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REV. A

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Superseding AS25959

Tie Downs, Cargo, Aircraft

RATIONALE

AS25959 was returned to military custody as MIL-DTL-25959D at their request. Accordingly, it is hereby cancelled as regards SAE.

CANCELLATION NOTICE

This document has been declared "CANCELLED" as of June 2006. By this action, this document will remain listed in the Numerical Section of the Aerospace Standards Index.

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NOTICE

This document has been taken directly from U.S. Military Specification MIL-DTL-25959D, Notice 1, Amendment 1 and contains only minor editorial and format changes required to bring it into conformance with the publishing requirements of SAE technical standards. The initial release of this document is intended to replace MIL-DTL-25959D, Notice 1, Amendment 1. Any part numbers established by the original specification remain unchanged.

The original Military Specification was adopted as an SAE standard under the provisions of the SAE Technical Standards Board (TSB) Rules and Regulations (TSB 001) pertaining to accelerated adoption of government specifications and standards. TSB rules provide for (a) the publication of portions of unrevised government specifications and standards without consensus voting at the SAE Committee level, and (b) the use of the existing government specification or standard format.

Under Department of Defense policies and procedures, any qualification requirements and associated qualified products lists are mandatory for DOD contracts. Any requirement relating to qualified products lists (QPL's) has not been adopted by SAE and is not part of this SAE technical document.

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1. SCOPE:

1.1 Scope:

This specification covers four types of aircraft cargo tie downs.

1.2 Classification:

Tie downs covered by this specification shall be one of the following types:

MB-1	10,000 pound capacity
CGU-4/E	Same as MB-1 except the adjuster mechanism hook is turned 180 degrees
MB-2	25,000 pound capacity
CGU-3/E	Same as MB-2 except the adjuster mechanism hook is turned 180 degrees

2. APPLICABLE DOCUMENTS:

2.1 General:

The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents:

2.2.1 Specifications and standards: The following specifications and standards form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the specific issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto cited in the solicitation (see 6.2)

SPECIFICATIONS

DEPARTMENT OF DEFENSE

MIL-DTL-6458 - Chain Assemblies, Single Leg, Aircraft Cargo Tie Down

STANDARDS

DEPARTMENT OF DEFENSE

MIL-STD-130 - Identification Marking of US Military Property

(Unless otherwise indicated, copies of the above specifications and standards are available from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D Philadelphia, PA 19111-5094.)

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2.3 Non-Government publications:

The following document(s) form a part of this document to the extent specified herein. Unless otherwise specified, the applicable issues of the documents which have been adopted by the DoD are those listed in the specific issue of the DoDISS cited in the solicitation. Unless otherwise specified, the documents not listed in the DoDISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN SOCIETY FOR QUALITY CONTROL (ASQC)

ANSI/ASQC Z1.4 - Sampling Procedures and Tables for Inspection by Attributes (DoD adopted)

(Application for copies should be addressed to American Society for Quality Control, 611 East Wisconsin Avenue, P.O. Box 3005, Milwaukee, WI 53201-3005, or to the American National Standards Institute, 11 West 42nd Street, New York, NY 10036.)

RADIO TECHNICAL COMMISSION FOR AERONAUTICS (RTCA)

RTCA/DO-160 - Environmental Conditions and Test Procedures for Airborne Equipment

(Applications for copies should be addressed to RTCA, Inc, 1140 Connecticut Ave. NW, Washington, DC 20036.)

2.4 Order of precedence:

In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS:

3.1 Qualification:

The tie downs furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable Qualified Products List before contract award (see 4.2 and 6.3).

3.2 Materials:

All materials shall be suitably treated to resist corrosion due to electrolytic decomposition, fungus, salt spray, and any other atmospheric condition that may be encountered during operational use or storage.

