article samples required (see 3.1).
e. Marking and shipping of samples.
f. Place of final inspection (see 4.1).

6.3 Non-compliance. Approval to ship may be withheld at the discretion of the Government, pending the decision from the contracting officer on the adequacy of corrective action taken for elimination of non-compliance (see 4.3.3.3 and 4.3.4).

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

Custodians:
Army - ER
Air Force - 99

Preparing activity:
Army - ER

(Project 6660-0053)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS This form is provided to solicit beneficial comments which may improve this document and enhance its use DoD contractors, government activities, manufacturers, vendors, or other prospective users of the document are invited to submit comments to the government Fold on lines on reverse side, staple in corner, and send to preparing activity. Attach any pertinent data which may be of use in improving this document If there are additional papers, attach to form and place both in an envelope addressed to preparing activity A response will be provided to the submitter, when name and address is provided, within 30 days indicating that the 1426 was received and when any appropriate action on it will be completed

NOTE: This form shall not be used to submit requests for waivers, deviations or clarification of specification 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

DOCUMENT IDENTIFIER *(Number)* AND TITLE

MIL-B-10743E BALLOON, PILOT AND CEILING

NAME OF ORGANIZATION AND ADDRESS OF SUBMITTER

☐ VENDOR ☐ USER ☐ MANUFACTURER

1 ☐ HAS ANY PART OF THE DOCUMENT CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE? ☐ IS ANY PART OF IT TOO RIGID, RESTRICTIVE, LOOSE OR AMBIGUOUS? PLEASE EXPLAIN BELOW

A GIVE PARAGRAPH NUMBER AND WORDING

B RECOMMENDED WORDING CHANGE

C REASON FOR RECOMMENDED CHANGE(S)

2 REMARKS

SUBMITTED BY *(Printed or typed name and address — Optional)*

TELEPHONE NO

DATE

DD FORM 1 OCT 76 1426 EDITION OF 1 JAN 72 WILL BE USED UNTIL EXHAUSTED

FOLD

POSTAGE AND FEES PAID

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE $300

Commander
US Army Electronics Research and Development Command
Combat Surveillance and Target Acquisition Laboratory
ATTN: DELCS-PE
Fort Monmouth, New Jersey 07703

FOLD