

MIL-W-7327C
19 December 1968
SUPERSEDING
MIL-W-7327B
23 April 1964 and
MIL-W-7617B
23 April 1964

MILITARY SPECIFICATION

WEIGHING KITS, ELECTRONIC, AIRCRAFT AND MISSILE
A/S 37M-1 AND A/S 37M-2

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

1. SCOPE

- * 1.1 Scope. This specification covers two types of aircraft and missile weighing kits.
- * 1.2 Classification. The weighing kits shall be of the following types and capacities:
 - a. Type A/S 37M-1 - 150,000 pound capacity
 - b. Type A/S 37M-2 - 400,000 pound capacity

2. APPLICABLE DOCUMENTS

- * 2.1 The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

SPECIFICATIONS

Federal

W-C-596	Connector, Plug, Electrical; Connector, Receptacle, Electrical.
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Military

MIL-P-116 MIL-D-1000	Preservation, Methods Of Drawings, Engineering And Associated Lists
MIL-C-3432	Cable And Wire, Electrical (Power And Control; Semi-Flexible, Flexible, And Extra-Flexible, 300 And 600 Volts)
MIL-E-4970	Environmental Testing, Ground Support Equipment, General Specification For
MIL-C-5015	Connectors, Electric, "AN" Type

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MIL-A-26975	Accessory Kit, Aircraft Weighing, Type MB-1
MIL-B-43291	Boxes: Fiberboard; Corrugated, Double-Wall, Weather Resistant

STANDARDS

Federal

FED-STD-595	Colors
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Military

MIL-STD-129	Marking For Shipment And Storage
MIL-STD-130	Identification Marking Of US Military Property
MIL-STD-143	Specifications And Standards Order Of Precedence For The Selection Of
MIL-STD-470	Maintainability Program Requirements (For Systems And Equipments)
MIL-STD-471	Maintainability Demonstration
MIL-STD-781	Reliability Tests: Exponential Distribution
MIL-STD-808	Finishes, Protective, And Codes, For Finishing Schemes For Ground And Ground Support Equipment
MIL-STD-831	Test Reports, Preparation Of

DRAWINGS

Air Force

44A5184	Adapter-Electric Weighing Kit Stud
45A7324	Adapter-Airplane Electric Weighing Kit Spherical
48A7153	Adapter Assembly-Adjustable Electric Weighing Kit

(Copies of specifications, standards, drawings, and publications required by suppliers 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 following document forms a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

OFFICIAL CLASSIFICATION COMMITTEE

Uniform Freight Classification Rules

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(Application for copies should be addressed to the Official Classification Committee, Room 202, Union Station, 516 West Jackson Boulevard, Chicago IL 60606.)

3. REQUIREMENTS

3.1 Preproduction. This specification makes provision for preproduction testing.

* 3.2 Components. The weighing kits covered by this specification shall consist of the following major units:

<u>Item Number</u>	<u>Quantity</u>		<u>Unit Name</u>	<u>See Requirements</u>
	Type A/S 37M-1	Type A/S 37M-2		
1	1	1	Indicator Amplifier	3.4.5
2	1	1	Power Supply	3.4.6
3	3	4	Load Cell	3.4.9
4	1	1	Extension Cord, Alternating Current (AC) Power	3.4.7.2
5	1	1	Extension Cord, Direct Current (DC)	3.4.7
6	3	4	Extension Cord, Load Cell	3.4.8
7	1	1	Battery Cable	3.4.7.1
8	1	-	Accessory Kit	3.4.13
9	3	4	Plug Adapter	3.4.14.3
10	3	4	Adjustable Adapter	3.4.14.3
11	3	4	Spherical Adapter	3.4.14.1 and 3.4.14.2
12	1	1	Spare Parts Kit	3.4.15
13	1	1	Carrying Case	3.4.12

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3.3 Materials.

3.3.1 Protective treatment. When materials are used in the construction of the weighing kit that are subject to deterioration, when exposed to climatic and environmental conditions likely to occur during service usage, they shall be protected against such deterioration in a manner that will in no way prevent compliance with the performance requirements of this specification. The use of any protective coating that will crack, chip or scale with age or extremes of climatic and environmental conditions shall be avoided.

3.3.2 Selection of materials. Specifications and standards for all materials, parts, and Government certification and approval of processes and equipment, which are not specifically designated herein and which are necessary for the execution of this specification, shall be selected in accordance with MIL-STD-143, except as provided in the following paragraph.