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3.3 Design and construction:

The tie down shall be as simple, lightweight, and compact as possible and shall be constructed so that no parts will work loose in service. It should be of rugged construction so as to withstand the rough handling encountered in installation and service. Frequent dropping of the tie down 16 feet to a concrete runway should not deform the tie down in such a manner that it would cause it to be rendered inoperable. There shall be no sharp corners or other stress risers which would tend to cause cracks with repeated use under normal operating conditions. All mechanisms shall be so constructed that they will not cause injury to operating personnel. The MB-1 and MB-2 design shall be such that the adjuster mechanism hooks face downward when the tie downs are positioned with the release levers on top.

3.3.1 Tensioning ability: After preliminary adjustment of the tie down to remove excess slack, the tensioning assembly shall be operable and shall be capable of applying tension to the chain of not less than 300 pounds with a manually applied force of not more than 60 pounds. This mechanism shall be designed in such a manner that manually applied forces in excess of this magnitude shall not result in failure. Failure is defined as catastrophic as well as permanent deformation of components.

3.3.2 Tension releasing: The tie down shall be so designed that the chain assembly can be manually released and automatically separated from the tensioning assembly in a single operation with an applied force not exceeding 50 pounds while restraining loads that apply 5000 pounds tension on the chain. It shall also be possible, by the application of additional force, to release the chain assembly from the tensioning assembly while restraining loads that apply 10,000 pounds tension (MB-1 and CGU-4/E) or 25,000 pounds (MB-2 and CGU-3/E). Any release mechanism which results in any component of the tensioning assembly becoming detached or damaged or does not permit the tie down to be immediately reapplied shall not be acceptable. The mechanism shall be designed in such a manner that inadvertent release of the mechanism by personnel moving about the aircraft will be improbable. Any design which requires operating personnel to exercise extreme caution in releasing the tie down under the proof loads cited in this specification shall not be acceptable.

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3.4 Components:

Each tie down shall consist of a chain assembly and tensioning assembly.

3.4.1 Chain assembly: The chain assembly shall conform to MIL-DTL-6458 as follows:

a. Type I chain assembly for MB-1 and CGU-4/E tie down.
b. Type II chain assembly for MB-2 and CGU-3/E tie down.

3.4.2 Tensioning assembly: The tensioning assembly adjustment shall be capable of quickly providing any adjustment within the range of 0 to at least 3.5 inches. Preliminary adjustment of the tie down length shall be accomplished as specified in 3.4.2.2. Final adjustment of the tie down length shall be provided by a take-up in the tensioning assembly itself.

3.4.2.1 Ring attachment: One end of the tensioning assembly shall be provided with a flat hook to permit rapid attachment of the tensioning assembly to a ring having a minimum clear open diameter of 1.25 inches for the MB-1 and CGU-4/E tie downs and a minimum of 2 inches for the MB-2 and CGU-3/E tie downs. The stock cross-sectional diameter shall not be less than 0.875 inch for the MB-1 and CGU-4/E tie downs and not less than 1 inch for the MB-2 and CGU-3/ tie downs. The tip of the hook shall be wedge shaped so that operating personnel can use the tensioning assembly as a handle to scoop up and attach the hook to tie down rings in the aircraft floor. A spring-loaded mechanism or similar positive automatic-acting system shall be provided on the hook to prevent inadvertent disengagement. Pressure of the ring against the keeper shall permit the ring to enter the hook. Disengagement of hook and tie down ring shall be accomplished by manually depressing the keeper.

3.4.2.2 Chain attachment: As a preliminary adjustment, the opposite end of the tensioning assembly shall be provided with a mechanism that will permit the tensioning assembly to be quickly attached to any link of the chain assembly with the exception of end links. This attachment shall provide any tie down length within the limits imposed by the chain link configuration and the lengths of the chain and tensioning assemblies. The chain attachment mechanism shall be so constructed that the chain will not become detached from the tensioning assembly during the operations required to apply the tie down. Any design that requires the chain assembly to thread through the tensioning assembly or requires manipulation of the mechanism to attach the chain assembly will not be acceptable. The MB-1 and CGU-4/E chain attachment mechanism shall be capable of attachment to any chain that falls within dimensional requirements of MIL-DTL-6458, Type I. The MB-2 and CGU-3/E chain attachment mechanism shall be capable of attachment to any chain that falls within dimensional requirements of MIL-DTL-6458, Type II.

3.4.3 Dimensions: The dimensions of the tensioning assembly, including the space through which levers and other mechanisms move, shall not exceed envelope sizes as shown in table I.

TABLE I. Tie down dimensions

Tie Down	Length	Width	Height
MB-1 and CGU-4/E	15 inches	4 inches	3.5 inches
MB-2 and CGU-3/E	18 inches	5 inches	4 inches

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3.5 Operation:

The four types of tie downs listed in this specification shall be capable of being easily operated in world-wide environmental conditions (see 3.7). The tie downs must function easily by personnel wearing standard aircrew work gloves. All mechanisms shall be manually operable within the use of tools or supplementary devices. Positive locking shall be incorporated in the tensioning mechanism and automatically engage upon completion of the tensioning operation. The mechanism shall be capable of one-handed tensioning and release by one crew member.

3.6 Loads:

The tie downs shall be capable of withstanding proof loads of 10,000 pounds for the MB-1 and CGU-4/E and 25,000 pounds for the MB-2 and CGU-3/E for 30 seconds without permanent deformation or damage. The adjustable hook shall be capable of withstanding an axial torque of 2000 inch-pounds for the MB-1 and CGU-4/E and 4000 inch-pounds for the MB-2 and CGU-3/E for 30 seconds without failure or extensive deformation. The tie downs shall also be capable of withstanding ultimate loads of 14,100 pounds for the MB-1 and CGU-4/E and 35,250 pounds for the MB-2 and CGU-3/E for 30 seconds without failure. At these ultimate loads, deformation, but not rupture of parts, will be allowed. The tie down need not be functional after being subjected to the ultimate load tests in this paragraph.

3.7 Environmental conditions:

The tie downs shall be capable of operating satisfactorily under the following conditions:

a. Exposure to salt sea atmosphere.
b. Sand and dust particles as encountered in desert areas.
c. Vibrations encountered during use in transport aircraft (see 6.2).
d. Temperature range of -65°F to 160°F.

3.8 Weight:

3.8.1 Type MB-1 and CGU-4/E: The weight of the MB-1 and CGU-4/E tensioning assembly shall not exceed 3.5 pounds each.

3.8.2 Type MB-2 and CGU-3/E: The weight of the MG-2 and CGU-3/E tensioning assembly shall not exceed 6.5 pounds each.

3.9 Reliability:

The tie down shall perform in its intended environment (see 3.7) for at least 30 years of continuous use with no loss of function or safety.

3.10 Interchangeability:

All parts having the same manufacturer's part number shall be functionally and dimensionally interchangeable.

3.11 Identification:

Equipment, assemblies, and parts shall be marked for identification in accordance with MIL-STD-130. The contract number and date is mandatory.

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3.12 Safety:

The tie downs shall be functional without sharp edges, burrs, or protrusions that might injure operational personnel or prevent the operation of the tie downs in restricted locations. Operation of tie down equipment shall not present undue hazards to personnel during tie down of cargo, while the cargo is secured, during the release of cargo restraint, or during removal or stowage of the tie downs. Normal operation shall not present cutting, pinching, stabbing, nor abrupt impact hazards to personnel.

3.13 Maintenance:

The tie down shall not require periodic maintenance, lubrication, or adjustment to maintain its serviceability.

3.14 Recycled, recovered, or environmentally preferable materials:

Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible provided that the materials meet or exceed the operational and maintenance requirements, and promote economically advantageous life cycle cost.

3.15 Toxic chemicals, hazardous substances, and ozone depleting chemicals (ODCs):

The use of toxic chemicals, hazardous substances, or ODCs shall be avoided, whenever feasible.