3.3.2.1 Standard parts. Standard parts (MS, AN, or JAN) shall be used wherever they are suitable for the purpose, and shall be identified on the drawing by their part numbers. Commercial utility parts such as screws, bolts, nuts, cotter pins, et cetera, may be used, provided they possess suitable properties and are replaceable by the standard parts (MS, AN, or JAN) without alteration, and provided the corresponding standard part numbers are referenced in the parts list and, if practicable, on the contractor's drawings. In the event there is no suitable corresponding standard part in effect on date of invitation for bids, commercial parts may be used provided they conform to all requirements of this specification.

- * 3.4 Design and construction. The weighing kits shall be designed and constructed as a self-contained, portable weighing instrument capable of maintaining calibration for a minimum time period of at least 6 months, consistent with the accuracy requirements specified herein.
- * 3.4.1 The A/S 37M-1 weighing kit shall contain three 50,000 pound capacity load cells.
- * 3.4.2 The A/S 37M-2 weighing kit shall contain four extendable 100,000 pound capacity weighing capsules.
- * 3.4.3 Reliability. The equipment shall have a minimum mean time between failures (MTBF) of 100 cycles with a minimum reliability of .99 for a 1 cycle mission at a confidence factor of .90.
- * 3.4.4 Maintainability. Maintainability requirements shall be in accordance with MIL-STD-470.
- * 3.4.5 Indicator amplifier. The indicator amplifier instrument shall consist of a chassis, containing the necessary amplifying equipment and bridge circuits required for measuring compression loads in pounds from each of the individual load cells. The indicator amplifier shall be mounted within a dust proof box and shall contain an off-on switch, voltage check switch, null balance meter, calibrated load indicator with load dial adjustment, three circuit selector switches for the A/S 37M-1 and four circuit selector switches for the A/S 37M-2,

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circuit zero adjustments, and a weight increment stepping switch. An internal span adjustment in each of the load cell circuits shall be provided to permit load cell interchangeability between kits of any one manufacturer's make or model. The indicator shall be removable from the kit carrying case as a unit, and the interior of the instrument shall be readily accessible for maintenance.

- * 3.4.5.1 Power requirements. The indicator amplifier instrument shall be designed to operate on 22 to 28 volts DC.
- * 3.4.5.2 Load indicator. The load indicator shall be illuminated, shall have full direct reading and be of the digital type with the following characteristics:
 - a. Type A/S 37M-1 weighing kit load indicator shall have a range of 0-50,000 pounds with digital increments of 10 pounds. Lines shall be included between the 10 pound increments for 5 pound readability. A means shall be incorporated for reading zero shift below zero to a minimum of 25 pounds. The digital figures shall be of sufficient size and character as to be clearly readable at a distance of 5 feet. A switch may be used to add increments of weight every 5,000 or 10,000 pounds.
 - b. Type A/S 37M-2 weighing kit load indicator shall have a range of 0-100,000 pounds with digital increments of 20 pounds. Lines shall be included between the 20 pound increments for 10 pound readability. A means shall be incorporated for reading zero shift below zero to a minimum of 25 pounds. The digital figures shall be of sufficient size and character as to be clearly readable at a distance of 5 feet. A switch may be used to add increments of weight every 10,000 or 20,000 pounds.
- * 3.4.5.3 Zero adjustment. The indicator amplifier instrument shall have a means of adjustment for each load cell to zero on the balance indicator before loads are applied.
 - * 3.4.5.3.1 For Type A/S 37M-1, the range of the zero adjustment shall be a minimum of 2,000 pounds in both directions from the design standard load cell resistance at no load. Each adjustment knob shall be color coded 1 red, 1 yellow, and 1 blue.
 - * 3.4.5.3.2 For Type A/S 37M-2, the range of the zero adjustment shall be a minimum of 5,000 pounds in both directions from the design standard load cell resistance. Each adjustment knob shall be color coded 1 red, 1 yellow, 1 blue and 1 green.
- * 3.4.5.4 On-off switch and voltage check switch. Two switches shall be provided, one switch to cause the meter to operate in response to load, and one momentary switch to indicate on the meter the battery or rectified voltage that is being supplied to the indicator amplifier. Interlocks shall be provided, or the wiring so arranged to prevent load reading and voltage check reading being applied simultaneously. One selector-type switch or double-throw toggle-type switch may be furnished provided above requirements are met.

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- * 3.4.5.5 Meter. The meter shall serve both as a null balance indicator and a voltage check. It shall be of the zero-center type. When used as a balance indicator, the pointer shall indicate to the right of zero when the load dial is rotated too far to the right, and shall indicate to the left of zero when the dial is rotated too far to the left. Correct balance shall be when the meter reads zero. When used as a battery check, wrong polarity shall be indicated by the pointer moving to the right of zero in a sector marked yellow. When the polarity is correct, the meter shall show by means of red and green sectors whether the battery voltage is high, above 28 volts red; low, below 22 volts red; or correct, between 22 and 28 volts green. The meter shall show approximately 1 degree per volt, that is, the low red sector shall be approximately 22 degrees and the green sector shall be approximately 6 degrees.
- * 3.4.5.6 Sensitivity. The sensitivity of the meter balance indication shall be measured as the amount of pounds change on the load dial required to move the meter pointer from zero to the beginning of the green sector. To do this, it shall require not more than 210 pounds movement of the load dial, or approximately 9.5 pounds per degree for the Type A/S 37M-1, and not more than 450 pounds movement of the load dial, or approximately 20 pounds per degree for the Type A/S 37M-2. Provisions shall be made within the indicator to allow adjustment of sensitivity at time of calibration.
- * 3.4.6 Power pack. The power pack shall consist of suitable rectifier devices and circuits to convert 110 volts, 60 cycle AC to 24 volts DC for supply to the indicator amplifier. A manual or automatic device shall be incorporated to compensate for at least ± 10 percent voltage variation in the 110 volt supply. Adequate fuses shall be provided for protection of the power pack. One on-off switch shall be provided to disconnect the power pack from the indicator. One recessed twist lock plug Style G26 conforming to W-C-596, shall be built into the power pack panel for connecting the alternating current power cord.
- * 3.4.7 Direct current power cord. A flexible, electric cord, type CO-02 MGF (2/18) O300 in accordance with MIL-C-3432, 15 feet long, shall be supplied for the DC power supply. One end shall be equipped with a two-prong, twist-lock connector, Style C42, conforming to the requirements of W-C-596, and the other end with a two-prong twist-lock plug, Style C22, conforming to W-C-596. A 2 foot length of the same cable shall be attached to the indicator amplifier power input and equipped with a two-prong twist-lock plug, Style C22, conforming to W-C-596.
- * 3.4.7.1 Direct-current power cord adapter. The adapter shall consist of two pieces of single-conductor, flexible cable, type CO-01 MGF (1/18) O166 conforming to MIL-C-3432. It shall be at least 18 inches long, and shall be connected to a two-prong twist-lock connector, Style C42, conforming to W-C-596. Each of the remaining two ends shall be attached to battery clips of adequate size to be easily clamped on battery terminals.
- * 3.4.7.2 Alternating current power cord. A 25 foot long, flexible, electric cord, type CO-03 MGF (3/18) O330, conforming to MIL-C-3432, shall be supplied. One end shall be equipped with a three-prong, twist-lock connector, Style G44 conforming to W-C-596, to fit the plug base specified in 3.4.6, and the other

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end shall be equipped with a three-prong, parallel blade plug, Style D conforming to W-C-596.

* 3.4.8 Load cell cord. One 50 foot length of flexible, ground shielded, oil resistant, four 20-gauge Teflon insulated singles, all nylon jacketed electric cord shall be furnished for each load cell. One end of each cord shall be attached to the indicator amplifier terminals. The other end shall be attached to its respective load cell with a lock-type disconnect plug conforming to the requirements of MIL-C-5015. Each plug and receptacle shall be color coded as follows: No. 1 circuit red, No. 2 circuit yellow, and No. 3 circuit blue. For Type A/S 37M-2, the No. 4 circuit shall be green. The color of each plug and receptacle shall agree with the color of the zero set knobs of the indicator amplifier instrument (see 3.4.5.3). A spool shall be furnished for each cord for storage purposes.

* 3.4.9 Load cells. Hermetically sealed load cells with lock-type disconnect receptacles shall be supplied with each kit. Each cell containing the weight sensing elements, shall be color coded to agree with the circuit coding specified in 3.4.8. The weight sensing element may be any type capable of meeting the requirements of this specification. The design configuration shall be such as not to impose restrictions upon their use between aircraft jack pads and the jack rams. Requirements for the specific type weighing kit load cell are:

a. Type A/S 37M-1 - Overall height and width shall not exceed 3 inches. The top of each cell shall be provided with a 3/8 inch deep, 3/4 inch spherical radius socket to fit the spherical adapters specified in 3.4.14.1.

b. Type A/S 37M-2 - Overall height and width shall not exceed 4-1/2 inches. The top of each cell shall be provided with a 3/8 inch deep, 3/4 inch spherical radius socket to fit the spherical adapters specified in 3.4.14.2.

The bottom of each cell shall be machined flat, and smooth, and provided with a tapped hole to fit the threaded part of the adapters specified in 3.4.14. The cell of any one manufacturer shall be completely interchangeable and replaceable without the necessity of linearity matching, replacing, or altering components. Minor adjustment of the screw or knob type shall be acceptable provided this adjustment is located so as not to be subject to tampering by other than kit maintenance personnel.