4. VERIFICATION:

4.1 Classification of inspection:

The inspection requirements specified herein are classified as follows:

a. Qualification inspection (see 4.2).
b. Conformance inspection (see 4.3).

4.1.1 Sampling for inspection: Except as otherwise specified, sampling and associated procedures for formation of lots shall be in accordance with ANSI/ASQC Z1.4.

4.2 Qualification inspection:

Qualification inspection shall be performed on three tie down assemblies. This inspection shall include the examination under 4.6 and the tests indicated in 4.7.

4.2.1 Qualification matrix: The testing sequence is shown in table II.

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TABLE II. Testing sequence

Test Paragraph	Test Article A	Test Article B	Test Article C
4.7.1 & all subpara.	1		
4.7.1.4		5	3
4.7.1.5		6	4
4.7.2.1		1	
4.7.2.2		2	
4.7.2.3		3	
4.7.2.4			1
4.7.2.5			2
4.7.3.1	2		
4.7.3.2	3		
4.7.3.3	4		
4.7.4		4	

4.2.2 Inspection sample: The inspection sample shall consist of three tie downs, of the type submitted for qualification, which shall be identified with the supplier's product identification number and any identification required by the procuring activity.

4.3 Conformance inspection:

Conformance inspection shall include examinations and inspections under 4.3.1, 4.3.2, and 4.6 and tests included in 4.7.1.4 and 4.7.1.5.

4.3.1 Visual characteristics examination: The sample unit shall be one tie down. Characteristics to be examined are shown in table III.

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TABLE III. Visual examination

Examine	Defect	Classification Major	Classification Minor
Chain and Grab Hook	Not type specified.	X	
	Cracking, peeling, or flaking of protective finish; rust or corrosion.		X
	Any part broken or deformed.	X	
Tensioning Assembly	Component missing.	X	
	Component damaged.	X	
	Rust or corrosion.		X
	Burrs or sharp edges.		X
Identification Marking	Missing, incomplete, incorrect, or not legible.		X
Workmanship	Loose, cocked, or inadequately headed rivets; distorted or loose bushings and pins; rough, malformed, misaligned, or improperly fabricated fittings.	X	

4.3.2 Dimensional inspection: The sample unit shall be one tie down. Inspection shall be made to determine conformance to the applicable dimensional requirements of 3.4.2, 3.4.2.1, 3.4.2.2, and 3.4.3.

4.4 Test conditions:

Unless otherwise specified, all tests shall be performed in accordance with the test conditions specified in RTCA/DO-160 for the applicable test.

4.5 Requirements cross-reference matrix:

Table IV provides a cross-reference matrix of the section 3 requirements tested or verified in section 4.

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TABLE IV. Requirements cross-reference matrix

REQUIREMENT	VERIFICATION
3.2	4.6, 4.7.2.1
3.3	4.6
3.3.1	4.7.1.4
3.3.2	4.7.1.5
3.4	4.6
3.4.1	4.6
3.4.2	4.7.1.3
3.4.2.1	4.3.2, 4.6
3.4.2.2	4.3.2, 4.6
3.4.3	4.3.2
3.5	4.7.1.2

REQUIREMENT	VERIFICATION
3.6	4.7.3.1, 4.7.3.2, 4.7.3.3
3.7	4.7.2 & sub-paragraphs
3.8.1	4.6
3.8.2	4.6
3.9	4.7.2, 4.7.4, 4.7.2.1 through 4.7.2.4
3.10	4.6
3.11	4.3.1, 4.6
3.12	4.6, 4.7.1.2, 4.7.1.5, 4.7.3.3
3.13	4.6
3.14	4.6
3.15	4.6

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4.6 Examination:

Each tie down assembly shall be examined for compliance with the requirements specified in 3.2, 3.3, 3.4.1, 3.4.2.1, 3.4.2.2, 3.8.1, 3.8.2, 3.10, 3.11, 3.12, 3.13, 3.14, and 3.15. Any redesign or modification of the contractor's standard product to comply with specific requirements, or any necessary redesign or modification following failure to meet the specified requirements shall receive particular attention for adequacy and suitability. This element of inspection shall encompass all visual examinations for dissimilar metals as well as dimensional requirements (see 6.4).