* 3.4.9.1 Calibration and capacity. Calibration shall not be affected when a full load is applied vertically on 1/2 of the top rim of the cell when in a vertical position or when a full load is applied vertically at the center of the top rim when the cell is at 9 degrees from the vertical position. Capacities shall be as follows:

a. Type A/S 37M-1 - Each load cell shall have a capacity of 50,000 pounds or a total of 150,000 pounds for the three cells. The cells shall be so designed as not to be damaged when a 100 percent overload is applied.

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b. Type A/S 37M-2 - Each load cell shall have a capacity of 100,000 pounds or a total of 400,000 pounds for the four cells. The cells shall be so designed as not to be damaged when a 50 percent overload is applied.

- * 3.4.10 Weighing kit accuracy, Type A/S 37M-1. The indication amplifier and load cells shall be so designed that a load applied vertically, and in the center of the cell, can be measured on any of the cells accurately within 0.1 percent of applied load or 10 pounds whichever is greater, without any calibration correction. The cells shall be so designed that loads applied at any angle up to 4 degrees, or eccentric up to 1/4 inch or applied evenly over the top rim of the cell, will not introduce an error greater than 0.34 percent of applied load. Each kit shall be calibrated to a standard of 45 degrees latitude ($G = 980.665 \text{ cm/sec}^2$).
- * 3.4.11 Weighing kit accuracy, Type A/S 37M-2. The indicator amplifier and load cells shall be so designed that a load applied vertically, and in the center of the cell, can be measured on any of the cells accurately within 0.2 percent of applied load or 50 pounds whichever is greater, without any calibration correction. The cells shall be so designed that loads applied at an angle up to 4 degrees, or eccentric up to 1/4 inch or applied evenly over the top rim of the cell, will not introduce an error greater than 0.5 percent of applied load. Each kit shall be calibrated to a standard of 45 degrees latitude ($G = 980.665 \text{ cm/sec}^2$).
- * 3.4.12 Case. A case shall be provided for housing the entire weighing kit and shall be capable of protecting the contents therein from environmental conditions specified in 4.4.3.3, 4.4.3.4, and 4.4.3.6. Provisions shall be provided for placing each individual unit in a neat, orderly manner and in such a way that when the kit is transported from one place to another, they will be held securely in place. Heavy metal hinges shall be used on the case and the cover shall be held closed with two lock and key-type trunk fasteners. One handle shall be located at each end of the case. The case shall be provided with a receptacle and retainer for an accessory kit conforming to MIL-A-26975.
- * 3.4.12.1 The Type A/S 37M-1 weighing kit case shall have one handle on the top of the case to enable the kit to be carried easily by one person
- * 3.4.13 Accessory kit. One accessory kit conforming to MIL-A-26975 shall be furnished with each Type A/S 37M-1 weighing kit. When specified, one accessory kit conforming to MIL-A-26975 shall be furnished with each Type A/S 37M-2 weighing kit (see 6.2).
- * 3.4.14 Adapters.
- * 3.4.14.1 Spherical adapters, Type A/S 37M-1. Three spherical adapters conforming to Drawing 45A7324 shall be furnished to fit the 3/4 inch spherical radius socket of the load cell.
- * 3.4.14.2 Spherical adapters, Type A/S 37M-2. Four spherical adapters, similar to the adapters shown on Drawing 45A7324, shall be furnished to adapt the 1-1/8 inch socket on the weighing capsules to the 3/4 inch spherical radius jack pad installed on aircraft.

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- * 3.4.14.3 Jack adapters. Stud adapters, similar to the adapters shown on Drawing 44A5184, shall be furnished to fit the bottom of the capsules to the 1 inch diameter socket atop the aircraft jack rams. Adjustable assemblies, similar to the adapters shown on Drawing 48A7153, shall be furnished complete with the necessary wrenches to fit the bottom of the capsules to the flat top of the axle jacks. The threaded portion of the adapters shall be enlarged or lengthened as necessary, and the type of steel changed as necessary to provide sufficient strength to withstand the tests specified herein.
- * 3.4.15 Spare parts. A set of component parts, as specified in the invitation for bids, shall be provided as spares and shall be packed with the kit (see 6.2).
- * 3.5 Interchangeability. All parts having the same manufacturer's part number shall be directly and completely interchangeable with each other with respect to installation and performance. Changes in manufacturer's part numbers shall be governed by the drawing number requirements of MIL-D-1000.
- * 3.6 Weight. The weight and cubic capacity of the complete kit shall be minimum, consistent with the requirements of this specification. The Type A/S 37M-1 weighing kit, including accessory kit, shall weigh not more than 75 pounds. The complete kit, Type A/S 37M-2 shall weigh not more than 120 pounds, without the accessory kit.

3.7 Finish. Fiber-covered cases shall be finished outside with two or more coats of oleo-resinous paint, conforming to Color No. 13538 of FED-STD-595. Molded, plastic cases, if finished in natural color, shall have a color conforming to Color No. 13538 of FED-STD-595. The finish shall be applied in accordance with MIL-STD-808.

3.8 Identification of product. Equipment assemblies, and parts shall be marked for identification in accordance with MIL-STD-130. The following special marking shall be included: 22 to 28 volts DC or 110 volts AC, 60 cycle, single phase.

3.9 Special marking.

3.9.1 Diagrams. A diagram shall be located inside the case showing the cable terminal connections, and containing complete instructions for operation of the weighing kit. A plate shall be provided on the indicator for marking the original and subsequent calibration dates.

- * 3.9.2 Cautions. Precautionary measures necessary to the handling and operation of the weighing kit shall be stenciled on two opposite sides of the case, using 1 inch letters for "Caution" and 1/2 inch letters for the remainder. A permanent-type plastic or metal tag shall be securely attached to the plug end of the DC power cord specified in 3.4.7 warning that the cord is to be used only on 24 volts DC.

- * 3.9.3 Correction factor. A table with the correction factors for various latitudes and instructions for using them shall be provided. The plate shall be located on the case in such a way so as to be convenient to the operator while using the kit (see Table I).

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TABLE I

CORRECTION FACTOR FOR WEIGHING
KITS AT VARIOUS LATITUDES

Kit is calibrated to standard
gravity $G = 980.665 \text{ cm/sec}^2$
(32.174 ft/sec^2)

<u>Lat</u>	<u>Cor Factor</u>	<u>Lat</u>	<u>Cor Factor</u>
0°	1.0027	50°	0.9996
5°	1.0026	55°	0.9991
10°	1.0025	60°	0.9987
15°	1.0023	65°	0.9984
20°	1.0021	70°	0.9980
25°	1.0017	75°	0.9978
30°	1.0014	80°	0.9976
35°	1.0010	85°	0.9974
40°	1.0005	90°	0.9974
45°	1.0000		

INSTRUCTIONS: To obtain actual weight, multiply the weight read from the weighing kit indicator by the correction factor for the latitude at which the kit is being used.

- * 3.9.4 Accuracy of kit. The kit shall be marked on the panel below the digital readout in the following manner for the Type A/S 37M-1:

Accuracy: ± 1 percent or 10 pounds whichever is greater.

For the Type A/S 37M-2 the kit shall be marked:

Accuracy: ± 2 percent or 50 pounds whichever is greater.

3.10 Workmanship.

3.10.1 General. The weighing kits, including all parts and accessories, shall be fabricated and finished in a thoroughly workmanlike manner. Particular attention shall be given to freedom from blemishes, defects, burrs, and sharp edges; accuracy of dimensions, radii of fillets, and marking of parts and assemblies; thoroughness of soldering, welding, brazing, painting, wiring, and riveting; and alignment of parts and tightness of assembly screws and bolts.

3.10.2 Cleaning. The weighing kit shall be thoroughly cleaned, and loose, spattered or excess solder, metal chips and other foreign material removed during and after final assembly.

4. QUALITY ASSURANCE PROVISIONS

- * 4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier 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.

4.2 Classification of tests. The inspection and testing of weighing kits shall be classified as follows:

- a. Preproduction tests 4.4
- b. Acceptance tests 4.5

4.3 Test conditions.

4.3.1 Standard test conditions. Unless otherwise specified herein, all tests shall be conducted under room conditions with the temperature at $21^{\circ} \pm 5^{\circ}$ Centigrade (C), the relative humidity at 90 percent or less, and the barometric pressure at 28 to 32 inches of mercury.

- * 4.3.2 Apparatus and instruments. Apparatus and instruments used in conjunction with the testing specified herein shall be of laboratory precision type and shall be checked to ascertain that they have been installed in a satisfactory manner for durability and accurate operation and shall be calibrated at intervals properly spaced to insure laboratory efficiency. Load calibration equipment other than dead weights shall have an accuracy of ± 0.05 percent of reading for the Type A/S 37M-1 and ± 0.10 percent of reading for the Type A/S 37M-2. This equipment shall be calibrated by the National Bureau of Standards, Washington DC, no longer than 6 months prior to each use or more often if required to maintain specified accuracy.

4.4 Preproduction tests.

4.4.1 Test plan. All tests shall be conducted in accordance with a detailed test plan prepared by the contractor and approved by the procuring activity prior to preproduction testing. If during the test program this test plan is found to be inadequate by the procuring activity, it shall be amended and resubmitted for approval.

4.4.1.1 Preproduction test sample tested by the contractor. The contractor shall subject one of each type weighing kit to the preproduction tests specified in 4.4.2.