4.7 Tests:

4.7.1 Performance: 4.7.1.1Test methods: Except otherwise specified, tests shall be conducted with the tie down working length adjusted to 3 feet.

4.7.1.2 Operations test: The operations test ensures that gloves do not cause interference or otherwise present a safety hazard to the user during tie down operations. The test shall be performed in conjunction with the tensioning test (see 4.7.1.4) and the release test (see 4.7.1.5). These tests shall be conducted with test personnel wearing standard aircrew work gloves.

4.7.1.3 Manual adjustment test: This test consists of performing the tensioning test (see 4.7.1.4) at three incremental lengths specified by the Government (see 6.2).

4.7.1.4 Tensioning test: With the tie down connected between two fixed points 9 feet apart, the tensioning mechanism shall be operated and checked for compliance with the requirements of 3.3.1 and 3.4.2.

4.7.1.5 Release test: The tie down shall be adjusted to a length of approximately 4 feet and assembled in a test machine. A load of 5000 pounds shall then be applied and the release mechanism operated manually while sustaining this load. The assembly shall then be released while sustaining a 10,000 pound load (MB-1/CGU-4/E) or a 25,000 pound load (MB-2/CGU-3/E). The release mechanism shall meet the requirements specified in 3.3.2. The tie down shall be suspended between two free-swiveling rings that are positioned 80 inches apart in the same horizontal plane with sufficient slack in the connection to permit 5 inches of sag in the assembly. The tie down shall be rotated slowly through 360 degrees. Under these conditions, the chain shall not become detached from the tensioning assembly.

4.7.2 Environmental tests: Environmental testing shall be planned and conducted under the guidance of RTCA/DO-160. At the conclusion of each test, and during the temperature tests, the tie down shall be checked for compliance with the adjustment requirements of 3.4.2 and subjected to the tests specified in 4.7.1.4 and 4.7.1.5.

4.7.2.1 Salt fog: The tie down shall be subjected to a salt fog test in accordance with DO-160, Section 14, Category S, 5% Salt Spray.

4.7.2.2 Sand and Dust: The tie down shall be subjected to a dust test in accordance with DO-160, Section 12, Category D. Note: if 140 mesh silica flour is used, local environmental laws and criteria must be observed.

4.7.2.3 Vibration: The tie down shall be assembled between two points that are three feet apart and tensioned to 300 pounds. The tie down shall be subjected to a vibration test in accordance with DO-160, Section 8, Standard and Random Vibration. The vibration profile shall be in accordance with 3.7.c.

4.7.2.4 Low temperature: The tie down shall be subjected to a low temperature test in accordance with DO-160 Section 4, Category A3, Ground Survival Low Temperature Curve, and a temperature of -65°F.

4.7.2.5 High temperature: The tie down shall be subjected to a high temperature test in accordance with DO-160 Section 4, Category A3, Ground Survival Low Temperature Curve, except the maximum temperature shall be 160°F.

4.7.3 Load tests: 4.7.3.1Proof-load test: The tie downs shall be subjected to proof loads of 10,000 pounds for the MB-1 and CGU-4/E and 25,000 pounds for the MB-2 and CGU-3/E for 30 seconds to determine compliance with the requirements of 3.6. During this test, there shall be no slippage through the adjustment device.

4.7.3.2 Axial-torque load test: The adjustable hook shall be extended out 2 inches from the fully retracted position. The tie down shall be held firmly in a vice and torque shall be applied to the adjustable hook for 30 seconds to determine compliance with 3.6. During this test, there shall be no permanent deformation or damage.

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