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4.4.1.2 Preproduction test report. After the contractor completes the preproduction tests, he shall prepare a preproduction test report in accordance with MIL-STD-831, and furnish the report to the procuring activity.

4.4.1.3 Maintenance data. A log of maintenance downtime occurring during the tests shall be included as an attachment to the test report together with a complete analysis of the maintenance problems and corrective actions pertinent to all downtime periods, including predictions of reliability improvement resulting from any corrections made. Such corrections shall be reflected in production equipment.

4.4.1.4 Component failure. An account shall be made of all component failures that occur during testing. The type of component, the conditions during failure, and the type of failure shall be recorded and included in the preproduction test report.

4.4.1.5 Preproduction test sample for the procuring activity. After submission of the preproduction test report, the contractor shall retain the preproduction test sample at his plant in operating condition pending the following action by the procuring activity:

- a. Review of the mechanical construction.
- b. Performance of any test, included in the specification, after reviewing the contractor's test report.
- c. Notification of final acceptance.

4.4.2 Tests. Preproduction tests shall consist of all tests specified herein.

4.4.3 Environmental tests. The weighing kit shall be subjected to the following environmental tests in accordance with MIL-E-4970. Deterioration or corrosion of any part which would be detrimental to satisfactory operation of the kit shall be cause for rejection.

4.4.3.1 Low temperatures. This test shall be conducted in accordance with Procedure I of MIL-E-4970. After low temperature exposure for 15 hours, the kit shall be permitted to warm up and stabilize at 0°C. The kit shall then be tested in accordance with 4.5.1.2, except ambient temperature shall be 0°C. The entire kit including the amplifier instrument shall be subject to this test. The ambient temperature shall then be raised to +10° and +21°C and the entire kit tested in accordance with 4.5.1.2. The kit shall be allowed to stabilize before testing at each temperature.

4.4.3.2 High temperature. This test shall be conducted in accordance with Procedure I of MIL-E-4970. After high temperature exposure for 15 hours, the kit shall be cooled and allowed to stabilize at 49°C. The kit shall then be tested in accordance with 4.5.1.2 except ambient temperature shall be 49°C. The entire kit including the indicator amplifier shall be subjected to this test. The ambient temperature shall then be lowered to +38°C, +27°C and +21°C and the entire kit tested in accordance with 4.5.1.2. The kit temperature shall be allowed to stabilize before testing at each temperature.

4.4.3.3 Humidity. During exposure, the case shall be closed and locked. After the exposure period, the kit shall be removed and inspected for evidence of deterioration or corrosion.

4.4.3.4 Salt spray. The time of exposure shall be 50 hours. During exposure, the case shall be closed and locked. After the exposure period, the kit shall be removed and inspected for evidence of deterioration or corrosion.

4.4.3.5 Fungus. During exposure, the case shall be open. After the exposure period, the kit shall be removed, inspected for evidence of deterioration or evidence of supported fungus growth, and subjected to the test specified in 4.5.1.2 of this specification.

4.4.3.6 Sand and dust. During exposure, the case shall be closed and locked. After the exposure period, the kit shall be removed and the inside of the case shall be examined for sand and dust.

* 4.4.4 Overload test. Each load cell in the weighing kit shall be subjected to a 100,000 pound load for the Type A/S 37M-1 or 150,000 pound load for the Type A/S 37M-2, applied vertically downward through a 3/4 inch radius, spherical pad. The cell shall be fitted with a plug adapter as specified in 3.4.14 and mounted in the same manner in which it would be used in service. The cell shall show no signs of structural failure, and shall require no more than routine calibration to restore its original accuracy.

* 4.4.5 Eccentric load tests. Each load cell shall be tested for accuracy under eccentric loading at room temperature of approximately 22°C, in the following manner:

a. Type A/S 37M-1 - Loads shall be applied at an angle of 4 degrees with the vertical centerline of the load cell at 2000, 5000, and every 5000 pounds thereafter up to and including full capacity. The indicator shall be set to zero before each load. Each cell shall be rotated in the test fixture to a new position relative to the position of previously tested cells. All indicator readings shall be accurate to within 0.3 percent of the vertical component of the load. After each applied load, the zero shift shall not be greater than 0.02 percent of capacity after an interval of 3 minutes.

b. Type A/S 37M-2 - Loads shall be applied at an angle of 4 degrees with the vertical centerline of the load cell, at 2000, 5000, 10,000 and every 10,000 pounds thereafter up to and including full capacity. The indicator shall be set to zero before each load. Each cell shall be rotated in the test fixture to a new position relative to the position of previously tested cells. All indicator readings shall be accurate to within 0.5 percent of the vertical component of the load. After each applied load, the zero shift shall not be greater than 0.02 percent of capacity after an interval of 3 minutes.

4.4.5.1 With the cell at an angle of 9 degrees from the load line, a load equal to the cell capacity shall be applied. The calibration of the cells shall not be changed after removal of the test load.

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4.4.6 Stability test. One weighing kit shall be stored for a period of 6 months. Upon completion of the storage period, the kit shall be subjected to the test specified in 4.5.1.2 and shall meet the accuracy requirements specified therein without requiring calibration or any other maintenance operations.

4.4.7 Reliability demonstration and test. The contractor shall submit for approval a reliability test program based on MIL-STD-781, using Test Level A-1 (Table I) and Test Plan III. The application cycle shall consist of application and removal of 50 percent of the rated capacity weight of each kit by either calibrated weights or by a calibrated press. This test shall follow the successful completion of the tests described in 4.4.3, 4.4.4 and 4.4.5. Unless otherwise specified (see 6.2), one unit shall be used for this test.

4.4.8 Maintainability verification. Verification of the maintainability requirements shall be in accordance with MIL-STD-471.

4.4.9 Preproduction test report. After the preproduction tests are completed a copy of a test report in accordance with MIL-STD-831 shall be supplied to the procuring activity.

4.4.9.1 Reliability and maintainability information. The following information shall be submitted as an attachment accompanying the above report or shall be included as part of that report.

a. All failures, maintenance, and other events recorded shall be identified by accumulated operating time, miles, cycles, or position in the test procedure as appropriate. Test conditions during the failures or irregular operations identified shall be recorded.

b. Description of the engineering reasoning and of any tests conducted to determine assignable causes for all failures and irregular operations identified.

c. Description of the engineering reasoning behind any corrections made, to be made on production items, or proposed to be made, and behind the predicted effectiveness of those corrections.

d. Test activity or contractor comments on item features or requirements that, if modified, should improve the item.

e. Test activity or contractor comments on field conditions or procedures to be avoided or cultivated to increase the item's reliability and useful life.

f. Estimates (± 5 percent of actual experienced) of man-hours required for each maintenance and servicing action during the tests. A brief description of the qualifications and experience of the personnel involved shall be included and shall be adequate to allow comparison to the personnel anticipated in similar field work.

4.5 Acceptance tests. The acceptance tests shall consist of individual tests.

4.5.1 Individual tests. Each weighing kit shall be subjected to the following tests:

4.5.1.1 Examination of product. Each weighing kit shall be inspected to determine compliance with the requirements specified herein with respect to materials, workmanship, and marking.

* 4.5.1.2 Load test. Each kit shall be tested in the following manner:

a. Type A/S 37M-1 - Loads shall be vertically applied to each load cell at 2000, 5000 and every 5000 pounds thereafter up to and including full capacity at ambient room temperature of approximately 22°C. The indicator shall be set to zero before each load. Loads shall be applied at a maximum rate of 2 pounds per second as the set load is approached. All indicator readings shall be accurate to within 0.1 percent of applied load or 10 pounds, whichever is greater. After each applied load, the zero shift shall not be greater than 0.02 percent of capacity after an interval of 3 minutes.

b. Type A/S 37M-2 - Loads shall be vertically applied to each load cell at 2000, 5000, 10,000 and every 10,000 pounds thereafter up to and including full capacity at ambient room temperature of approximately 22°C. The indicator shall be set to zero before each load. Loads shall be applied at a maximum rate of 2 pounds per second as the set load is approached. All indicator readings shall be accurate to within 0.2 percent applied load or 50 pounds, whichever is greater. After each applied load, the zero shift shall not be greater than 0.02 percent of capacity after an interval of 3 minutes.

* 4.5.1.3 Sensitivity. The sensitivity of the meter balance indication shall be determined for each kit by observing the movement of the meter point in response to movement of the load dial. For the Type A/S 37M-1 not more than 210 pounds movement of the load dial shall be required to move the meter pointer from zero to the beginning of the green sector (22 degrees of arc, or approximately 9.5 pounds per degree). For the Type A/S 37M-2, not more than 450 pounds movement of the load dial shall be required to move the meter pointer from zero to the beginning of the green sector (22 degrees of arc, or approximately 20 pounds per degree).

4.5.1.4 Sampling. The first kit and every fiftieth kit thereafter under each contract or order, shall be submitted by the contractor to the National Bureau of Standards in Washington DC, or to a laboratory approved by the procuring activity, for calibration by means of their standard dead weights, as specified in 4.5.1.2. Results of the calibration check shall be made a part of the test records submitted by the contractor (see 6.2).

* 4.6 Rejection and retest. Items which have been rejected may be reworked or replaced to correct the defects, and resubmitted for acceptance. Before resubmitting, full particulars concerning previous rejection and the action taken to correct the defects found in the original shall be furnished the inspector. Units rejected after retest shall not be submitted without the specific approval of the procuring activity.

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- 4.7 Inspection of the preservation, packaging, packing and marking for shipment and storage. Sample items or packs and the inspection of the preservation, packaging, packing and marking for shipment and storage shall be in accordance with the requirements of Section 5, or the documents specified therein.

5. PREPARATION FOR DELIVERY

- 5.1 Preservation and packaging. Preservation and packaging shall be level A or C as specified (see 6.2).
- * 5.1.1 Level A. Each weighing kit shall be preserved and packaged in accordance with MIL-P-116, Method III and placed in a snug fitting container conforming to MIL-B-43291, grade VIIC.
- † 5.1.2 Level C. Each weighing kit shall be preserved and packaged in a manner which will afford adequate protection against corrosion, deterioration and physical damage during shipment from supply source to the first receiving activity. The supplier may use his commercial practice providing it fulfills this requirement.
- * 5.2 Packing. Packing shall be level A, B or C as specified (see 6.2).
- * 5.2.1 Level A. Unless otherwise specified (see 6.2), weighing kits preserved and packaged as specified in 5.1.1 do not require overpacking. Closure and strapping shall be accomplished in accordance with the appendix of the specification.
- † 5.2.2 Level B. Same as level A.
- * 5.2.3 Level C. Packages that require overpacking for acceptance by the carrier shall be placed in exterior type shipping containers in a manner that will insure safe transportation at lowest rate to the point of delivery. Containers shall comply with Uniform Freight Classification Rules or regulations of other carriers as applicable to the mode of transportation.
- * 5.3 Marking. In addition to any other marking required by order or contract, interior and exterior containers shall be marked in accordance with MIL-STD-129.

6. NOTES

- * 6.1 Intended use. The weighing kits covered by this specification are intended for weighing aircraft and missiles. By suspending the entire weight of the object on the load cells and individually noting the weight applied to each cell on the readout instrument, the total weight can be computed, and the center of gravity may be determined.
- * 6.2 Ordering data. Procurement documents should specify the following:
- Title, number, and date of this specification.
 - Type of weighing kit required (see 1.2).
 - Whether the accessory kit is required (see 3.4.13).
 - Applicable spare parts (see 3.4.15).

- e. Location where tests are to be made (see 4.1 and 4.5.1.4).
- f. Selection of applicable levels of preservation, packaging and packing (see 5.1 and 5.2).
- g. Applicable shipping containers, when required (see 5.2.1).
- h. Number of weighing kits required for reliability testing, if more than one (see 4.4.7).

6.3 Definitions.

6.3.1 Reliability. Reliability is the probability of performing without failure a specified function under given conditions for a specified period of time. Recognizing that, in general, the rate of failure of equipment is fairly constant throughout the life of the equipment, the probability of nonfailure over an operating time interval decreases exponentially as a function of the length of the interval, during which time is a constant failure rate, and can be expressed as follows:

Confidence level: 90 percent.

$$MTBF = \frac{\text{Total test time}}{2.3}$$

$$\text{Reliability} = \frac{\text{Mission time}}{MTBF}$$

The $2.3 = \frac{4.61}{2}$ is based on the constant for the Poisson/Chi squared distribution, assuming an exponential (2 degree freedom) distribution even though the failure rate for the test is zero.

6.3.2 Mean time between failures. The mean life or mean time between failures is the arithmetical mean (average) of the operating time between failures.

- * 6.4 The margins of this specification are marked with an asterisk to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

Custodians:
 Army - AV
 Air Force - 82

Review Activities:
 Army - AV
 Air Force - 82

Preparing Activity:
 Air Force - 82

User:
 Army - MI

Project No. 6670-0079

SPECIFICATION ANALYSIS SHEET		Form Approved Budget Bureau No. 119-R004
<u>INSTRUCTIONS</u>		
This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity.		
SPECIFICATION		
ORGANIZATION		CITY AND STATE
CONTRACT NO.	QUANTITY OF ITEMS PROCURED	DOLLAR AMOUNT \$
MATERIAL PROCURED UNDER A		
<input type="checkbox"/> DIRECT GOVERNMENT CONTRACT <input type="checkbox"/> SUBCONTRACT		
1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?		
A. GIVE PARAGRAPH NUMBER AND WORDING		
B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES		
2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID		
3. IS THE SPECIFICATION RESTRICTIVE?		
<input type="checkbox"/> YES <input type="checkbox"/> NO IF "YES", IN WHAT WAY?		
4. REMARKS (Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)		
SUBMITTED BY (Printed or typed name and activity)		DATE